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Informal Report

QUALITATIVE RISK EVALUATION OF ENVIRONMENTAL RESTORATION PROGRAMS AT BROOKHAVEN NATIONAL LABORATORY

S. C. Morris

May 1996

Prepared for the
Office of Environmental Restoration
Brookhaven National Laboratory

BIOMEDICAL AND ENVIRONMENTAL ASSESSMENT GROUP

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DEPARTMENT OF APPLIED SCIENCE

BROOKHAVEN NATIONAL LABORATORY
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DISCLAIMER

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ABSTRACT

This report documents the evaluation of risks associated with environmental restoration activities at Brookhaven National Laboratory using two tools supplied by DOE to provide a consistent set of risk estimates across the DOE complex: Risk Data Sheets (RDS) and Relative Risk Ranking. The tools are described, the process taken characterized, results provided and discussed. The two approaches are compared and recommendations provided for continuing improvement of the process.

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PURPOSE AND SCOPE

The Department of Energy Office of Environmental Management developed a qualitative risk evaluation tool to allow managers to discuss possible effects of budget reductions on a site's or program's ability to adequately manage risk and to compare results across the DOE complex. In a time of tightening budgets, the aim is to convert from a compliance-based to a risk-based process. This information was used successfully in 1995 to inform budget decisions. In 1996, the Qualitative Risk Evaluation Process was incorporated into the budget formulation process for the 1998 budget year.

Risk Data Sheets (RDSs) are a key part of this process. These forms and the process used to compile information for them are similar to those used in 1995 (Morris and Meinhold, 1995), but some changes were made. The current format of the RDS is provided in Appendix I. DOE developed a set of standard assumptions to be used throughout the complex unless noted otherwise on the RDS. Those assumptions applicable to BNL-OER program are listed in Appendix II. For the Environmental Remediation program, RDSs were to be based on "Release Sources." This is a much narrower scope for an RDS than was the case in 1995, when the RDSs were completed at BNL for Operable Units, a more aggregate level. Release Sources are interpreted liberally, however, so that an area of groundwater contamination, for example, might be treated separately from its original source. Multiple source terms are not combined unless they are truly linked or if they represent similar concerns with similar risks.

In addition, the Office of Environmental Restoration developed a separate Relative Ranking Evaluation Framework, based on an approach used by the Department of Defense. This framework is grounded in environmental measurements more than in judgment, but is also narrower in scope than the Risk Data Sheets. Although the original intention was the results of this ranking would feed into the RDS process, authorization to initiate this process was not obtained until following the completion of the RDS process.

Both processes were implemented for the Brookhaven National Laboratory (BNL) Office of Environmental Restoration (OER). The RDS process and the Relative Ranking Evaluation Framework are described, along with their implementation in BNL-OER and the results of that implementation. The two processes and their results are compared.

RISK DATA SHEET PROCESS

Background and Description

All the scoring was done in the Management Evaluation Matrix. This was computerized within the EM Management Evaluation Process Information System software. The Matrix included impact categories and likelihood levels. Impact categories included Public Safety and Health; Site Personnel Safety and Health (including site visitors); Environmental Protection; Compliance; Mission Impact; Mortgage Reduction; and Social, Cultural, and Economic impacts. Likelihood levels

were Very High, High, Medium, and Low. The Matrix and the scores (high, medium, and low) are shown in Figure 1. The likelihood scale is shown in Figure 2.

Figure 1. RDS Management Evaluation Matrix.

IMPACTS	LIKELIHOOD OF OCCURRENCE A VERY HIGH	B HIGH	C MEDIUM	D LOW
CATEGORY: PUBLIC SAFETY AND HEALTH				
PS1. Immediate or eventual loss of life/permanent disability	H	H	M	M
PS2. Excessive exposure and/or injury	H	M	(M)	L
PS3. Moderate to low-level exposure	M	M	L	L
CATEGORY: SITE PERSONNEL SAFETY AND HEALTH				
SP1. Catastrophic - Injuries/illnesses involving permanent total disability, chronic or irreversible illnesses, extreme overexposure, or death	H	H	M	M
SP2. Critical - Injuries/illnesses resulting in permanent partial disability or temporary total disability > 3 months, or serious overexposure	H	M	M	L
SP3. Marginal - Injuries/illnesses resulting in hospitalization, temporary, reversible illnesses with a variable but limited period of disability of < 3 months, slight overexposure, or exposure near limits (20-100%)	M	M	L	L
SP4. Negligible - Injuries/illnesses not resulting in hospitalization, temporary reversible illnesses requiring minor supportive treatment, or exposures below 20% of limits	M	L	L	L
CATEGORY: ENVIRONMENTAL PROTECTION				
EN1. Catastrophic damage to the environment (widespread and long-term or irreversible effects)	H	H	M	M
EN2. Significant damage to the environment (widespread and short-term effects, or localized and long-term or irreversible effects)	H	M	M	L
EN3. Minor to moderate damage to the environment (localized and short-term effects)	M	M	L	L

IMPACTS	LIKELIHOOD OF OCCURRENCE A VERY HIGH	B HIGH	C MEDIUM	D LOW
CATEGORY: COMPLIANCE				
CO1. Major noncompliance with Federal, State, or Local Laws; Enforcement Actions; or Compliance Agreements significant to ES&H and involving significant potential fines or penalties	H	H	M	M
CO2. Major noncompliance with Executive Orders; DOE Orders; or Secretary of Energy Directives (Notices or Guidance Memoranda) significant to ES&H and not involving significant potential fines and penalties	H	M	M	L
CO3. Marginal noncompliance with Federal, State, or Local Laws; Enforcement Actions; Compliance Agreements; Executive Orders; DOE Orders; or Secretary of Energy Directives significant to ES&H	M	M	L	L
CO4. Significant deviation from good management practices	M	L	L	L
CATEGORY: MISSION IMPACT				
MI1. Serious negative impact on ability to accomplish major program mission	H	H	M	M
MI2. Moderate negative impact on ability to accomplish major program mission	H	M	M	L
CATEGORY: MORTGAGE REDUCTION				
MR1. Significant avoidable cost (today's dollars) due to degraded infrastructure, inefficient management systems or program implementation, accident-related capital loss, or operational expense (annual cost > 1% of annual site EM budget or > $5M)	H	H	M	M
MR2. Moderate avoidable cost (today's dollars) due to degraded infrastructure, inefficient management systems or program implementation, accident-related capital loss, or operational expense (annual cost .1-1% of annual site EM budget or $1-5M)	H	M	M	L
CATEGORY: SOCIAL/CULTURAL/ECONOMIC				
SO1. Significant adverse: Damage so severe to a social, cultural or economic value, e.g., a Tribal burial ground, that no mitigation is possible, i.e., the value would be irrevocably lost.	H	H	M	M
SO2. Moderate adverse: Damage to a social, cultural, or economic value. Mitigation may be possible, but would involve a considerable investment of time and money	H	M	M	L

Figure 2. RDS Likelihood scale.				
Likelihood	Very High	High	Medium	Low
Probability of Occurrence	1 per year	≥ 0.1 / yr < 1 / yr	≥ 0.01 / yr < 0.11 /yr	< 0.01 / yr
Expected Time to Impact	≤ 1 yr	> 1 yr ≤ 10 yrsr	> 10 yr ≤ 100 yrsr	> 100 yrs

Scoring for most categories was done for "before", "during" and "after." "Before" represented the situation if remediation were not done and future impacts were based on existing conditions. "After" represented the situation following remediation and was essentially parallel to "before." "During" represented the potential adverse impacts of the restoration process itself. This included risks to remediation workers or to the public resulting from the remediation process itself and damage to the environment caused by remediation, for example, disturbing wildlife habitat or impacts on the protected pine barrens or wetlands as result of removing contaminated soil. For three categories, compliance, mission impact, and mortgage reduction, scoring for the "During" phase was not applicable.

Implementing The RDS Process in BNL-OER

The author attended a 1-day training session at the DOE Chicago Operations Office. This provided an update on the RDS process and hands-on training with the new RDS software. The implementation process consisted of three stages: (1) determining the number of RDSs that would be scored; (2) scoring the RDSs; and (3) review. These stages overlapped to some degree. A more detailed description of the steps involved in Implementing the RDS process within BNL OER follows.

Preliminary Meeting with Management

The author met with OER management to discuss the scope of the effort and the appropriate people to be involved within the organization. The DOE 1996 guidelines and changes from the previous year were discussed also. It was determined that the level of problem that would be addressed in an RDS would be Areas of Concern (AOC) rather than the broader Operable Units that were used in 1995.

Preliminary Scoping with Project Managers

The author then met with each of the OER Project Managers for a preliminary scoping session. Areas of discussion included the AOCs within the Project Manger's control that were possible subjects of RDSs; the kinds of risks associated with these AOCs; reports and data available to document those risks; the expected work schedule to ascertain the likely status of the AOC in 1998, and the possibilities of combining two or more AOCs into a single RDS.

Prepare preliminary list of RDSs

Based on the preliminary scoping with the Project Managers, a preliminary list of RDSs to be completed was developed and submitted to OER management for review. This was preliminary because it was expected that as information was gathered and the RDSs began take shape, that it would be determined that some AOCs that had been combined should have separate RDSs and that some that began as separate RDSs might be appropriately combined. In fact, this list was modified three times during the process within OER and again after preliminary review by the DOE Brookhaven Area Office. The final list of RDSs is given in Table 1.

Table 1. Final List of Risk Data Sheets for BNL Office of Environmental Restoration activities

1. OU I Groundwater - other	Groundwater plume moving from OU-IV to OU-I
2. OU IV EDB Groundwater Plume	
3. OU I Hazardous Waste Management Facility	
4. OU III Misc. Groundwater and Soil Contamination	Includes several areas of contamination within OU III
5. OU IV Remediation	Primarily oil and solvent spills near the Steam Plant
6. OU I Radiation Contaminated Soil	Numerous sites contaminated at low levels
7. USTs at Building 830 and 811	Includes contamination around the Waste Concentration Facility (Bldg 830)
8. OU V Sewage Treatment Plant	Includes leaking sewer lines and Satellite Disposal Area
9. Core Program	
10. OU III Accelerated Groundwater Action	Groundwater plume moving off site to the south
11. Brookhaven Graphite Research Reactor D&D	
12. OU I Landfills Removal Action	Former Landfill, Current Landfill, Glass and Chemical Holes
13. OU I Groundwater Removal Action	Treatment of groundwater plumes from landfills and HWMF

Scoring RDSs

The RDSs were completed in 1996, but needed to address the situation in 1998 and thereafter. In most cases, the action that would take place in 1998 was as yet undetermined and would depend in part on further measurements taken in 1996 and 1997. The first step in preparing each RDS was thus to define a scenario describing the likely sequence of events.

Based on information from the Project Managers and available documentation, risk data sheets were then scored and descriptive material supporting the score drafted. This was done directly on the RDS software provided by DOE. Some RDSs were fully completed in draft, while others were left incomplete with specific questions for further discussion with OER Project Managers. The scoring process included determining the possible impact levels in each category and the likelihood of that impact. In many cases, multiple options were scored. That is, a given action might have a medium likelihood of excessive exposure and high likelihood of moderate to low exposure. The score (high, medium, or low) was based on the highest score of the combinations considered.

A question arose during the process on what was to be considered remediation and whether there was a limit on the time scale. For contaminated groundwater plumes, natural attenuation was included as part of the remediation process. Completion of remediation, including natural attenuation, might require decades. Guidance was sought from DOE and the response was that natural attenuation should be included without regard to the timing if that was, or was expected to be, specified as part of the remediation process.

Draft RDSs were provided to appropriate OER Project Managers for review. In some cases comments on the RDS were minor while in other cases extensive discussions with references to maps and reports were required to fully understand the nature of the potential risks involved.

Draft RDSs were also provided to the OER Community Relations team for review. To some degree, this helped to assure that stakeholder concerns would be reflected.

Finalize RDSs and Create Summaries

Following the second interviews with OER Project Managers, the RDSs were finalized. They were reviewed for completeness and consistency and to assure relative scores among RDSs seemed reasonable. Summary tables were produced at this stage to assist in the internal review and to facilitate presentation of results in the next stage. These summaries and the full set of RDSs were provided to OER management and to the Brookhaven DOE Group.

Laboratory-Wide Review

A formal presentation was made of the BNL-OER RDS results. RDS scores completed by the BNL Safety and Environmental Protection Division for waste management operations (EM-30) were also presented at this time. DOE

representatives from the Brookhaven Environmental Restoration Group participated in this review.

Chicago Operations Review and Implementation of New Software

The final RDS results were transmitted through the DOE Brookhaven Area Office to DOE Chicago Operations for further review. Chicago Operations recommended three changes to the scoring. Two related to the scoring of the core program, indicating the "Before" rating should reflect the highest rating of the activities being managed. The third indicated that the "After" score for Mission Impact should be changed to reflect minimal risk after the task was completed. An additional change recommended was that assumptions imbedded in the Scenario description should be moved to the field, "Standard Assumptions Exceptions/Additions." All recommended changes were implemented.

Along with the recommended changes, a new version of the software was provided and the RDSs were re-numbered.

RELATIVE RANKING EVALUATION FRAMEWORK

Background and Description

The relative ranking system (DOE, 1995) is derived from a system developed by the Department of Defense (DOE, 1994). It is based on a three-step process: the source hazard factor, the pathway factor and the receptor factor. The first is calculated mechanically by summing the ratios of the concentration of each contaminant to its "standard", where the standard is specified in the guidance. If the sum of ratios exceeds 100, the source hazard factor is "significant." If it is less than 100, but greater than 2, the hazard factor is "moderate." If it is less than 2, the hazard factor is minimum. The pathway factor is either evident, potential, or confined; these refer to the possibility for contamination in the media to move away from the source. The receptor factor is either identified, potential, or limited; these refer to access by receptors. The process is carried out for each media separately. The highest result of any media becomes the score for the release source.

Since data were required to do the scoring, "not evaluated" was a legitimate response when no data were available. This was the case for several sites. In a few cases, although data were not available, the sites could be evaluated by extrapolation from findings at other similar sites.

Implementing The Relative Ranking Evaluation Framework

Although the intention of the DOE Office of Environmental Remediation was that the results of this ranking would feed into the RDS process, authorization to initiate this process was not obtained until following the completion of the RDS process. The list of release sites that were provided to be scored under the Relative Ranking Evaluation (RRE) was much more extensive than the number of RDSs that had been completed (60 compared to 13). Because the RRE required the use of actual measurement data,

it was difficult to combine release sites. Nonetheless, the material that was gathered for the RDS scoring contained much of the measurement data needed for the RRE.

The process was similar to that used for the RDSs, although since the RRE was begun late, the process was more compressed. Although there were more of them, the sites to be scored were pre-defined, eliminating the need to determine them. Time limitations resulted in less review, but since the scores were, for the most part, calculated directly from data, there were fewer judgments that required review. Since the RRE applied only to environmental restoration, it was completely within the scope of OER and site-wide review was not appropriate.

The author used available data to determine relative risks, met (and/or spoke on the phone) with OER Project Managers to review what was done, to get more up-to-date data, if available, and to verify the lack of data when that was the case. RRE scores were compared with RDS scores (see below).

RESULTS

The results of the RDS scoring are presented below. Results of the RRE scoring are presented in the context of a comparison with the RDS scores.

Results of the RDS Scoring

Results were tabulated by category of effect to facilitate comparison among RDSs. These are shown in Tables 2-8. The full RDS sheets that include documentation of the scoring are provided in Appendix I. Based on instructions received from DOE, the core program was scored in each category with the highest score of all the RDSs under its management.

In the category Public Health and Safety (Table 2), all contaminated groundwater plumes that have moved off-site or are likely to move off-site were scored Medium for "Before." Soil contamination at high levels were scored Medium, and a low levels were scored Low. Remediation activities are expected to have minimal direct impact on the public, so most "During" scores are low. In all cases, a Low score was applied after completion of remediation. This was possible because remediation is considered to include a period of natural attenuation.

In the category Site Personnel Health and Safety (Table 3), most scores are low since site workers subject to exposure are carefully controlled. Median scores reflect potential contact of monitoring and remediation personnel to contaminated soil. In all cases, a Low score was applied after completion of remediation.

In the Environmental Protection category, RDSs involving groundwater are ranked High because of the extended time needed for cleanup. Soils are scored High or Medium, depending on the level of contamination. As in the public health category, all RDS fall to a Low score after remediation is completed.

In the Compliance Category, all RDSs except two are scored High for "Before" since if no action is taken, they will be out of compliance with a Compliance Agreement. Action on the OU I USTs is scheduled and thus they are technically not out of

compliance with the Compliance Agreement. They are scored Medium since there is a reasonably probability that they will be in noncompliance with DOE orders by 1998. D&D of the Graphite Reactor is not scheduled under the Compliance Agreement, but failure to take action to remove contamination may lead to noncompliance.

Public controversy over the off-site contaminated groundwater plumes has led to a level of public outrage that threatens major missions of the laboratory, including -- but not limited to -- the OER mission. The scores reflect the degree to which each RDS is likely to attract this outrage. In some cases they also reflect the degree to which the shut-down of a given facility would affect major missions of the laboratory.

The Mortgage Reduction Category indicates the degree to which inaction would lead to increased costs in the future. In general, inaction leads to a Moderate future increase in costs. It is assumed for the "After" case that the remediation action undertaken will be designed in the most cost-effective manner, so all RDSs are scored Low.

Scores for the category Social, Cultural and Economic effects generally reflect the social impact engendered by outrage and fear in the community that was initially focused on off-site contaminated groundwater. This social impact can lead to an economic impact through a decline in property values. Cleanup activity is unlikely to reduce this impact. Although it is to be expected that, over time, this impact will decline as the site is cleaned, it is expected that in many cases it will not drop to Low levels soon. The Brookhaven Graphite Research Reactor is an exception to this. It is a true cultural artifact as the first reactor built for the sole purpose of providing neutrons for peaceful research. It currently serves as a museum, with thousands visitors per year. Plans for D&D of this facility are not firm, but its destruction would be a cultural loss.

Table 2. RDS Public Health And Safety	Before	During	After
OU I Groundwater Removal action	M	L	L
OU I Groundwater - Other	M	L	L
OU VI (EDB Groundwater Plume)	M	M	L
OU I, Hazardous Waste Management Facility	M	L	L
OU III Proper (Misc GW and Soil Contamination	L	L	L
OU IV Remediation (Central Steam Plant)	L	L	L
OU I Rad Contaminated Soils (except HWMF)	L	L	L
OU I USTs (Bldgs 830 and 811)	L	L	L
OU V (Sewage Treatment Plant)	M	L	L
OU III Accel. Groundwater Action	M	L	L
OU I Landfills Removal Action	L	L	L
Brookhaven Graphite Research Reactor	L	L	L
Core Program	M	L	L

Table 3. RDS Site Personnel Health & Safety.	Before	During	After
OU I Groundwater Removal action	L	L	L
OU I Groundwater - Other	L	L	L
OU VI (EDB Groundwater Plume)	L	L	L
OU I, Hazardous Waste Management Facility	M	M	L
OU III Proper (Misc GW and Soil Contamination	L	L	L
OU IV Remediation (Central Steam Plant)	L	L	L
OU I Rad Contaminated Soils (except HWMF)	L	M	L
OU I USTs (Bldgs 830 and 811)	M	M	L
OU V (Sewage Treatment Plant)	L	L	L
OU III Accel. Groundwater Action	L	L	L
OU I Landfills Removal Action	L	M	L
Brookhaven Graphite Research Reactor	L	L	L
Core Program	M	M	L

Table 4. RDS Environmental Protection.	Before	During	After
OU I Groundwater Removal action	H	H	L
OU I Groundwater - Other	H	H	L
OU VI (EDB Groundwater Plume)	H	M	L
OU I, Hazardous Waste Management Facility	H	H	L
OU III Proper (Misc GW and Soil Contamination	M	L	L
OU IV Remediation (Central Steam Plant)	M	M	L
OU I Rad Contaminated Soils (except HWMF)	M	M	L
OU I USTs (Bldgs 830 and 811)	H	L	L
OU V (Sewage Treatment Plant)	H	M	L
OU III Accel. Groundwater Action	H	H	L
OU I Landfills Removal Action	M	M	L
Brookhaven Graphite Research Reactor	M	M	L
Core Program	H	H	L

Table 5. RDS Compliance.	Before	After
OU I Groundwater Removal action	H	L
OU I Groundwater - Other	H	L
OU VI (EDB Groundwater Plume)	H	L
OU I, Hazardous Waste Management Facility	H	L
OU III Proper (Misc GW and Soil Contamination	M	L
OU IV Remediation (Central Steam Plant)	H	L
OU I Rad Contaminated Soils (except HWMF)	H	L
OU I USTs (Bldgs 830 and 811)	M	L
OU V (Sewage Treatment Plant)	H	L
OU III Accel. Groundwater Action	H	L
OU I Landfills Removal Action	H	L
Brookhaven Graphite Research Reactor	M	L
Core Program	H	L

Table 6. Mission Impact.	Before	After
OU I Groundwater Removal action	H	M
OU I Groundwater - Other	H	M
OU VI (EDB Groundwater Plume)	M	M
OU I, Hazardous Waste Management Facility	H	M
OU III Proper (Misc GW and Soil Contamination	M	L
OU IV Remediation (Central Steam Plant)	M	L
OU I Rad Contaminated Soils (except HWMF)	M	L
OU I USTs (Bldgs 830 and 811)	H	L
OU V (Sewage Treatment Plant)	H	M
OU III Accel. Groundwater Action	H	M
OU I Landfills Removal Action	H	L
Brookhaven Graphite Research Reactor	L	L
Core Program	H	L

Table 7. Mortgage Reduction.	Before	After
OU I Groundwater Removal action	M	L
OU I Groundwater - Other	M	L
OU VI (EDB Groundwater Plume)	M	L
OU I, Hazardous Waste Management Facility	M	L
OU III Proper (Misc GW and Soil Contamination	M	L
OU IV Remediation (Central Steam Plant)	M	L
OU I Rad Contaminated Soils (except HWMF)	M	L
OU I USTs (Bldgs 830 and 811)	M	L
OU V (Sewage Treatment Plant)	M	L
OU III Accel. Groundwater Action	M	L
OU I Landfills Removal Action	M	L
Brookhaven Graphite Research Reactor	M	L
Core Program	H	L

Table 8. Social, Cultural, Economic.	Before	During	After
OU I Groundwater Removal action	H	H	M
OU I Groundwater - Other	M	M	M
OU VI (EDB Groundwater Plume)	H	H	M
OU I, Hazardous Waste Management Facility	H	H	M
OU III Proper (Misc GW and Soil Contamination	M	L	L
OU IV Remediation (Central Steam Plant)	M	M	L
OU I Rad Contaminated Soils (except HWMF)	M	M	L
OU I USTs (Bldgs 830 and 811)	M	M	L
OU V (Sewage Treatment Plant)	H	M	M
OU III Accel. Groundwater Action	H	H	M
OU I Landfills Removal Action	H	H	M
Brookhaven Graphite Research Reactor	L	H	H
Core Program	H	H	M

Comparing Results Of The RDS And Relative Ranking Evaluation

The data sheets, which provide basis for the RRE scores, are provided in Appendix II. They show the contaminants and concentrations, the Source Hazard Factor, the Pathway Factor and the Receptor Factor. The most useful way to consider

these results, however, is in the context of the RDS scores. Table 9 provides the relative risk rankings of the release sites in association with the RDS that includes them.

Anticipating that the Relative Ranking Evaluation would be performed before the RDS process, DOE provided in its guidance a cross-walk going from the results of the RRE to the RDS categories for public and occupational health and safety risks. Unfortunately, because authorization to initiate the RRE process was not obtained until after completion of the RDS process, the sequence was reversed.

The cross-walk provided in the DOE guidance was used to estimate appropriate RDS scores for public and occupational health and safety risks. These estimated RDS scores were then compared to the RDS scores that had been obtained previously in the RDS scoring exercise. Results are shown in Table 9. Since there were many more sites scored under the RRE system than RDS system, the comparison is between the set of scores of RRE sites that fall within a given RDS and the original scores for that RDS. The table includes only those release sites that fell within an RDS and were scored under the RRE system. There were some release sites that were scored, but did not fall into one of the previously scored RDSs, and some release sites that were not scored. Three RDSs do not appear in the table. RDS 9 is the core program, which was not required to be scored under the RRE. RDS 11 is the Brookhaven Graphite Research Reactor, which was not scored under the RRE because of lack on data on the total amount of Curies of radiation it contained. RDS 13 is the OU I Groundwater Removal Action. This RDS was used to address the groundwater plume that originated in the Current and Former Landfills and the Hazardous Waste Management Facility. The plumes were combined in one RDS because they are co-mingled, are being treated together (except the former landfill plume that is being treated by natural attenuation) and the landfills (although not the HWMF) are. or will have been, capped before 1998. The release sites specified by DOE, however, specified the landfills separately. This contrasted with the DOE specification of the EDB groundwater plume as a release site. RDS 1, the groundwater plume moving from OU IV to OU I, was not identified until after the DOE list of release sites was developed.

The table highlights several discrepancies between the two systems. First, the cross-walk simply assigns the RRE score to the "Before" score in the Public and Worker risk categories. In the reporting requirements for the RRE, it was requested that the basis of the score be identified as either public or worker. This implies that the cross-walk did not mean that the same score should be assigned to both categories in the RDS.

RDSs 1 and 2 each are associated with a single release site. The scores were based on potential public exposure to groundwater. In the RRE system, RDS 1 was ranked minimal for source hazard, based on limited available data. The plume is evidently moving toward a point of exposure, however, and a receptor population south of the laboratory site has been identified. This combination resulted in a score of High. RDS 2 was similar, differing only in being ranked Moderate for source hazard. In both cases the RRE score was High. The RDS process in resulted in only a Medium score in both cases.

Table 9 Comparison of RDS and RRE results

RDS 1, OU I Groundwater - Other	Public=M	Worker=L
GW Plume OU-IV to OU-I	H	
RDS 2, OU IV EDB Groundwater Plume	Public=M	Worker=L
EDB Groundwater Plume	H	
RDS 3, OU I Hazardous Waste Mgt Facility	Public=M	Worker=M
HWMF	H	
Bldg. 650 Outfall	H	
RDS 4, OU III Misc. GW and Soil Contam.	Public=L	Worker=L
Underground pipeline	H	
AGS Scrap yard	L	
Particle Beam Dump	L	
TCE Spill Area	L	
Oil Firehouse Soil	L	
Recharge Basin HP	L	
Recharge Basin HN	L	
Paint Shop	L	
RDS 5, OU IV Remediation	Public=L	Worker=L
1977 Oil/Solvent Spill	H	
RDS 6, OU I Radiation Contam. Soil	Public=L	Worker=L
Field Behind Medical Bldg.	H	
Field Behind Chemistry Bldg.	H	
Field East of Brookhaven Ctr	H	
Landscaping Soil	H	
RDS 7 USTs Bldg. 830 & 811	Public=L	Worker=M
6 USTs at Waste Conc. Facility	L	
Waste Conc. Facility Soils	H	
Bldg. 830 Pipe Leak	L	
USTs at Bldg. 830	L	
RDS 8, OU V Sewage Treatment Plant, etc.	Public=M	Worker=L
Leaking Sewer Lines in OU-V	L	
Sewage Treatment Plant	H	
Imhoff Tank	L	
Satellite Disposal Area	H	
RDS 10, OU III Accel. Groundwater Action	Public=M	Worker=L
OU III Groundwater Plume	H	
RDS 12, OU I Landfills Removal Action	Public=L	Worker=L
Former Landfill	M	
Ash Pit	L	
Current Landfill	H	

The RDSs took into account that (a) the plume had not yet reached the receptor population, (b) that the receptor population is being offered the opportunity to hook up to public water, but may continue to use private wells for swimming pools and irrigation of gardens, the limiting the exposure pathways and (c) the probability of a member of the health of a member of the receptor population being impacted, even if there were

an exposure (taking into account the uncertainty in the dose-response function of the contaminants and the numbers of people likely to be exposed).

RDS 3 includes the HWMF and the Building 650 sump, two areas of high radiation contamination of soil. The HWMF RRE score was dominated by soil contamination, so a comparison of the RRE and RDS scores is not confounded by the fact that the existing groundwater plume from HWMF is treated as part of RDS 13. Cs-137 levels in the HWMF clearly made the source hazard Significant. The pathway factor was potential and the receptor factor Identified, yielding a High score for the RRE. The RDS Medium scores for both public and workers were based on considerations that, with hydraulic control of ground water in place, groundwater contamination would be unlikely to leave the site and certainly not within 10 years. In addition, similar to RDS 1 and 2, above, exposure pathways to the public were reduced and the likelihood of health impacts in the receptor population was low, even if exposure occurred. A trespasser scenario dominated the risk and the likelihood of this was judged to be such as to warrant a Moderate score.

RDS 4 had low RDS scores for both public and workers. Seven of the eight RRE scores of the release sites that fell under this RDS corresponded well with the RDS score. One, groundwater contamination near an underground pipeline, received a High RRE score because of a Significant source hazard in groundwater dominated by radium-228. The RDS score could take into account that the groundwater was localized (although not contained) and far from a potential receptor.

RDS 5 addressed an old spill that had been remediated, but where some residual soil and water contamination remained. The RRE score was Low for soil but High for groundwater. The source hazard was medium, with numerous organic contaminants contributing, the pathway was evident since the contaminants were detected in down-gradient wells, and the receptor factor was potential. The RDS considered that the potential receptor population was distant and that the contaminants could degrade naturally before reaching any receptors.

RDS 6 dealt the several locations on site with soil contaminated by radiation, primarily Cs-137. These were ranked Low for public and Worker risk in the RDS since concentrations are minimal and some of these areas do not even require placarding to warn people to avoid walking on them. We believe the reference value for CS-137 in the guidance is too low. This is discussed further below.

RDS 7 ranked Low for Public and Medium for Workers on the RDS. Three of four release sites under this RDS ranked Low on the RRE, while one ranked High. The Contaminated soil that ranked High was dominated by Cs-137, discussed below. The RDS Medium ranking for workers was based on potential exposure to workers working in the area around the Waste Concentration Facility or conducting monitoring or inspection of potential contamination. In retrospect, the Medium score for workers may have been too high.

RDS 8. Groundwater contamination from the Sewage Treatment Plant and associated areas have impacted domestic wells with VOCs above MCLs and tritium below MCLs. This public exposure scored High on the RRE with a Moderate source

factor and Evident pathway and receptor factors. Surface water and sediment concentrations of contaminants in the Peconic River also ranked High on the RRE. In the RDS, however, the likelihood of health effects considering the small number of wells effected and the concentration in the water was taken into consideration, resulting in a Medium score.

RDS 10 characterizes a groundwater plume that has migrated off-site and underlies (or soon will) an area served by domestic wells. The High RRE score was based on a Moderate groundwater source factor, Evident pathway and Identified receptor. The RDS score for Public risk was Moderate because of limited environmental pathways (residents being offered a public water supply) and the likelihood of health effects given exposure considering the size of the population that might be exposed, the timing of the exposure, and the uncertainties in the dose-response information on the contaminants.

Differences between the RRE and RDS scores for RDS 12 are related to the timing of the scoring. The RRE requirement was to use the most recent measurements as the basis of the score, while the RDS requirement was to address the situation expected in 1998. The RRE evaluation of the Current landfill had a Moderate source factor, based on the sum of numerous contaminants, Evident pathway and Identified receptors. The RDS considered that the Former and Current landfill will be capped by 1998 and a pump-and-treat groundwater treatment system will be in place for the latter. Thus, the RDS score was Low.

DISCUSSION AND RECOMMENDATIONS

Discussion of the RDS System

This discussion applies primarily to the application of the RDS to environmental remediation. The system was applied to operations, also. While the RDS approach of "Before", "During", and "After" works well for restoration, it does not work for operations, which are continuing.

Following comments refer to the definitions of impact levels in the Management Evaluation Matrix.

It is not clear why the number of impact levels differ among categories. Mission and Mortgage Reduction have two, Public Health, Site Personnel, and Environment have three, Compliance and Social categories have four. Since Mortgage Reduction is based on monetary value, it is the easiest to disaggregate into more categories, yet it has the fewest. Social impacts, the most nebulous category, has the finest break-down. Perhaps the level of disaggregation reflects DOE's perception of importance?

Distinguishing between levels of impact is often difficult. For example, for Site Personnel Health and Safety, Impact SP1 includes fatalities from latent cancers from radiation exposure. Impact SP 2 addresses illnesses resulting in disability including serious overexposure to radioactivity. Yet how does one distinguish a radiation exposure that might lead to serious disability from one that leads to death? The difference is more in how soon the cancer is detected than in the exposure level. In the

BNL evaluation, the impact levels were looked upon as a gradation of impacts, considering their titles: Catastrophic, Critical, Marginal. Although the examples for Catastrophic suggest impacts to a single worker, catastrophic effects more commonly refer to impacts to many people. It might be better to use this approach. More specific examples, including quantitative exposure levels, would be helpful.

The Environmental Impacts category is improved from last year. It still is not as specific as it could be. Terms like "wide area" and "limited area" need to be defined quantitatively. Since a areal extent of contamination that is important may vary by the kind of impact, this may require different definitions for different types of problems.

The Social/Economic/Cultural impact category is the least well defined. This may necessarily be the case because of the diverse nature of the category. While unfavorable media coverage may be an indicator or significant adverse social or cultural impact, some communities do not have full access to media. Is an impact that "disrupt[s] traditions or ceremonies practiced by specific populations..." any less significant because it gets no media coverage?

More examples, covering a wider range of problems, would help to provide consistent interpretation across the complex. Lots of good examples should be available from the submissions over two years.

Discussion of the RRE System

The RRE system requires direct use of data. The Source Hazard Factor, in particular, is determined mechanically with little possibility for judgment. The Pathway Factor is also fairly restrictive. The Confined category has limited application; the guidelines essentially restricted it to clear cases of confinement of the contamination. It applied to none of the BNL sites. The DOE guidance makes clear that Potential is the preferred default in the absence of evidence. For the Receptor Factor, the boundary between Potential and Limited seemed rather fuzzy. Limited was used where the source was small and far from the site boundary. For most BNL groundwater sources the Pathway Factor was Evident from downgradient wells and the Receptor Factor was Identified, since most contaminated groundwater plumes are moving toward identified populated areas.

Working on a media-specific basis introduces some anomalies. Limits on contaminant levels in soil are, in part, based on the ability of the contaminant to leach into groundwater, yet this pathway does not appear to be allowed in the system. The guidance describes the pathway factor as being determined by soil particles being carried by water or wind away from the source as evidenced by runoff or wind erosion. This is further emphasized by the description of the receptor factor, which requires the potential that people "...come into contact with contaminated soils." Since all media may be scored, the groundwater pathway from a contaminated soil source might be identified there. The groundwater scoring rules, however, make this realistic only if contamination has already entered groundwater. If it has not done so, the hazard factor becomes minimal and the pathway factor can be no greater than potential. The result is that the overall score can be no greater than Medium. If the soil had been

contaminated for years, this may be reasonable, but recently contaminated soil could pose a high risk via groundwater even though contamination had not yet entered groundwater.

Establishing reference standards for each contaminant in the guidelines assures consistency across the complex for that compound. A greater effort is needed however, to assure consistency among the reference standards. Inconsistencies among the standards results in inconsistencies among sites that have different mixes of contaminants. Examples:

> The soil benchmark for ^{137}Cs is 2.1 pCi/g and for ^{90}Sr 1,400. pCi/g, a ratio of nearly 200. In a recent run of RESRAD 5.61, however, based on a 15 mrem/y dose limit, the ratio was 1.3. The difference may be because RESRAD 5.61 handles radioactive decay and buildup of progeny better than RESRAD BASELINE, which was used for the soil benchmarks in the guidance.
>
> The water benchmark for ^{3}H was given as 20,000 pCi/L, from the drinking water standard. the water benchmark for ^{90}Sr, however, is given as 85 pCi/L, presumable calculated from RESRAD BASELINE, although 8 pCi/L is commonly treated as if it were an MCL (e.g., in 40 CFR 141.16) since that is the equivalent to the 4 mrem/y allowable off site.

The RRE system focuses on existing conditions. It implies a "worst first" approach. This is not the best criteria for allocating funds among sites to be cleaned up. One needs to consider other factors including costs, environmental impacts, and technical ability to achieve various cleanup goals. Perhaps the RRE results are only meant to provide one input to a more complex evaluation system.

REVIEWS

DOE Chicago Operations Office provided a review of the BNL RDS (Selby, 1996). Comments on RDSs for Environmental Restoration were:

- Core Activities: Before rating should coincide with the highest rating of the activities being managed. After rating should coincide with the highest rating of the activities being managed.
- Landfills Removal. After rating should reflect minimal risk after task is performed (initial rating had indicated less then minimal risk for "After." By including the period of natural attenuation of the groundwater contamination as part of the cleanup process, the After rating was changed to minimal.
- General Comments:
  - Assumptions to be moved from field 21 to field 20.
  - Evaluation scenarios are discussed well. Good background information is given to support the rating text.
  - The sections of public health and site safety are well written and give specific information including pathway, receptor and in some cases containment levels. This data helps support all the given ratings.

A national review panel organized by the Consortium for risk Evaluation with Stakeholder Participation (CRESP) reviewed the RDS results across the complex using a sampling approach (CRESP, 1996). Emphasis was placed on the larger installations and only one BNL RDS was mentioned. Their comment in this case was "The BNL water plume is ranked as a Medium risk to the public (before scenario) because the material has not yet gone off-site. This seems appropriate and the three plume RDSs [BNL, PADUC and LLNL) agree fairly well for the health risks."

REFERENCES

Morris, S.C. and A.F. Meinhold. 1995. Risk-based priority scoring for Brookhaven National Laboratory Environmental Restoration Programs (BNL-62011).

DOE. 1995. Relative ranking evaluation framework for EM-40 release sites, facilities & buildings, Office of Environmental Restoration working draft, Dec 29.

DOD. 1994. Relative risk site evaluation primer (summer 1994 Interim Edition), Office of the Deputy Under Secretary of Defense (Environmental Security).

Selby, R.C. 1996. Letter to C.L. Nealy, subject: activity data sheets (ADS) and risk data sheet (RDS) comments. DOE, Chicago Operations Office (April 2).

APPENDIX I: RISK DATA SHEETS

RDS Identification Section

1. Facil Code: BNL - BROOKHAVEN NATIONAL LABORATORY
   RDS Number: R96Z0001
3. Location.....: NY
4. RDS Title.....: OU I Groundwater - other
5. EM Office.....: 40
6. EM ADS Number.....: CH 2321
7. WBS Code.....:
8. Reference RDS Number.:
9. Ops Project Manager..: Michael Ferrigan
10. Ops Office Phone.....: 708-252-2570
11. Dependent RDS Numbers:
12. Safety & Health Act.?: NO
13. A-106 Activity?.....: NO
    Voided RDS?.....: NO

14. RDS Summary Description

A contaminated groundwater plume has been identified entering OU-I west of the Former Landfill from OU-IV. Preliminary measurements (CDM, 12 Feb 1996, Summary Report Phase II Field Investigation Oct 18-Dec 29, 1995) show TCA at concentrations approaching 100 microgram/L. Rad measurements are not yet available, but may include Sr-90. Current thinking is that this plume has not yet gone off-site, but is heading south toward a residential areas partially served by domestic wells.

In addition, chloroform at a concentration of 500 ppb (5 times the MCL) was found at a single data point south of the Former Landfill, indicating the possibility of another plume of grounwater contamination. This will be further investigated in FY97; remedial action may be required.

RDS Evaluation Section

15. Category		Be	Du	Af	Be	Du	Af
Public Safety & Health	PS	2B	3D	2D	M	L	L
Site Personnel Safety & Health	SP	4D	3C	4D	L	L	L
Environmental Protection	EN	2A	2A	3D	H	H	L
Compliance	CO	1A		4D	H		L
Mission Impact	MI	1B		2C	H		M
Mortgage Reduction	MR	2B		2D	M		L
Social/Cultural/Economical	SO	2B	2B	2C	M	M	M

16. Assessed By: S.C. Morris
17. Date Assessed: 03/04/1996
18. Assessment Completed: YES
19. Site Priority: 0.0
20. Standard Assumptions Exceptions/Additions:
Only a single data point is available on the chloroform plume, but it must be assumed that this plume could be of significance and also could reach the residential area within 10 years.

21. Evaluation Scenario:
Before:
Characterization of the groundwater plume from OU-IV is based on preliminary data only. It is contains VOCs well above MCLs. Unabated, it could reach a residential area partially served by domestic wells within 10 years (although people in this area are now being offered access to public water).

During:
It is too early to know what the appropriate remedial action is. The potential area impacted is currently being offered access to public water supply. Pump-and-treat and/or natural attinuation are the likely remedies.

After:
Presumably the plume will be remediated appropriately to minimize potenital risks to health and environment.

22. Public Safety and Health:
Before (likelihood methodology - P/T):T
Groundwater contamination has not yet migrated off-site, but it is near the site boundary at concentrations many times MCLs. Within 10 years this plume will impact a residential area partially served by domestic wells. Residents in this area are being offered hook-ups to a public drinking water supply. Some people, however, may not accept public water. Moreover, there is no requirement that people who hook up to public water discontinue use of their well. Well water might be used for irrigating gardens or filling swimming pools. Given the concentrations measured within the site boundary and the potential number of homes at risk, the likelihood of health impact given exposure would be greater than 10%.

Therefore, PS2B was chosen.

During:
Implementing and operating a monitoring and pump-and-treat system results in little risk to the public, although part of the operation may be off-site and may pose a slight risk to children attracted to the construction or operations. Exposure to the public of the off-gases from the pump-and-treat system are expected to be well below New York State standards.

Therefore PS3D was chosen.

After:
A pump-and-treat system will limit further contributions of off-site contaminated water so the likelihood of continued

exposure is less. Existing off-site concentrations not treated will attinuate and be diluted over time to make the likelihood of exposures above the MCL less likely (2D) although exposures below the MCL will remain for some time (3C).

Therefore, PS2D was chosen.

23. Site Personnel Safety and Health:
Before (likelihood methodology - P/T):P
The contaminated groundwater plumes currently do not impact the safety or health of site personnel.

Therefore, SP4D was chosen.

During:
Construction and operation of monitoring wells and a pump-and-treat system poses a risk of occupational injury. The risk is not high and the construction will take less than 1 year. During the operation of the pump and treat system, site personnel may be exposed to off-gases from the system at levels well below New York State Standards.

Therefore, SP3C was chosen.

After:
Same as "Before."

Therefore, SP4D was chosen.

24. Environmental Impact:
Before (likelihood methodology - P/T):P
The groundwater environmental is contaminated (probability = 1) at high levels on-site. Contamination is currently limited but is likely to take several years to remediate. The situation is a significant, but not catastrophic damage to the environment.

Therefor, EN2A was chosen.

During:
During cleanup, the condition of the groundwater environment will improve over time, but, at least in the early stages of cleanup, will remain at significant levels. This will gradually improve to match the "After" condition.

Therefore, EN2A was chosen.

After:
It is assumed the remedial action chosen will reduce contamination to minor levels of damage.

Therefore, EN3D was chosen.

25. Compliance:
Before (likelihood methodology - P/T):P
By FY98, this contaminated plume is assumed to be characterized and recognized by EPA and NYSDEC to require remediation. Failure to address this would place BNL in a major violation of state and federal regulations and of the Compliance Agreement.

Therefore, CO1A was chosen.

After:
Presumably, the remedy will be chosen with the approval of EPA and NYSDEC. When it is satisfactorily completed, the laboratory should be in compliance on this issue.

Therefore, CO4D was chosen.

26. Mission Impact:
Before (likelihood methodology - P/T):P
The public controversy over nearby off-site groundwater plumes has led to a level of public outrage that threatens major missions of the laboratory, e.g., reactor operations. Moreover, a $1 billion lawsuit has been served on the laboratory. This outrage is likely to extend to this plume that affects the same residential neighborhood and is expected to contain radionuclides as well as VOCs. While it is unlikely that this could threaten a major mission within a year, the threat seems quite real over a 2-10 year time frame.

Therefore, MI1B was chosen.

After:
After cleanup, the threat of mission impact may decrease, but the residual threat is unlikely to go away. A 10-100 year time frame is estimated as the likelihood.

Therefore, MI2C was chosen.

27. Mortgage Reduction:
Before (likelihood methodology - P/T):P.
A contaminated groundwater plume with concentrations well above MCLs is within 5 years of migrating off-site toward a residential area partically served with domestic wells. DOE has already committed to a cost of over $900,000. to

provide public water to homes in the immediate area. Were this plume allowed to further disperse into a larger area down-gradient that is also served by domestic wells an equal or larger cost could be incurred. A pump-and-treat system will prevent the flow of highly contaminated groundwater beyond the site boundary. Failure to complete the cleanup when scheduled would lead to more widespread contamination and would also subject the laboratory to fines, penalties and law suits (a $1 billion lawsuit has already been filed).

Therefore, MR2B was chosen.

After:
Following completion of the cleanup, groundwater may still exceed MCLs in some locations, especially on-site, but the extent and nature of contamination will be much better characterized, eliminating -- or at least minimizing -- the need for additional hook-ups to public water.

Therefore, MR2D was chosen.

28. Social/Cultural/Economic Impacts:
Before (likelihood methodology - P/T):P.
Public awareness of groundwater contamination off-site and underlying a residential area with domestic wells has already raised considerable social impact through fear and outrage in the community. This served as an ignition for a broader public outcry, extending to concers about BNL going well beyond the realm of the groundwater contamination, spurred by regional TV reports and local and national news coverage. The groundwater is a focal point because it provides a forum. DOE has offered to provide public water supply to the areas impacted as a precaution. This has actually increased fear in the community. People are afraid to drink their well water and going to more expensive substitutes. Many residents have expressed concern about loss of economic value of their homes. The existing climate of fear and outrage probably feeds the economic damage as much as the actual contamination. This groundwater plume, unabated, will impact the same residential community and is likely to further increase social and economic damage. This impact is not a irrevocable loss of social value in the community. It is a social disruption and probably involves economic loss. While this damage is now occuring in association with another plume that is already off-site, since it cannot be certain this plume will increase the impact a likelihood less then certainty was used.

Therefore, SO2B was chosen.

During:
Action to clean up the contamination is, at least initially, not expected to mitigate the social and economic impacts. The possibility that increased efforts at involving the community during the cleanup process might lead to a greater public understanding of the problem and a reduction in the level of fear and outrage was considered. It appears more likely, however, that the activity of the cleanup effort may increase the visibility of the problem and even increase the socio-economic impact. No decrease in the probability was therefore assigned.

Therefore, SO2B was chosen.

After:
Following a successful clean up, including improved public involvement in the process, as well as the passage of time, one would a decrease in the level of socio-economic impact. This may be wishful thinking. It may also be that the assignment of socio-economic impact in the nearby community is switched to other cleanup projects. It seems reasonable to decrease the expected probability level of this impact to medium.

Therefore, SO2C was chosen.

29. Quantative Data: NO
30. Assessment Status Comments

31. Other Site Appraisal Issue: NO
32. Site Issue Comments:

33. Site Issue Contact.....:
34. Site Issue Contact Phone:

Resource Data Section
35. Funding Case.....: 1 - Funded
36. B & R Code.....: EX2010304 or Allocable Cost Pool:
37. Project Lifecycle Cost ($K): 0.0
38. Min. Safe Cost Percentage..: 0 38.1 Annual Cost Savings ($K): 0

39.

FY	OE	CE	GPP	LIP	TOTAL	S&H %	40. FED FTE	CONTR FTE
1996	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
1997	1,097.0	0.0	0.0	0.0	1,097.0	0	0.00	0.00
1998	666.0	0.0	0.0	0.0	666.0	0	0.00	0.00
1999	472.0	0.0	0.0	0.0	472.0	0	0.00	0.00
2000	218.0	0.0	0.0	0.0	218.0	0	0.00	0.00
2001	226.0	0.0	0.0	0.0	226.0	0	0.00	0.00
2002	234.0	0.0	0.0	0.0	234.0	0	0.00	0.00

41. Project Start Year: 42. Expected Year of Completion:

RDS Identification Section

1. Facil Code: BNL - BROOKHAVEN NATIONAL LABORATORY
   RDS Number: R96Z0002
3. Location.....: NY
4. RDS Title.....: OU VI (EDB Groundwater Plume)
5. EM Office.....: 40
6. EM ADS Number.....: CH 2321
7. WBS Code.....:
8. Reference RDS Number.:
9. Ops Project Manager..: Michael Ferrigan
10. Ops Office Phone.....: 708-252-2570
11. Dependent RDS Numbers:
12. Safety & Health Act.?: NO
13. A-106 Activity?.....: NO
    Voided RDS?.....: NO

14. RDS Summary Description

Ethylene dibromide (EDB) was detected in several wells at levels above the MCL of 0.05 ug/l and has migrated beyond the site boundary at concentrations exceeding the NYS MCL. The plume is moving toward a large, non-residential, wooded area. Based on the long-term average flow field, the nearest existing homes in its path are more than 1 mile south. The full off-site extent of EDB contamination, however, has not yet been established vertically or horizontally. The potential source of EDB is the Biology Fields, where EDB was reportedly used as a herbicide to sterilize the soil. Dates and amounts of EDB applied to the field are unknown, although groundwater modeling indicates EDB probably entered the aquifer at the Biology Fields during the early 1970s. The plume is identified as AOC 28. Mixed with this plume is a groundwater plume contaminated with tritium below MCLs that is believed to originate in the Meadow-Marsh area. Ref: Draft RI/RA Operable Unit I/VI, Vol 1, CDM, 21 Sep. 1995.

RDS Evaluation Section

15. Category

Category		Be	Du	Af	Be	Du	Af
Public Safety & Health	PS	2C	3B	3C	M	M	L
Site Personnel Safety & Health	SP	4D	4D	4D	L	L	L
Environmental Protection	EN	2A	3B	3C	H	M	L
Compliance	CO	1A		4D	H		L
Mission Impact	MI	2C		2C	M		M
Mortgage Reduction	MR	2B		2D	M		L
Social/Cultural/Economical	SO	2A	2A	2C	H	H	M

16. Assessed By: S.C. Morris
17. Date Assessed: 03/04/1996
18. Assessment Completed: YES
19. Site Priority: 0.0
20. Standard Assumptions Exceptions/Additions:

No drinking water wells appear to be contaminated yet, but there are homes in its apparent path and, given the uncertainties in characterization of the plume off-site and specific information on groundwater flow in its location, it might begin to intersect domestic wells in the 1 to 10 year time frame.

21. Evaluation Scenario:

Before: The EDB plume is off-site at concentrations above the NYS MCL of 0.05 ug/l. Although 1,2-dibromoethane (EDP) is the principal contaminent in the plume, it also contains chloroform, methylene chloride, arsenic, beryllium and tritium.

During:
This plume will most likely be treated by natural attinuation.

After:
After some time, the concentrations of contaminants will decrease to acceptable levels.

22. Public Safety and Health:

Before (likelihood methodology - P/T):T.
The EDB plume is off-site at concentrations above the NYS MCL of 0.05 ug/l. No drinking water wells appear to be contaminated yet, but there are homes in its apparent path and, given the uncertainties in characterization of the plume off-site and specific information on groundwater flow in its location, it might begin to intersect domestic wells in the 1 to 10 year time frame. Future cancer risk for residents was estimated to be 2.7E-4, above the EPA Superfund range of 1E-6 to 1E-4. It would 40 people exposed to increase the likelihood of an effect to above 0.01 and nearly 400 people exposed to bring the likelihood of effect to 0.1. Given the area that the plume is in, the latter seems unlikely to occur within the timeframe. The combined time equivalent is 1 to 10 years plus 10 to 100 years (equivalent to 0.01 to 0.1 probability per year in the MEM scale), with the sum equivalent to a medium likelihood. Since the exposure is above the MCL, the impct is PS2, excessive. A 0.1 likelihood of effect was also considered (associated with over 400 people exposed), but the time to impact to include this many people was judged to be more than 10 years. Combining the two yields the same result as above. Ref: DRAFT RI/RA REport, Op Unit I/VI, Vol. 2A, Baseline Chemical Human Health Risk Assessment, 21 Sep 95, CDM.

Therefore PS2C was chosen.

During:
The potential public health impact will gradually decrease during cleanup.

Therefore PS3B was chosen.

After:

Following a considerable period of natural attinuation, only low levels of exposure will exist.

Therefore PS3D was chosen.

23. Site Personnel Safety and Health:
Before (likelihood methodology - P/T):P.
The contaminated ground water plume do not impact the safety or health of site personnel. Probability = 0.

Therefore, SP4D was chosen.

During:
Same as "Before"

Therefore SP4D was chosen.

After:
Same as "Before."

Therefore, SP4D was chosen.

24. Environmental Impact:
Before (likelihood methodology - P/T):P.
The groundwater is contaminanted (probability = 1) on- and off-site. The impact is in a limited area and would take more than 1 year to remediate. This corresponds to "significant damage" in the MEM impact categories.

Therefore, EN2A was chosen.

During:
Environmental damage will gradually diminish during natural attinuation.

Therefore, EN3B was chosen.

After:
After some period of natural attinuation, only a medium likelihood of low-level exposure is expected.

Therefore, EN3C was chosen.

25. Compliance:
Before (likelihood methodology - P/T):P.
Groundwater is contaminated above MCLs. This is in violation of state and Federal regulations (category CO1) with a probability of 1. Not cleaning up this contamination could place the laboratory in violation of the compliance agreement among DOE, EPA, and New York State.

Therefore, CO1A was chosen.

After:
The remedial action plan must be approved by the parties to the Compliance Agreement, therefore when the plan is successfully implemented, the facility will be in compliance.

Therefore, CO4D was chosen.

26. Mission Impact:
Before (likelihood methodology - P/T):P.
There is no immediate impact on the laboratory mission associated with this plume. Great public concern and outrage has developed over other off-site plumes nearby. The controversy is such that major laboratory missions could be impacted. There is a reasonable probability that this plume could within the next few years contribute to that controversy, but both the likelihood and impact of the controversy is likely to be less. This was assigned a moderate negative impact with a medium likelihood, lower than the landfills plume.

Therefore, MI2C was chosen.

After:
Following cleanup, public concern would be expected to abate, but not disappear.

Therefore, MI2C was chosen.

27. Mortgage Reduction:
Before (likelihood methodology - P/T):P
A contaminated groundwater plume exists off-site. Without remediation, the volume of groundwater impacted by contamination will continue to increase. It is possible that domestic or agricultural wells might be impacted. This would lead to an increased cost for a later remediation effort. Neither the contaminated plume itself nor the groundwater characteristics off-site are sufficiently well defined to accurately estimate the increased cost, but there is at least a 10% probability that it will be at least 0.1% of the BNL EM budget.

Therefore, MR2B was chosen.

After:

It is assumed that cleanup will include all cost-effective options.

Therefore, MR2D was chosen.

28. Social/Cultural/Economic Impacts:
Before (likelihood methodology - P/T):P.
Public awareness of groundwater contamination off-site and underlying a residential area with domestic wells raised considerable social impact through fear and outrage in the community. This served as an ignition for a broader public outcry, extending to concers about BNL going well beyond the realm of the groundwater contamination, spurred by regional TV reports and local and national news coverage. The groundwater is a focal point because it provides a forum. Although groundwater modeling indicates domestic wells are unlikely to be affected and that wells showing contamination were probably contaminated by an industrial source and not BNL, DOE has offered to provide public water supply to the areas impacted as a precaution. This has actually increased fear in the community. People are afraid to drink their well water and going to more expensive substitutes. Many residents have expressed concern about loss of economic value of their homes. The existing climate of fear and outrage probably feeds the economic damage as much as the actual contamination. This impact is not a irrevocable loss of social value in the community. It is a social disruption and probably involves economic loss. It is clearly occuring and is therefore assigned a probability of 1.

Therefore, SO2A was chosen.

During:
Action to clean up the contamination is, at least initially, not expected to mitigate the social and economic impacts. The possibility that increased efforts at involving the community during the cleanup process might lead to a greater public understanding of the problem and a reduction in the level of fear and outrage was considered. It appears more likely, however, that the activity of the cleanup effort may increase the visibility of the problem and even increase the socio-economic impact. No decrease in the probability was therefore assigned.

Therefore, SO2A was chosen.

After:
Following a successful clean up, including improved public involvement in the process, as well as the passage of time, one would a decrease in the level of socio-economic impact. This may be wishful thinking. It may also be that the assignment of socio-economic impact in the nearby community is switched to other cleanup projects. It seems reasonable to decrease the expected probability level of this impact to medium.

Therefore, SO2C was chosen.

29. Quantative Data: NO
30. Assessment Status Comments

31. Other Site Appraisal Issue: NO
32. Site Issue Comments:

33. Site Issue Contact.....:
34. Site Issue Contact Phone:

Resource Data Section
35. Funding Case.....: 1 - Funded
36. B & R Code.....: EX2010304 or Allocable Cost Pool:
37. Project Lifecycle Cost ($K): 0.0
38. Min. Safe Cost Percentage..: 0 38.1 Annual Cost Savings ($K): 0

39.

FY	OE	CE	GPP	LIP	TOTAL	S&H %	40. FED FTE	CONTR FTE
1996	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
1997	910.0	0.0	0.0	0.0	910.0	0	0.00	0.00
1998	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
1999	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
2000	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
2001	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
2002	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00

41. Project Start Year: 42. Expected Year of Completion:

RDS Safety and Health Section
43. Functional Area Breakdown:

FA.SA	Pct	Functional Area/Sub-Area Title

44. S&H Drivers:

P/S	Typ	Driver Code	Driver Title

45. S&H Activity Type: 4 - [Unknown]

RDS Identification Section

1. Facil Code: BNL - BROOKHAVEN NATIONAL LABORATORY
   RDS Number: R96Z0003
3. Location.....: NY
4. RDS Title.....: OU I, HAZARDOUS WASTE MANAGEMENT FACILITY
5. EM Office.....: 40
6. EM ADS Number.....: CH 2321
7. WBS Code.....:
8. Reference RDS Number.:
9. Ops Project Manager..: Michael Ferrigan
10. Ops Office Phone.....: 708-252-2570
11. Dependent RDS Numbers:
12. Safety & Health Act.?: NO
13. A-106 Activity?.....: NO
    Voided RDS?.....: NO

14. RDS Summary Description

This RDS includes the Hazardous Waste Management Facility (HWMF) and the Building 650 (Reclamation and Laundry Facility) Sump. These facilities require control and/or remediation. They are considered separately from other less contaminated soils which require further investigation by are likely to require no action.

The levels of contamination in HWMF are high (CS-137 160,000 pCi/g in asphalt, and up to 810,000 pCi/g in surface soils). It also involves the additional special issue of a contaminated wetland enhabited by the endangered Tiger Salamander.

The HWMF is a fenced 12-acre controlled compound that has been the central receiving RCRA facility for processing, limited treatment (neutralization) and storage for radioactive wastes and RCRA hazardous wastes generated throughout BNL since 1947. Approximately one-fourth of the area is paved and the remainder is a field which is mowed for fire control. A shallow seasonal ponded wetland, known as the HWMF Wetland, exists along the fence bordering the northwestern side of the HWMF. This is a New York State designated wetland and has been confirmed as a breeding ground for a NYS endangered species, the tiger salamander.

Historically, accidental spills of various hazardous and/or radioactive materials have occured within the HWMF compound. Principal radionuclides in soils are Cs-137 and Sr-90. Chemical contamination includes VOCs and mercury.

The present HWMF is currently being prepared for closure. Activated source material is being removed and shipped to DOE's Hanford Facility. Underground wtorage tanks were removed in 1994. upon closure of the HWMF, all storage, treatment and disposal of radioactive and RCRA hazardous wastes will be performed in a newly constructed, RCRA-permitted facility in the northern part of the BNL site.

Reference: CDM, Draft RI/Risk Assessment Report Operable Unit I/VI, Sep, 1995.

The Building 650 Sump is primarily contaminated with Cs-137 at up to 734 pCi/g and with other radionuclides at lower concentrations. Direct exposure is estimated to dominant other pathways. While these concentrations are not as high as in the HWMF, they are sufficiently high to require controlled access to the site, concern for future landuse (estimated exposure to a future resident in 2095 exceeds 1000 mrem/y), and consideration of remediation.

Reference: B. J. Dionne, M.S. Thesis, New York Institute of Technology, 1995; CDM, Brookhaven National Laboratory Final Remedial Investigation/Risk Assessment Report Operable Unit IV, Dec, 1994.

RDS Evaluation Section

15. Category

Category		Be	Du	Af	Be	Du	Af
Public Safety & Health	PS	2C	3C	3D	M	L	L
Site Personnel Safety & Health	SP	2C	3B	4C	M	M	L
Environmental Protection	EN	2A	2A	3C	H	H	L
Compliance	CO	1A		4D	H		L
Mission Impact	MI	1B		2C	H		M
Mortgage Reduction	MR	2B		2D	M		L
Social/Cultural/Economical	SO	2A	2A	2C	H	H	M

16. Assessed By: S.C. Morris
17. Date Assessed: 02/20/1996
18. Assessment Completed: NO
19. Site Priority: 0.0
20. Standard Assumptions Exceptions/Additions:
It is expected that the closure of the HWMF will be in the design stage in FY1998 and the facility will still be in operation. It is expected, however that a pump-and-treat system will be in operation that will provide hydraulic control of ground water as well as treatment and that most of the residential area will have been provided with a public water supply not subject to contamination.

21. Evaluation Scenario:
Before:
HWMF will thus be a source of groundwater contamination with potential risk to off-site residents.

During:
During FY1998,environmental measurements will continue to be made in the HWMF to monitor contamination and to provide additional design information. The closure operation is expected to take place subsequent to FY1998. Cleanup workers may be exposed to accidential injury and exposure to chemical and radiation hazards.

After:

Following cleanup, the HWMF will no longer be a significant source of groundwater contamination. The cleanup is expected to greatly reduce risk within the area itself, although insitutional controls for a considerable period following clean up may be imposed to allow natural attenuation and decay to continue the cleanup process.

22. Public Safety and Health:
Before (likelihood methodology - P/T):T.
The HWMF remains a source of groundwater contamination. The groundwater plume is addressed separately because it co-mingles with the plume from the former and "current" landfills. If the HWMF is not controlled as a source, high concenrations of contaminants on site (well characterized and quantified) could migrate off site, potentially intersecting domestic wells above MCLs. This is because hydraulic control may not be complete, some homes may not receive public water, and the groundwater plume is not completely characterized off-site. Assuming the hydraulic control is in place, exposure within ten years is unlikely. In addition to exposure to people, however, there is the probability of whether or not exposure, even above the MCL, will lead to health impacts. The likelihood of this is judged to be at least 1%, equivalent to 10-100 years on the MEM scale. This combination would yield a medium likelihood (10-100 years) on the MEM scale. In addition, without remediation there is a separate and continuing hazard associated with potential exposure to workers at the HWMF and to potential trespassers. Despite fencing and other controls, a trespasser event within 10 years seems likely. Moreover, the likelihood of a trespasser recieving an excessive exposure is higher than a person drinking groundwater, probably at least 10% The trespasser scenario appears to dominate the risk.

Therefore, PS2C was selected.

During:
Implementing the cleanup would be expected to pose little risk to the public, since the entire operation is on-site and at a reasonable distance from the site boundary with a wooded area between which will mitigate the transport of any airborne dust. Because of increased activity in the area, the probability and the potential exposure of trespassers is reduced.

Therefore, PS3C was selected.

After:
The HWMF should no longer be a source of contamination to the groundwater and concentrations in soil should be greatly reduced. Some institutional controls are likely to remain to allow natural decay and attinuation of contaminants over time.

Therefore, PS3D was selected.

23. Site Personnel Safety and Health:
Before (likelihood methodology - P/T):T.
Over a period of 1 to 10 years, one or more workers at the HWMF are likely to receive an exposure above 20% of dose limits (likelihood category "3B"). [HISTORICL DATA??] Site personnel not actually working at the HWMF have a negligible risk from the facility.

Therefore, SP3B was selected.

During:
During the cleanup, remedial workers face a risk of accidental injury and of exposure to radiation and chemical contaminants. During this operation, it seems reasonable that there would be a greater than 10% probability that a remediation worker would receive an exposure above 20% of limits ("3B") or that there would be greater than a 1% chance that a worker would incur a temporary total disability lating over 3 months due to an accident involving construction equipment ("2C").

Therefore, SP2C was chosen since both options are at the same level.

After:
After cleanup, activities will be limited to monitoring and maintaining security. The risk of an exposure even approaching 20% of limits would seem rare (10-100 years).

Therefore, SP4D was chosen.

24. Environmental Impact:
Before (likelihood methodology - P/T):P.
Soil and groundwater are contaminated (probability = 1) by multiple contaminants at high levels, in some cases exceeding soil cleanup guidelines by over 1000 times. Contamination of soil is localized to the fenced facility and groundwater contamination, although more widespread, is still localized. Wetlands are also contaminated. Remediation will require several years.

Therefore, EN2A was chosen.

During:
Cleanup operations are expected to be highly disruptive to the local environment, involving removal of soil and possibly destruction of the wetland with an impact on endangered species. Most likely, the wetland would be replaced and the tiger salamanders re-introduced. Part of the land disruption would be to a paved area, therefore having little impact on the ecology. Since the area involved is small, environmental disruption would not be widespread or long-term.

Therefore, EN2A was chosen.

After:
The environment and ecology should recover with grasses coming in with a year and woodland (if allowed) starting with a decade. Residual contamination levels will decrease to below cleanup goals by natural decay and attinuation.

Therefore, EN3C was chosen

25. Compliance:
Before (likelihood methodology - P/T):P.
Groundwater is contaminanted above MCLs. This is in violation of state and Federal regulations. Soil is also contaminated above levels allowed by CERCLA. Failure to remediate would place BNL in violation of the Compliance Agreement among DOE, EPA and New York State.

Therefore, CO1B was chosen.

After:
The cleanup will be designed to satisfy the parties to the Compliance agreement. Once accomplished, the facility should be considered in complience, although groundwater and soil contamination may still not meet standards immediately, but will depend on natural attinuation and decay, under institutional controls.

Therefore, CO4D was chosen.

26. Mission Impact:
Before (likelihood methodology - P/T): T. Great public concern and outrage has developed over the off-site groundwater plume to which contamination at the HWMF contributes. The controversy is such that major laboratory missions could be impacted within 10 years.

After:The threat of mission impact may decrase after cleanup, but the residual threat, once established is unlikely to go away completely. The 10-100 year time frame is estimated as the likelihood.

27. Mortgage Reduction:
Before (likelihood methodology - P/T):P.
The HWMF is an important contributor to a contaminated groundwater plume with concentrations well above MCLs. Failure to prevent further groundwater contamination by reducing concentrations in soils will lead to continued expansion of the groundwater plume. This will lead to increased cleanup costs later. DOE has already committed to a cost of $900,000 to provide public water. The area needing public water could be expanded. In addition, the laboratory could be subject to fines, penalties, and law suits (a $1 billion lawsuit has already been filed).

Therefore, MR2B was chosen.

After:
Following compeletion of cleanup, groundwater will still exceed MCLs in some locations and soil concentrations may exceed guidelines for some time, requiring continuing monitoring and institution control, but the groundwater contamination will be better contained and further costs of cleanup or provision of public water supplies will be eliminated.

Therefore, MR2D was chosen.

28. Social/Cultural/Economic Impacts:
Before (likelihood methodology - P/T):P.
Public awareness of groundwater contamination off-site, partially from the HWMF, and underlying a residential area with domestic wells raised considerable social impact through fear and outrage in the community. This served as an ignition for a broader public outcry, extending to concers about BNL going well beyond the realm of the groundwater contamination, spurred by regional TV reports and local and national news coverage. The groundwater is a focal point because it provides a forum. Although groundwater modeling indicates domestic wells are unlikely to be affected and that wells showing contamination were probably contaminated by an industrial source and not BNL, DOE has offered to provide public water supply to the areas impacted as a precaution. This has actually increased fear in the community. People are afraid to drink their well water and going to more expensive substitutes. Many residents have expressed concern about loss of economic value of their homes. The existing climate of fear and outrage probably feeds the economic damage as much as the actual contamination. This impact is not a irrevocable loss of social value in the community. It is a social disruption and probably involves economic loss. It is clearly occuring and is therefore assigned a probability of 1.

Therefore, SO2A was chosen.

During:
Action to clean up the contamination is, at least initially, not expected to mitigate the social and economic impacts. The possibility that increased efforts at involving the community during the cleanup process might lead to a greater public understanding of the problem and a reduction in the level of fear and outrage was considered. It appears more likely, however, that the activity of the cleanup effort may increase the visibility of the problem and even increase the socio-economic impact. No decrease in the probability was therefore assigned.

Therefore, SO2A was chosen.

After:
Following a successful clean up, including improved public involvement in the process, as well as the passage of time, one would a decrease in the level of socio-economic impact. This may be wishful thinking. It may also be that the assignment of socio-economic impact in the nearby community is switched to other cleanup projects. It seems reasonable to decrease the expected probability level of this impact to medium.

Therefore, SO2C was chosen.

29. Quantative Data: YES
30. Assessment Status Comments

31. Other Site Appraisal Issue: NO
32. Site Issue Comments:

33. Site Issue Contact.....:
34. Site Issue Contact Phone:

Resource Data Section
35. Funding Case.....: 1 - Funded
36. B & R Code.....: EX2010302 or Allocable Cost Pool:
37. Project Lifecycle Cost ($K): 0.0
38. Min. Safe Cost Percentage..: 0 38.1 Annual Cost Savings ($K): 0

39.

FY	OE	CE	GPP	LIP	TOTAL	S&H %	40. FED FTE	CONTR FTE
1996	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
1997	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
1998	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
1999	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
2000	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
2001	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
2002	2,480.0	0.0	0.0	0.0	2,480.0	0	0.00	0.00

41. Project Start Year: 42. Expected Year of Completion:

RDS Safety and Health Section
43. Functional Area Breakdown:

FA.SA	Pct	Functional Area/Sub-Area Title

44. S&H Drivers:

P/S	Typ	Driver Code	Driver Title

45. S&H Activity Type: 4 - [Unknown]
46. Safety & Health Narrative

47. General Comments

RDS Identification Section

1. Facil Code: BNL - BROOKHAVEN NATIONAL LABORATORY
   RDS Number: R96Z0004
3. Location.....: NY
4. RDS Title.....: OU III Proper (Misc. Groundwater and Soil Contam.)
5. EM Office.....: 40
6. EM ADS Number.....: CH 2321
7. WBS Code.....:
8. Reference RDS Number.:
9. Ops Project Manager..: Michael Ferrigan
10. Ops Office Phone.....: 708-252-2570
11. Dependent RDS Numbers:
12. Safety & Health Act.?: NO
13. A-106 Activity?.....: NO
    Voided RDS?.....: NO

14. RDS Summary Description

This RDS addresses several Areas of Concern within OU III involving chemically contaminated soil and chemical and/or radiologically contaminated groundwater. They were identified as contaminated in the past, some were cleaned up, and are being re-checked for contamination in groundwater or are being newly evaluated. None of these are likely to require cleanup, but there is at least a 1% likelihood that at least one will require cleanup. If cleanup is required, it could take several years to remediate. They include
AOC 7 Paint Shop;
AOC 14 Bubble Chamber spill area;
AOC 18 AGS storage yards (groundwater contamination only -- soil contamination in OU I)
AOC 19 TCE spill;
AOC 21 Leaking sewer pipes;
AOC 22 Old Fire House area;
AOC 24A Process supply wells #104 and 105;
AOC 24 B Recharge basin HP, Medical Research Reactor;
AOC 24C Recharge basin HN, AGS;
AOC 25 Building 479; ;
AOC 27 Building 464;
AOC 9 Brookhaven Graphite Reactor groundwater contamination; and
AOC 20 Particle beam dump.

RDS Evaluation Section

15. Category

Category		Be	Du	Af	Be	Du	Af
Public Safety & Health	PS	3C	3D	3D	L	L	L
Site Personnel Safety & Health	SP	4D	3D	4D	L	L	L
Environmental Protection	EN	2C	3C	3D	M	L	L
Compliance	CO	1C		4D	M		L
Mission Impact	MI	2C		2D	M		L
Mortgage Reduction	MR	2C		2D	M		L
Social/Cultural/Economical	SO	2C	2D	2D	M	L	L

16. Assessed By: S.C. Morris
17. Date Assessed: 02/20/1996
18. Assessment Completed: NO
19. Site Priority: 0.0
20. Standard Assumptions Exceptions/Additions:
Some of these areas were subjected to clean-up in the past, under less rigid standards than now. All are to be examined to assure there is no residual contamination that would require remediation, which would be done if deemed appropriate. It is assumed that, if cleanup were necessary, it would not begin before FY1998.

21. Evaluation Scenario:
Before:
While all of these sites are unlikely to require cleanup, there is at least a 1% likelihood that one or more will require cleanup. If cleanup is required, especially for groundwater contamination, it could take as much as a 5-year effort.

During: Soil and groundwater samples will be taken as appropriate and the sites remediated if necessary.

After: Safety of the groundwater will be assured.

22. Public Safety and Health:
Before (likelihood methodology - P/T):P.
These are areas that have been cleaned up, but may have some residual soil or groundwater contamination. Without checking, there is at least a 1% chance that at least one of the areas may have sufficient groundwater contamination to pose a risk to off-site residents who may have domestic wells.

Therefore PS3C was chosen.

During:
No off-site impact would be expected from the monitoring or possible cleanup procedure.

Therefore, PS3D was chosen.

After:

Assurance is gained that no risk to the public exists.

Therefore, PS3D was chosen.

23. Site Personnel Safety and Health:
Before (likelihood methodology - P/T):P.
There is no risk to on-site personnel from the possibility of spots of contaminated groundwater in these areas. Potential exposure to on-site personal of soil contamination is minimal since the sites are either fenced or pose a risk of only very low exposures.

Therefore, SP4D was chosen.

During:
Marginal risk of occupational injury to remediation workers if remediation proved necessary.

Therefore SP3D was chosen.

After:
Same as "Before."

Therefore, SP4D was chosen.

24. Environmental Impact:
Before (likelihood methodology - P/T):P.
A small probability (at least 1%) exists that localized groundwater contamination may be found at one or more of these areas. If contamination is found, it could take as much as 5 years to remediate (based on professional judgment of how big a problem might have been missed earlier). If any areas of soil contamination are found sufficent to require excavation, this would take less than 1 year.

Therefore, EN2C was chosen.

During:
If remediation is required, only minor environmental disturbance would be expected.

Therefore, EN3C was chosen.

After:
Level of residual environmental impact would be minimal.

Therefore, EN3D was chosen.

25. Compliance:
Before (likelihood methodology - P/T):P.
There remains a probability of greater than 1% that groundwater contamination will be found at one or more of these areas. If it is found, it could require as much as 5 years to remediate and failure to do so would constitute a major noncompliance with the Compliance Agreement, DOE orders, etc.

Therefore CO1C was chosen.

After:
After evaluation and, if necessary, remediation, compliance should be assured.

Therefore, CO4D was chosen

26. Mission Impact:
Before (likelihood methodology - P/T):P.
A mission impact in association with these areas is unlikely, but, were groundwater found to be contaminated with radionuclides at one or more of these locations (judged to have a likelihood of greater than 1%), a moderate impact on mission could result.

Therefore MI2C was chosen.

After:
Following evaluation of all sites and completion of cleanup as necessary, no impact on mission is expected.

Therefore, MI2D was chosen.

27. Mortgage Reduction:
Before (likelihood methodology - P/T):P. There would seem to be at least a 1% chance that one or more of these areas would have residual groundwater contamination that required remediation. Were this left un-remediated, it would lead to contamination of a wider area leading to a later, more costly clean-up (an increment possibly greater than 0.1% of the BNL EM budget but less than 1%).

Therefore, MR2C was chosen.

After:Assurance that no significant residual groundwater contamination remains.

Therefore, MR2D was chosen.

28. Social/Cultural/Economic Impacts:
Before (likelihood methodology - P/T):P.
Social, cultural, or economic impacts are unlikely in association with these sites. There is a greater than 1% likelihood, however, that one or more of these sites would require cleanup. If cleanup were found necessary and not done, the continued existence of radionuclides in the sole-source aquifer would lead to considerable concern and resulting social and economic damage.

Therefore, SO2C was chosen.

During:
Remediation of these areas, if necessary, would not be expected to raise any social, cultural or economic issues.

Therefore, SO2D was chosen.

After:
No social, cultural or economic issues should exist.

Therefore, SO2D was chosen.

29. Quantative Data: NO
30. Assessment Status Comments

31. Other Site Appraisal Issue: NO
32. Site Issue Comments:

33. Site Issue Contact.....:
34. Site Issue Contact Phone:

Resource Data Section
35. Funding Case.....: 1 - Funded
36. B & R Code.....: EX2010302 or Allocable Cost Pool:
37. Project Lifecycle Cost ($K): 0.0
38. Min. Safe Cost Percentage..: 0 38.1 Annual Cost Savings ($K): 0

39.

FY	OE	CE	GPP	LIP	TOTAL	S&H %	40. FED FTE	CONTR FTE
1996	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
1997	1,058.0	0.0	0.0	0.0	1,058.0	0	0.00	0.00
1998	1,493.0	0.0	0.0	0.0	1,493.0	0	0.00	0.00
1999	1,388.0	0.0	0.0	0.0	1,388.0	0	0.00	0.00
2000	7,167.0	0.0	0.0	0.0	7,167.0	0	0.00	0.00
2001	10,657.0	0.0	0.0	0.0	10,657.0	0	0.00	0.00
2002	2,330.0	0.0	0.0	0.0	2,330.0	0	0.00	0.00

41. Project Start Year: 42. Expected Year of Completion:

RDS Safety and Health Section
43. Functional Area Breakdown:

FA.SA	Pct	Functional Area/Sub-Area Title

44. S&H Drivers:

P/S	Typ	Driver Code	Driver Title

45. S&H Activity Type: 4 - [Unknown]
46. Safety & Health Narrative

47. General Comments

RDS Identification Section

1. Facil Code: BNL - BROOKHAVEN NATIONAL LABORATORY
   RDS Number: R96Z0005
3. Location.....: NY
4. RDS Title.....: OU IV Remediation
5. EM Office.....: 40
6. EM ADS Number.....: CH 2321
7. WBS Code.....:
8. Reference RDS Number.:
9. Ops Project Manager..: Micael Ferrigan
10. Ops Office Phone.....: 708-252-2570
11. Dependent RDS Numbers:
12. Safety & Health Act.?: NO
13. A-106 Activity?.....: NO
    Voided RDS?.....: NO

14. RDS Summary Description

This focuses on the Central Steam Facility that supplies heating and cooling to all major BNL buildings. Several spills have resulted in soil and groundwater contamination. (a) In 1977 a pipeline break released about 25,000 gallons of waste oil and solvent mixture that pooled over 1.2 acres and was contained by sand berms. Some oil was recovered initially; visibly contaminated soil was removed in 1993-94. (b) A former leaching pit received waste oil and wash water from equipment cleaned inside the boiler building. Waste and surrounding soil were removed and the excavation back-filled in 1989. (c) A 550 gallon UST, used between 1948 and 1963 was removed in 1990. (d) Several small serface spills occured at fuel unloading areas surfaced with pavement, bluestone or concrete. (d) In 1977 a tank truck unloading fuel spilled 250 to 500 gallons of No. 6 oil, which flowed via a storm sewer line to a small drainage ditch. Pooled oil was recovered.

Radiologically contaminated soils were identified, characterized and fenced. These continue to be monitored, but final remediation has been deferred to OU I.

Remedial action planned includes soil: soil vapor extraction; groundwater: air sparging and soil vapor extraction. These are scheduled for construction in FY97 and operation and maintenance in FY98. Radiologically contaminated soils (AOC 6) were identified under the OU-IV RI/FS. Areas were fenced as an intermediate action and monitoring continues. Final remedial action for radiologically contaminated soils is deferred to OU-I.

Ref: BNL, Operable Unit IV, Proposed Remedial Action Plan, Nov. 1995; Draft ROD, Feb 1996.

RDS Evaluation Section

15. Category		Be	Du	Af	Be	Du	Af
Public Safety & Health	PS	3C	3D	3D	L	L	L
Site Personnel Safety & Health	SP	4C	3C	4D	L	L	L
Environmental Protection	EN	3A	3A	3D	M	M	L
Compliance	CO	1A		4D	H		L
Mission Impact	MI	2B		2D	M		L
Mortgage Reduction	MR	2B		2D	M		L
Social/Cultural/Economical	SO	2B	2C	2D	M	M	L

16. Assessed By: S.C. Morris
17. Date Assessed: 02/21/1996
18. Assessment Completed: NO
19. Site Priority: 0.0
20. Standard Assumptions Exceptions/Additions:
    None

21. Evaluation Scenario:
    Before:
    Soil and groundwater contamination with volatile and semi-volatile organic compounds (petroleum compounds and solvents) exceeds state cleanup goals. There is no current use of groundwater at this site. Potential future users were analyzed and found to be at a risk below 1/10,000. The site, however, overlays a sole source aquifer.

    During:
    Remediation workers will be exposed to accidential injury. Radiological monitoring of soils will continue (but final action on radiologically contaminated soils deferred to OU-I).

    After:Toxicity in soil would be reduced, groundwater cleanup goals will be met and the potential of further contamination of groundwater eliminated.

22. Public Safety and Health:
    Before (likelihood methodology - P/T):T.
    There is no current exposure to the public, but future residents (25 to 50 years hence) could be exposed to moderate levels of groundwater contamination.

    Therefore, PS3C was chosen.

    During:
    Public exposure during the cleanup process should be nil. If soil excavation and removal of soil was required (not currently the preferred option) some public risk associated with truck traffic would be added, bujt the likelihood would be less than 1% based on the amount of traffic anticipated.

    Therefore, PS3D was chosen.

After:
Long-term risks to future residents will be eliminated and the quality of the groundwater will be restored over the longterm.

Therefore, PS3D was chosen.

23. Site Personnel Safety and Health:
Before (likelihood methodology - P/T):T.
Worker exposure currently is limited to monitoring with negligible risk. The probability of minor occupational injury or exposure to contaminated soil below 20% of limits is unlikely, but could be expected to occur with a likelihood of once per 100 years.

Therefore, SP4C was chosen.

During:
Expected cleanup operations are not expected to involve heavy construction. A likelihood of less than 1% per year of a lost time occupational accidental injury is expected during the cleanup operation.

Therefore, SP3C was chosen.

After:
Potential risks of exposure to on-site personel are negligible.

Therefore, SP4D was chosen.

24. Environmental Impact:
Before (likelihood methodology - P/T):P.
Soil and groundwater are contaminated above state cleanup goals (probability = 1). The contamination is limited in area, is not expected to migrate off-site. Active efforts to reverse the situation will take less than 1 year, although a longer time will be required to achieve full recovery of the envionment by natural breakdown of the organic contaminants.

Therefore, EN3A was chosen.

During:
The currently planned cleanup operation would produce minor effects on the environment, but rapid recovery is expected.

Therefore, EN3A was chosen.

After:
Over the long-term, the environment will be restored to a natural condition.

Therefore, EN3D was chosen.

25. Compliance:
Before (likelihood methodology - P/T):P.
State cleanup goals are exceeded. A ROD is being signed and is enforceable under law and under the Compliance Agreement. Failure to complete planned cleanup would result in certain major noncompliance with the Compliance Agreement.

Therefore, CO1A was chosen.

After:
Assuming the design of the clean up is agreed to by the parties to the Compliance Agreement (DOE, EPA and NYS-DEC), full compliance will be achieved.

Therefore, CO4D was chosen.

26. Mission Impact:
Before (likelihood methodology - P/T):P.
Likelihood of a direct negative impact on the laboratory mission is low, but failure to cleanup radiological contamination would increase an already high level of public distrust and anger with BNL. This would be aggrevated by the fact that the public was told what action would be taken and a ROD is being signed. There is at least a 10% likelihood of a moderate impact on mission if the cleanup is not undertaken.

Therefore, MI2B was chosen.

After:
Same as "Before."

Therefore, MI2D was chosen.

27. Mortgage Reduction:
Before (likelihood methodology - P/T):P.
VOC and SVOC contamination in soil would eventually further contaminate groundwater leading to a more extensive volume of contaminated groundwater. The likelihood that the later cost of cleaning up this increased volume would exceed 0.1% of the BNL EM Budget is estimated to be greater than 10%.

After:
All cost-effective measures will have been taken.

28. Social/Cultural/Economic Impacts:
Before (likelihood methodology - P/T):P.
Public concern with this activity focused primarily on the earlier removal of contaminated soil off-site to a municipal landfill. Public attention was drawn to this activity, and it may share in some of the social fear, outrage, and concern that is primarily associated with off-site groundwater contamination. Failure to cleanup radiological contamination would increase an already high level of public distrust and anger with BNL. This would be aggrevated by the fact that the public was told what action would be taken and a ROD is being signed. Public fear and concern translates into social and economic damage such as lowering of property values. There is at least a 10% likelihood of a moderate social and economic impact if the cleanup is not undertaken.

Therefore, SO2B was chosen.

During:
Cleanup activity may tend to focus greater attention, which may increase public concern. Knowledge that cleanup is occuring, however, may re-assure.

Therefore, SO2C was chosen.

After:
Residual public concern is unlikely to disappear following cleanup, but should, in this case, reduce over time.

Therefore, SO2D was chosen.

29. Quantative Data: YES
30. Assessment Status Comments

31. Other Site Appraisal Issue: NO
32. Site Issue Comments:

33. Site Issue Contact.....:
34. Site Issue Contact Phone:

Resource Data Section
35. Funding Case.....: 1 - Funded
36. B & R Code.....: EX2010302 or Allocable Cost Pool:
37. Project Lifecycle Cost ($K): 0.0
38. Min. Safe Cost Percentage..: 0 38.1 Annual Cost Savings ($K): 0

39.

FY	OE	CE	GPP	LIP	TOTAL	S&H %	40. FED FTE	CONTR FTE
1996	452.0	0.0	0.0	0.0	452.0	0	0.00	0.00
1997	1,012.0	0.0	0.0	0.0	1,012.0	0	0.00	0.00
1998	1,037.0	0.0	0.0	0.0	1,037.0	0	0.00	0.00
1999	609.0	0.0	0.0	0.0	609.0	0	0.00	0.00
2000	627.0	0.0	0.0	0.0	627.0	0	0.00	0.00
2001	536.0	0.0	0.0	0.0	536.0	0	0.00	0.00
2002	356.0	0.0	0.0	0.0	356.0	0	0.00	0.00

41. Project Start Year: 42. Expected Year of Completion:

RDS Safety and Health Section
43. Functional Area Breakdown:

FA.SA	Pct	Functional Area/Sub-Area Title

44. S&H Drivers:

P/S	Typ	Driver Code	Driver Title

45. S&H Activity Type: 4 - [Unknown]
46. Safety & Health Narrative

47. General Comments

RDS Identification Section

1. Facil Code: BNL - BROOKHAVEN NATIONAL LABORATORY
   RDS Number: R96Z0006
3. Location.....: NY
4. RDS Title.....: OU I Radiologically Contaminated Soils
5. EM Office.....: 40
6. EM ADS Number.....: CH 2321
7. WBS Code.....:
8. Reference RDS Number.:
9. Ops Project Manager..: Michael Ferrigan
10. Ops Office Phone.....: 708-252-2570
11. Dependent RDS Numbers:
12. Safety & Health Act.?: NO
13. A-106 Activity?.....: NO
    Voided RDS?.....: NO

14. RDS Summary Description

The evaluation and, if necessary, clean up of a number of sites with radiologically contaminated soil have been consolidated into OU I.

Top soil, apparently contaminated with fission products, was removed from the Hazardous Waste Management Facility and used as landscaping material at numerous places thoughout BNL. The level of radioactivity present in the soil was not detectable with the techniques of that era (1950s). The contaminated areas were identified by aerial readiological survey in 1980 and 1983. Confirmatory soil samples were collected in 1983 and 1989. The principal radionuclide is Cs-137 (BNL Site Environmental Baseline Report, 1992; and Miltenberger, BNL Investigation of 1983 EG&G Survey, 1983; both as cited in IT Corp, Draft Operable Units II and VII RI/Feasibility Study Work Plan, 6 Dec 1994, p. 3-3). Specific activities of Cs-137 in soil range up to 310 pCi/g, but measurements were not made at all locations.

Another source of contaminated soil is in the AGS storage yards where steel is stored for future use in experimental areas, usually as shielding. Some of the steel is contaminated and has surface exposure levels ranging rom 10 to 100 mR/hr. Some of the steel has rusted and rust flakes have fallen to the ground. As a result, radioactive particles of steel may have contaminated soil. The full extent of contamination is unknown.

Radiologically contaminated soil identified in OU IV are also included here for final evaluation and, if required, remediation.

RDS Evaluation Section

15. Category

Category		Be	Du	Af	Be	Du	Af
Public Safety & Health	PS	2D	3C	3D	L	L	L
Site Personnel Safety & Health	SP	3C	3B	4D	L	M	L
Environmental Protection	EN	3A	3B	3D	M	M	L
Compliance	CO	1A		4D	H		L
Mission Impact	MI	2B		2D	M		L
Mortgage Reduction	MR	2C		2D	M		L
Social/Cultural/Economical	SO	2B	2C	2D	M	M	L

16. Assessed By: S.C. Morris
17. Date Assessed: 03/04/1996
18. Assessment Completed: NO
19. Site Priority: 0.0
20. Standard Assumptions Exceptions/Additions:
    None

21. Evaluation Scenario:

Before:
Cs-137 is the primary contaminant with concentrations in soil at levels up to about 10 times the Preliminary Remediation Goals.

During: Some of these contaminated soils will require remediation, probably by excavation and off-site disposal.

After:
Potential exposures to site personnel and to possible future residents will be reduced to acceptable levels.

22. Public Safety and Health:

Before (likelihood methodology - P/T):P
Areas of soil on site are contaminated. The public does not have general access to these areas, although trespassers potentially could have limited ability to be exposed. Left unremediated, Cs-137 may leach into the groundwater and contribute to public exposure in the long term (greater than 10 years). Meanwhile, the principal population that could be exposed is being provided access to a public water supply. A very low likelihood of an exposure above MCLs (PS2D) and a medium likelihood (greater than 1%) of an exposure below MCLs (PS3C) were considered.

Therefore, PS2D was chosen.

During:
During cleanup, the possibility of exposure to trespassers decreases because of the greater activity around these sites. Cleanup activities decrease the source of contamination to groundwater.

Therefore PS3C was chosen.

After:

The risk to the public will be much reduced.

Therefore, PS3D was chosen.

23. Site Personnel Safety and Health:
Before (likelihood methodology - P/T):P
Site personnel have access to these areas and could conceivable receive a dose over 20% of limits for non-radiation workers with at least a 1% probability.

Therefore, SP3C was chosen.

During:
Excavation and transport of soil off-site poses a risk of minor occupational accident (disability less than 3 months) or exposures near limits (above 20% of occupational limits).

Therefore, SP3B was chosen.

After:
Remediated soil poses little risk. Unremediated soil will be protected by institutional controls, e.g., fencing.

Therefore, SP4d was chosen.

24. Environmental Impact:
Before (likelihood methodology - P/T):P
Soil is contaminated (probability = 100%) with, in at least some cases, reasonably high concentrations of Cs-137. The extent of contaminated soil is limited and well defined and could be cleaned up in less than 1 year.

Therefore, EN3A was chosen.

During:
During cleanup, the contaminated areas will be remediated, reducing the contamination of the soil. The likelihood of minor to moderate environmental damage will decrease.

Therefore, EN3B was chosen.

After:
Following cleanup and possibly a period for natural decay, environmental contmaination will be reduced to acceptable levels.

Therefore, EN3D was chosen.

25. Compliance:
Before (likelihood methodology - P/T):P
These contaminated areas fall under the Compliance Agreement signed by DOE, EPA, and NYS-DEC. Failure to address these problems would result in a major noncomplience with the Agreement.

Therefore, CO1A was chosen.

After:
Soil clean up goals will be developed with the agreement of the Parties to the Compliance Agreement, who include the major regulatory agencies. Following completion of the agreed upon level of cleanup of all the areas, full compliance should be achieved.

Therefore, CO4D was chosen.

26. Mission Impact:
Before (likelihood methodology - P/T):P
None of these areas have any direct bearing on the laboratory mission. Increasing public concern in the region over radiation contamination in groundwater and the knowledge that soil contamination can lead to groundwater contamination, means that failure to address these contaminated soils could (with a likelihood of more than 10%) lead to a level of public outrage that could threaten the laboratory mission.

Therefore, MI2B was chosen.

After:
Following remediation of excessive contamination in these areas, the threat to laboratory mission from this source should be nil.

Therefore, MI2D was chosen.

27. Mortgage Reduction:
Before (likelihood methodology - P/T):P
If soil concentrations of Cs-137 go unremediated, the Cs could leach into the groundwater leading to a more extensive problem. The additional cost would be unlikely to exceed 1% of the BNL EM budget and the likelihood of extensive groundwater contamination was judged as less than 10%.

Therefore, MR2C was chosen.

After:
Since the cleanup operation will be designed to achieve a cost-effective solution, no further mortgage reduction would be expected.

Therefore, MR2D was chosen.

28. Social/Cultural/Economic Impacts:
Before (likelihood methodology - P/T):P
Increasing public concern in the region over radiation contamination in groundwater and the knowledge that soil contamination can lead to groundwater contamination, means that failure to address these contaminated soils could (with a likelihood of more than 10%) lead to a level of public outrage and concern leading to social and economic (decreased value of property) impacts.

Therefore, SO2B was chosen.

After:
Following remediation of excessive contamination in these areas, the public concern and resulting social and economic impact should be much reduced, since these areas are all on-site.

Therefore, SO2D was chosen.

29. Quantative Data: NO
30. Assessment Status Comments

31. Other Site Appraisal Issue: NO
32. Site Issue Comments:

33. Site Issue Contact.....:
34. Site Issue Contact Phone:

Resource Data Section
35. Funding Case.....: 1 - Funded
36. B & R Code.....: EX2010302 or Allocable Cost Pool:
37. Project Lifecycle Cost ($K): 0.0
38. Min. Safe Cost Percentage..: 0 38.1 Annual Cost Savings ($K): 0

39. 40.

FY	OE	CE	GPP	LIP	TOTAL	S&H %	FED FTE	CONTR FTE
1996	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
1997	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
1998	9,385.0	0.0	0.0	0.0	9,385.0	0	0.00	0.00
1999	3,748.0	0.0	0.0	0.0	3,748.0	0	0.00	0.00
2000	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
2001	1,831.0	0.0	0.0	0.0	1,831.0	0	0.00	0.00
2002	8,087.0	0.0	0.0	0.0	8,087.0	0	0.00	0.00

41. Project Start Year: 42. Expected Year of Completion:

RDS Safety and Health Section
43. Functional Area Breakdown:

FA.SA	Pct	Functional Area/Sub-Area Title

44. S&H Drivers:

P/S	Typ	Driver Code	Driver Title

45. S&H Activity Type: 4 - [Unknown]
46. Safety & Health Narrative

47. General Comments

RDS Identification Section

1. Facil Code: BNL - BROOKHAVEN NATIONAL LABORATORY
   RDS Number: R96Z0007
3. Location.....: NY
4. RDS Title.....: OU I USTs (Building 830 and 811)
5. EM Office.....: 40
6. EM ADS Number.....: CH 2321
7. WBS Code.....:
8. Reference RDS Number.:
9. Ops Project Manager..: Michael Ferrigan
10. Ops Office Phone.....: 708-252-2570
11. Dependent RDS Numbers:
12. Safety & Health Act.?: NO
13. A-106 Activity?.....: NO
    Voided RDS?.....: NO

14. RDS Summary Description

Building 811 and 830 are combined because they both involve underground tanks and they have similar levels of risk.

Building 811 is the Waste Concentration Facility (WCF), which began operations in 1949 and remains in service. It currently consistes of six 8,000 gal underground storage tanks (USTs), two 25,000 gal above ground tanks (ASTs), a 4,000 gal receiving tank, the evaporator/concentration unit (no longer used), a leased MF/RO unit underground pipelines, and a small building that houses the evaporator. Liquid radioactive waste is received via underground pipelines or truck, then stored and distilled to remove particulates, suspended and dissolved solids. Three 100,000 gallon storage tanks were removed in 1994. There were three documented leaks from these tanks. Cs-137 in soil around these tanks hs been measured at above 500 pCi/g. A second concern is possible (but undocumented) leakage from the underground pipelines, which are contaminated with Co-60, fission products, and transuranics. Soil samples along the pipeline in 1995 found additional leakage of radioactive contaminants. There is also soil contamination by radiologicals and chemicals just north of Building 811. Ref: IT Corp, Draft Operable Units II and VII Remedial Investigation/ Feasibility Study Work Plan, Dec 6, 1994; Preliminary 1995 measurements.

Building 830 is a research laboratory. Some radiologically contaminated soils and liquids, identified earlier from a pipe leak, were cleaned up and disposed off-site. Further radiological contamination has been found associated with a leak in a valve pit. Cs-137, CO-60, and radium area the major radionuclides.

RDS Evaluation Section

15. Category

		Be	Du	Af	Be	Du	Af
Public Safety & Health	PS	2D	3D	3D	L	L	L
Site Personnel Safety & Health	SP	3B	3B	4D	M	M	L
Environmental Protection	EN	2A	3C	3D	H	L	L
Compliance	CO	3B		4D	M		L
Mission Impact	MI	1B		2D	H		L
Mortgage Reduction	MR	2C		2D	M		L
Social/Cultural/Economical	SO	2B	2C	2D	M	M	L

16. Assessed By: S.C. Morris
17. Date Assessed: 02/22/1996
18. Assessment Completed: NO
19. Site Priority: 0.0
20. Standard Assumptions Exceptions/Additions:
    None

21. Evaluation Scenario:

Before:
In the Waste Concentration Facility (Bldg 811) there is contaminated soil in the area around the location of the now-removed D-tanks, from leaks in pipelines exiting the facility, and just north of the facility. Principal contaminant Cs-137 (10x background levels), but also transuranics and other radionuclides. Possible further soil contamination from inflowing waste pipelines and/or outflowing sewer based on nearby test wells, but no direct evidence of source. Building 830 has soil and possibly groundwater contaminated with Cs-137, Co-60, and radium that is associated with a leak from a valve pit.

During:
Required action not yet determined. Further characterization required. Assume concentrations in soil exceed remediation goals and removal, storage and disposal will be required under Compliance Agreement.

After:
Future land use for these areas is industrial. Assume remedial action will achieve concentrations appropriate for this land use.

22. Public Safety and Health:

Before (likelihood methodology - P/T):T.
In the next 10-100 years this part of the BNL site may be released for industrial use. Remaining concentrations of Cs-137 and other radionuclieds in the soil at that time could result in exposure to construction workers (as members of the public) above acceptable risks to the public, but because this is a known contaminated area, necessary controls would be taken and the likelihood of an excessive exposure would be less than 1%/y (2D). The potential of exposure to industrial workers or visitors would be much lower (3D).

Therefore, PS2D was chosen as it represents the highest public risk.

During:

Risks to the public associated with the cleanup itself would be nil, but if contaminated soil needed to be transported to an off-site disposal facility, a small risk of traffic accidents would exist. The latter would still be estimated to have a likelihood less than 1%/year (3D).

Therefore, PS3D was chosen.

After:
The potential for even low levels of exposure to the public would be small as they would be below EPA-mandated cleanup goals and any material above those levels would be safely off-site or stored in a safe manner on site.

Therefore PS3D was chosen.

23. Site Personnel Safety and Health:
Before (likelihood methodology - P/T):T.
Concentrations of Cs-137 and other radionuclides in the soil at these sites do not pose a great risk of exposure to site personnel, but, left unremediated, it would be marginally possible that a worker might be exposed above 20% of allowable limits occuring over a 10 year period.

Therefore SP3C was chosen.

During:
Safety and health physics controls during cleanup aim at avoidance of accidental injury and maintaining radiation exposures as far below standards as reasonably possible, but during the intensive activity of remediation, it is reasonable to consider the possibility of an exposure within 20% of the limits or a lost-time accident occuring during the cleanup. Since the cleanup itself will probably take less than 1 year to complete, even a slightly less than 10% likelihood of such an event occuring would lead to a score of 3B.

Therefore, SP3B was chosen.

After:
Following remediation, the risk of exposure to site personnel would be negligible as the potential for radiation exposure would be reduced to well below occupational standards.

Therefore, SP4D was chosen.

24. Environmental Impact:
Before (likelihood methodology - P/T):P.
Soil has definately been contaminated (probability = 1). The location is in an industrial-type setting, however, so no critical ecological habitat or species are endangered. The contamination is localized but would require several years to remediate. Levels of Sr-90 in groundwater have been found that are above 200 PCi/L (MCL=8). The degree of environmental damage is therefore significant. Without remediation, contamination in the soil will continue to enter the groundwater.

Therefore, EN2A was chosen since the contamination in soil and groundwater exists with certainty and the groundwater contamination would take several years to cleanup.

During:
Remediation, especially soil removal, if necessary, although possibly causing minor disruption, would not have any long-term impact because of the industrialized nature of the site. Depending on the extent of remediation required, there is some probability that no environmental damage may be inflicted.

Therefore, EN3C was chosen.

After:
Soil contamination would, in the long term, be restored to acceptable limits.

Therefore, EN3D was chosen.

25. Compliance:
Before (likelihood methodology - P/T):P.
This is scheduled in the Compliance Agreement and therefore is not formally out of compliance. None the less, there is soil and groundwater contamination, and the regulatory agencies are tracking it, so there is a greater than 10% probability that this will be scheduled before 1998 considered a marginal noncompliance with DOE Orders.

Therefore, CO3B was chosen because it provides the highest score among the options considered.

After:
The design of the remediation will be carried out only after approval from the parties to the Compliance Agreement, which includes the primary regulatory agencies. It can thus be assumed that successful completion of remediation will achieve full compliance.

Therefore, CO4D was chosen.

26. Mission Impact:
Before (likelihood methodology - P/T):P.
The operation of the Waste Concentration Facility is essential to several major missions of the laboratory, including the High Flux Beam Reactor. Given the current public concern with radiation at BNL, failure to remediate contamination associated with this facility could lead to serious negative impact on the research mission of BNL with

a probability of at least 10%. Failure to cleanup soil contamination at Building 830 (if it proves necessary) does not pose as great a direct impact on the research mission, but would have some direct effects. Moreover, failure to address this issue will further erode public confidence in DOE's and BNL's ability to protect the environment from current operations as well as past problems and would indirectly pose a threat to the continued operation of the research facilities.

Therefore, MI1B was chosen.

After:
Following cleanup, much of the basis for the WCF becoming the source of a threat to the laboratory mission disappears, although it is doubtful that the threat will be eliminated entirely.

Therefore, MI2D was chosen.

27. Mortgage Reduction:
Before (likelihood methodology - P/T):T.
Without remediation, within the 10-100 year timeframe contamination would be expected to migrate from the soil into groundwater and subsequently spread. This would lead to a requirement for a more extensive remediation at a later date. The nature of the contamination would suggest that the cost avoided is only moderate.

Therefore, MR2C was chosen.

After:
It is assumed that the remedial action taken will include all cost-effective options.

Therefore, MR2D was chosen.

28. Social/Cultural/Economic Impacts:
Before (likelihood methodology - P/T):P.
Although the potential public exposure is small, the contamination of soil and groundwater with radionuclides and the potential for further contamination of the sole-source aquifer raises a strong possibility of public concern and social and economic damage.

Therefore, SO2B was chosen.

During:
The increased public awareness of the contamination during the cleanup operation itself is likely to maintain or increase any social or economic damage.

Therefore, SO2C was chosen since the level of socio-economic damage remains the same as "before."

After:
Presumably social or economic impacts will be reduced over time following cleanup.

Therefore, SO2D was chosen.

29. Quantative Data: NO
30. Assessment Status Comments

31. Other Site Appraisal Issue: NO
32. Site Issue Comments:

33. Site Issue Contact.....:
34. Site Issue Contact Phone:

Resource Data Section
35. Funding Case.....: 1 - Funded
36. B & R Code.....: EX2010302 or Allocable Cost Pool:
37. Project Lifecycle Cost ($K): 0.0
38. Min. Safe Cost Percentage..: 0 38.1 Annual Cost Savings ($K): 0

39.

FY	OE	CE	GPP	LIP	TOTAL	S&H %
1996	0.0	0.0	0.0	0.0	0.0	0
1997	0.0	0.0	0.0	0.0	0.0	0
1998	776.0	0.0	0.0	0.0	776.0	0
1999	0.0	0.0	0.0	0.0	0.0	0
2000	0.0	0.0	0.0	0.0	0.0	0
2001	0.0	0.0	0.0	0.0	0.0	0
2002	0.0	0.0	0.0	0.0	0.0	0

40.

FED FTE	CONTR FTE
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00
0.00	0.00

41. Project Start Year: 42. Expected Year of Completion:

RDS Safety and Health Section
43. Functional Area Breakdown:
FA.SA Pct Functional Area/Sub-Area Title

RDS Identification Section

1. Facil Code: BNL - BROOKHAVEN NATIONAL LABORATORY
   RDS Number: R96Z0008
3. Location.....: NY
4. RDS Title.....: OU V, Sewage Treatment Plant, Etc..
5. EM Office.....: 40
6. EM ADS Number.....: CH 2321
7. WBS Code.....:
8. Reference RDS Number.:
9. Ops Project Manager..: Michael Ferrigan
10. Ops Office Phone.....: 708-252-2570
11. Dependent RDS Numbers: 0
12. Safety & Health Act.?: NO
13. A-106 Activity?.....: NO
    Voided RDS?.....: NO

14. RDS Summary Description

The Sewage Treatment Plant (AOC 4) and a leaky sewer pipe leading to the Sewage Treatment Plant (part of AOC 21) have resulted in contamination of soil and groundwater. The principal contaminants of concern are volatile organic solvents (VOCs). VOCs have been observed in monitoring wells at the site boundary and in 2 of the 70 domestic wells domestic wells monitored off-site (only one of these wells has contamination that is linked to BNL). Tritium has also been found off-site, but at levels well below MCLs.

The remedial action alternatives being considered are Pump and Treat and/or connection of residences in the effected area to public water.

RDS Evaluation Section

15. Category

Category		Be	Du	Af	Be	Du	Af
Public Safety & Health	PS	2B	3C	3D	M	L	L
Site Personnel Safety & Health	SP	4C	2D	4D	L	L	L
Environmental Protection	EN	2A	3B	3D	H	M	L
Compliance	CO	1B		4D	H		L
Mission Impact	MI	1B		2C	H		M
Mortgage Reduction	MR	2C		2D	M		L
Social/Cultural/Economical	SO	2A	2B	2C	H	M	M

16. Assessed By: S.C. Morris
17. Date Assessed: 02/26/1996
18. Assessment Completed: NO
19. Site Priority: 0.0
20. Standard Assumptions Exceptions/Additions:

The Sewage treatment plant and a sewage line coming into the plant are the source of a contaminated groundwater plume moving to the east.

21. Evaluation Scenario:

Before:
Volatile organic compounds (VOCs) have been identifed in soil near the plant and in groundwater above MCLs at the site boundary and in two of 70 domestic drinking water wells monitored during 1996. Tritium was also detected during this period, but well below MCLs.

During:
Remedial actions being considered for the groundwater contamination are pump and treat and/or provision of public water to the affected area. Contaminated soil may be excavated and removed. Only small areas would required disturbance of the terrestrial ecology for either the soil or groundwater cleanup. Much of the area is in the protected Long Island Pine Barrens Core Area and also constitutes the headwaters of the Peconic River, designated by the state as a Scenic River.

After:
After cleanup and allowing for natural attenuation and decay, soil will be safe for the designated future land use and the groundwater will eventually be restored to MCLs.

22. Public Safety and Health:

Before (likelihood methodology - P/T):T
Two of the 70 wells samples in 1996 were found to have VOCs above MCLs. In only one of these did there seem to be a connection to BNL. Several homes also were found with tritium in their water, but at concentratrations of 2,000 pCi/l, well below MCLs. The direction of flow of the groundwater plume is through low density residential areas, open space, and farmland. Given an exposure, the probability of harm must also be considerd. The MCLs are designed with a factor of safety built-in. The risk ranking assigned considers both. The public has essentially no exposure to rad-contaminated soil around the sewage plant. [Reference: preliminary measurement results being incorporated in the Draft Remedial Investigation Report.]

Therefore, PS2B was chosen on the basis of groundwater exposures.

During:
During characterization and remediation operations risk to the public should substancially decrease as the extent of contamination is better understood and domestic wells are monitored. The plan is to monitor domestic wells over the

next 10 years to avoid the possibility of unrecognized exposures.

Therefore, PS3C was chosen.

After:
Following remediation, concentrations that people could be exposued to would be below MCLs.

Therefore, PS3D was chosen.

23. Site Personnel Safety and Health:
Before (likelihood methodology - P/T):T.
Site personnel face a neglegable risk from contaminated soil but exposures below 20% of limits may be possible once every 10 years (between now and when the soil will be cleanup). Risk of exposure to contaminated groundwater is zero.

Therefore, SP4C was chosen on the basis of contaminated soil.

During:
Remediation workers evacuating soil or building and operating pump-and-treat systems for groundwater are exposed to risk of accidential injury and/or exposures below limits an an effective rate of once per 10 years (equivalent to 1-10% per year). There is a lower likelihood of remediation workers contracting a serious case of Lyme disease since this is a tick infested area.

Therefore SP2D was chosen.

After:
After remediation, no potential effects to site personnel are expected.

Therefore, SP4D was chosen.

24. Environmental Impact:
Before (likelihood methodology - P/T):P.
There is an impact on groundwater that would take several years to remediate. Concentrations of 50 ppb of total VOCs were measured in 1996 at the site boundary and concentrations of TCE above MCLs in a domestic well.

Therefore, EN2A was chosen.

During:
Although the area impacted is a sensitive environment protected as part of the Core Area of the Long Island Pine Barrens and is also the beadwaters of a state-designated Scenic River, only small areas would be disturbed for evaculation of soil or processes to clean the groundwater.

Therefore EN3C was chosen to represent a near certainty of minor, localized damage.

After:
Following cleanup, concentrations will be substantially reduced.

Therefore, EN3D was chosen.

25. Compliance:
Before (likelihood methodology - P/T):P
The Compliance Agreement (signed by DOE, EPA, and NYS-DEC) specifies that appropriate remediation will follow characterization. No action would be a near-certain violation of the Compliance Agreement.

Therefore, CO1B was chosen.

After:
Since any remediation will be agreed to in advance by the key regulatory agencies, upon completion of remediation, the facility should be in compliance.

Therefore CO4D was chosen.

26. Mission Impact:
Before (likelihood methodology - P/T):P.
Issues of tritium associated with the Sewage Treatment Plant have already resulted in the rescoping of a major upgrade to the Sewage Treatment Plant and have resulted in a call to shut down the reactors on site (the primary source of the tritium). The continuing contamination of groundwater with tritium poses a greater then 10% chance of a serious negative impact on the research mission of the laboratory.

Therefore, MI1B was chosen.

After:
Following cleanup, the extent of contamination will be much reduced, removing the rationale behind any threat to mission. It is doubtful whether that will entirely eliminate the threat, which may take on a life of its own, so a residual level of threat is assumed.

Therefore, MI2C is chosen.

27. Mortgage Reduction:
Before (likelihood methodology - P/T):P
Without remediation, the contaminated groundwater plume is likely (probability greater than 10%) to spread further, affecting a larger volume of groundwater. Soil contamination will, over time, potentially provide a further source of groundwater contamination. These could lead to higher costs of cleanup later although there remains a possibility that the best approach to remediation may be to allow natural attinuation. If a cleanup were necessary, the increamental cost would be at least 0.1% of BNL's EM annual budget.

Therefore, MR2C was chosen.

After:
Since the cleanup will be designed on a cost-effective basis, no further remediation costs should be necessary.

Therefore, MR2D was chosen.

28. Social/Cultural/Economic Impacts:
Before (likelihood methodology - P/T):P
A high degree of social impact already exists as a result of fear and concern over tritium from the Sewage Treatment Plant. In addition to concern over cancer, there is great concern over economic loss to the fishing industry and to property values through stigma. Mitigation of this impact is possible, but will require time and effort.

Therefore, SO2B was chosen.

During:
During cleanup, the social and economic impact may abate, but not entirely.

Therefore, SO2B was chosen.

After:
Following cleanup, much of the rationale for any economic or social impact will be gone, but the effect is likely to linger.

Therefore, SO2C was chosen.

29. Quantative Data: YES
30. Assessment Status Comments

31. Other Site Appraisal Issue: NO
32. Site Issue Comments:

33. Site Issue Contact.....:
34. Site Issue Contact Phone:

Resource Data Section
35. Funding Case.....: 1 - Funded
36. B & R Code.....: EX2010302 or Allocable Cost Pool:
37. Project Lifecycle Cost ($K): 0.0
38. Min. Safe Cost Percentage..: 0 38.1 Annual Cost Savings ($K): 0

39.

FY	OE	CE	GPP	LIP	TOTAL	S&H %	40. FED FTE	CONTR FTE
1996	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
1997	616.0	0.0	0.0	0.0	616.0	0	0.00	0.00
1998	1,496.0	0.0	0.0	0.0	1,496.0	0	0.00	0.00
1999	634.0	0.0	0.0	0.0	634.0	0	0.00	0.00
2000	5,621.0	0.0	0.0	0.0	5,621.0	0	0.00	0.00
2001	998.0	0.0	0.0	0.0	998.0	0	0.00	0.00
2002	1,035.0	0.0	0.0	0.0	1,035.0	0	0.00	0.00

41. Project Start Year: 42. Expected Year of Completion:

RDS Safety and Health Section
43. Functional Area Breakdown:

FA.SA	Pct	Functional Area/Sub-Area Title

44. S&H Drivers:

P/S	Typ	Driver Code	Driver Title

45. S&H Activity Type: 4 - [Unknown]
46. Safety & Health Narrative

RDS Identification Section

1. Facil Code: BNL - BROOKHAVEN NATIONAL LABORATORY
   RDS Number: R96Z0009
3. Location.....: NY
4. RDS Title.....: Core Program
5. EM Office.....: 40
6. EM ADS Number.....: CH 2320
7. WBS Code.....:
8. Reference RDS Number.:
9. Ops Project Manager..: Michael Ferrigan
10. Ops Office Phone.....: 708-252-2570
11. Dependent RDS Numbers:
12. Safety & Health Act.?: NO
13. A-106 Activity?.....: NO
    Voided RDS?.....: NO

14. RDS Summary Description
The Core Program of the BNL Office of Environmental Restoration is responsable for management control, training, quality control, community involvement, and oversight. Without these functions, the environmental restoration program at BNL could not operate.

RDS Evaluation Section

15. Category

		Be	Du	Af	Be	Du	Af
Public Safety & Health	PS	2B	2D	2D	M	L	L
Site Personnel Safety & Health	SP	2C	3B	4D.	M	M	L
Environmental Protection	EN	2A	2A	3C	H	H	L
Compliance	CO	1A		4D	H		L
Mission Impact	MI	1B		2D	H		L
Mortgage Reduction	MR	2B		2D	M		L
Social/Cultural/Economical	SO	2A	2A	2C	H	H	M

16. Assessed By: S.C. Morris
17. Date Assessed: 03/04/1996
18. Assessment Completed: NO
19. Site Priority: 0.0
20. Standard Assumptions Exceptions/Additions:
Core activities have important public health, safety, and environmental protection functions in their oversight of field activities to assure health and safety is protected and that personnel working in the field have adequate training and understand health, safety and environmental goals. Consistent with other facilities within Chicago Operations, The core activities are scored with the highest level of any activities under their management.

21. Evaluation Scenario:
Before:
The core program has a more direct role in the areas of compliance, mortgage reduction, and social and economic impact through its management, planning, budgeting, training, and community relations activities.

During:
Same as "Before"

After:
Same as "Before" with the following addition:

For the core program, "after" is interpreted to mean the completion of the overall mission of the BNL Office of Environmental Restoration, returning the BNL site and surrounding area to an acceptable level of environmental quality.

22. Public Safety and Health:
Before (likelihood methodology - P/T):P
The core activities have an important public health and safety function in their oversight of field activities to assure public health is maintained and to assure that personnel working in the field have adequate training.

Therefore, PS2B was chosen as the highest score of activities managed by the core.

During:
Same as "Before"

Therefore PS2D was chosen as the highest score of activities managed by the core.

After:
Same as "Before"

Therefore PS2D was chosen as the highest score of activities managed by the core.

23. Site Personnel Safety and Health:
Before (likelihood methodology - P/T):P
The core activities have an important role in assuring site personel health and safety through their mission of oversight, training of OER personnel and other remediation workers, and establishing safe work rules for contractors.

Therefore, SP2C was chosen as the highest score of activities managed by the core.

During:
Same as "Before"

Therefore, SP3B was chosen as the highest score of activities managed by the core.

After:
Same as "before"

Therefore, SP4D was chosen as the highest score of activities managed by the core.

24. Environmental Impact:
Before (likelihood methodology - P/T):P
The core activities have substantial indirect impact on maintaining and improving environmental quality through thei- oversight role, assuring adequate training of personnel, and interacting with environmental regulatory agencies.

Therefore, EN2A was chosen as the highest score of activities managed by the core.

During:
Same as "before"

Therefore, EN2A was chosen as the highest score of activities managed by the core.

After:
Same as "before"

Therefore, EN3C was chosen as the highest score of activities managed by the core.

25. Compliance:
Before (likelihood methodology - P/T):P
Management is responsible for assurance that the overall program proceeds in accordance with the Compliance Agreement and on-schedule. Failure to operate the core program would certainly (probability = 1) lead to major noncompliance with the Agreement.

Therefore, CO1A was chosen.

After:
Following completion of the environmental restoration mission, the facility should be in compliance.

Therefore, CO4D was chosen.

26. Mission Impact:
Before (likelihood methodology - P/T):P
The core program provides leadership to the overall environmental restoration mission. Without the core program, the mission could not be accomplished (probability = 1).

Therefore, MI1B was chosen.

After:
For the core program, "after" is interpreted to mean the completion of the overall mission of the BNL Office of Environmental Restoration, returning the BNL site and surrounding area to an acceptable level of environmental quality.

Therefore, MI2D was chosen.

27. Mortgage Reduction:
Before (likelihood methodology - P/T):P
Part of the responsibility of the core program is to assure that remediation is conducted as necessary and in a cost effective way. Without this management and oversight mission in operation, there is a greater likelihood that occurances of inefficient management and poor program planning and implementation would lead to efforts that might require later follow-up and additional work at extra cost. Further, without the core function of training and oversight of worker safety, accidents are more likely to occur leading to increased costs. These effects could exceed 1% of the BNL EM budget.

Therefore, MR2B was chosen.

After:
For the core program, "after" is interpreted to mean the completion of the overall mission of the BNL Office of Environmental Restoration, returning the BNL site and surrounding area to an acceptable level of environmental quality. This assumes that this management and oversight mission remains in operation, substantially increasing the likelihood that occurances of inefficient management and poor program planning and implementation would not occur.

Therefore, MR2D was chosen.

28. Social/Cultural/Economic Impacts:
Before (likelihood methodology - P/T):P
The core program includes the community relations function. This function, backed up by the BNL-OER management,

provides the key to regaining trust in the community which will lead to an acceptable level of cleanup, decreased public concern, and therefore a low level of social or economic damage. Without a strong community relations program, it is clear that public fear and concern leads to economic and social damage in the community without regard to the actual health and environmental risk.

Therefore, SO2A was chosen as the rank if the core program did not operate.

During:
The core program includes the community relations function. This function, backed up by the BNL-OER management, provides the key to regaining trust in the community which will lead to an acceptable level of cleanup, decreased public concern, and therefore a low level of social or economic damage. Without a strong community relations program, it is clear that public fear and concern leads to economic and social damage in the community without regard to the actual health and environmental risk.

Therefore, SO2A was chosen as the rank if the core program did not operate.

After:
For the core program, "after" is interpreted to mean the completion of the overall mission of the BNL Office of Environmental Restoration, returning the BNL site and surrounding area to an acceptable level of environmental quality and greater public understanding of the level of risk. It is unrealistic to expect that public understanding would be 100% and therefore, some probability of social and economic damage remains.

Therefore, SO2C was chosen.

29. Quantative Data: NO
30. Assessment Status Comments

31. Other Site Appraisal Issue: NO
32. Site Issue Comments:

33. Site Issue Contact.....:
34. Site Issue Contact Phone:

Resource Data Section
35. Funding Case.....: 1 - Funded
36. B & R Code.....: EX2010301 or Allocable Cost Pool:
37. Project Lifecycle Cost ($K): 0.0
38. Min. Safe Cost Percentage..: 0 38.1 Annual Cost Savings ($K): 0

39.

FY	OE	CE	GPP	LIP	TOTAL	S&H %	40. FED FTE	CONTR FTE
1996	1,952.0	0.0	0.0	0.0	1,952.0	0	0.00	0.00
1997	2,123.0	0.0	0.0	0.0	2,123.0	0	0.00	0.00
1998	2,580.0	0.0	0.0	0.0	2,580.0	0	0.00	0.00
1999	2,644.0	0.0	0.0	0.0	2,644.0	0	0.00	0.00
2000	2,771.0	0.0	0.0	0.0	2,771.0	0	0.00	0.00
2001	2,776.0	0.0	0.0	0.0	2,776.0	0	0.00	0.00
2002	2,859.0	0.0	0.0	0.0	2,859.0	0	0.00	0.00

41. Project Start Year: 42. Expected Year of Completion:

RDS Safety and Health Section
43. Functional Area Breakdown:

FA.SA	Pct	Functional Area/Sub-Area Title

44. S&H Drivers:

P/S	Typ	Driver Code	Driver Title

45. S&H Activity Type: 4 - [Unknown]
46. Safety & Health Narrative

47. General Comments

RDS Identification Section

1. Facil Code: BNL - BROOKHAVEN NATIONAL LABORATORY
   RDS Number: R96Z0010
3. Location.....: NY
4. RDS Title.....: OU III Accelerated Groundwater Action
5. EM Office.....: 40
6. EM ADS Number.....: CH 2321
7. WBS Code.....:
8. Reference RDS Number.:
9. Ops Project Manager..: Michael Ferrigan
10. Ops Office Phone.....: 708-252-2570
11. Dependent RDS Numbers:
12. Safety & Health Act.?: NO
13. A-106 Activity?.....: NO
    Voided RDS?.....: NO

14. RDS Summary Description

A plume of groundwater contaminated with volatile organic compounds (VOCs) has been identified in Operable Unit III through a series of monitoring wells and has moved off-site with concentrations well above MCLs. Contaminants include TCA and CCl4. The specific origin of this plume is unclear and it may result from several spills that occured at different times in different locations. It is believed that a groundwater plume stemming from contamination around Building 830 is or will mix with this plume, so the two are being considered together.

Cleanup alternative currently being considered include Pump-and-treat and/or provision of public water.

Reference: Preliminary data from RI field investigation.

RDS Evaluation Section

15. Category

Category		Be	Du	Af	Be	Du	Af
Public Safety & Health	PS	2B	3D	2D	M	L	L
Site Personnel Safety & Health	SP	4D	3C	4D	L	L	L
Environmental Protection	EN	2A	2A	3C	H	H	L
Compliance	CO	1A		4D	H		L
Mission Impact	MI	1B		2C	H		M
Mortgage Reduction	MR	2B		2D	M		L
Social/Cultural/Economical	SO	2A	2A	2C	H	H	M

16. Assessed By: S.C.Morris
17. Date Assessed: 03/04/1996
18. Assessment Completed: NO
19. Site Priority: 0.0
20. Standard Assumptions Exceptions/Additions:
    None

21. Evaluation Scenario:

Before:
A plume of groundwater contaminated with volatile organic compounds (VOCs) has been identified in Operable Unit III through a series of monitoring wells and has moved off-site with concentrations well above MCLs. Contaminants include TCA and CCl4. The specific origin of this plume is unclear and it may result from several spills that occured at different times in different locations. Because a large volume of groundwater on-site is contaminated at high levels, unremediated, this plume would be expected to continue to flow into a residential area south of BNL.

During:
Cleanup alternative currently being considered include Pump-and-treat and/or provision of public water.

After:
Following cleanup and time to allow natural attinuation, groundwater contamination will be at a level that poses no risk to the public or the environment.

22. Public Safety and Health:

Before (likelihood methodology - P/T):T
Measurements indicate groundwater contamination has migrated off-site at concentrations well above MCLs. This plume either currently underlies or is moving toward a residential area being served by domestic wells. Residents in this area are being offered hook-ups to a public drinking water supply. Since the plume is not fully characterized off-site and some people may not accept public water, there is a possibility that within 10 years domestic wells could be affected. Given the concentrations measured beyond the site boundary and the potential number of homes at risk, the likelihood of health impact given exposure would be greater than 10%.

Therefore, PS2B was chosen.

During:
Implementing and operating the monitoring and pump-and-treat system results in little risk to the public, although part of the operation may be off-site and may pose a slight risk to children attracted to the construction or operations. Exposure to the public of the off-gases from the pump-and-treat system are expected to be well below New York State standards.

Therefore PS3D was chosen.

After:
The pump-and-treat system will limit further contributions of off-site contaminated water so the likelihood of

continued exposure is less. Existing off-site concentrations not treated will attinuate and be diluted over time to make the likelihood of exposures above the MCL less likely (2D) although exposures below the MCL will remain for some time (3C).

Therefore, PS2D was chosen.

23. Site Personnel Safety and Health:
Before (likelihood methodology - P/T):P
The contaminated groundwater plumes currently do not impact the safety or health of site personnel.

Therefore, SP4D was chosen.

During:
Construction and operation of monitoring wells and the pump-and-treat system poses a risk of occupational injury. The risk is not high and the construction will take less than 1 year. During the operation of the pump and treat system, site personnel may be exposed to off-gases from the system at levels well below New York State Standards.

Therefore, SP3C was chosen.

After:
Same as "Before."

Therefore, SP4D was chosen.

24. Environmental Impact:
Before (likelihood methodology - P/T):P
The groundwater environmental is contaminated (probability = 1) at high levels on and off-site. Contamination is currently limited and is estimated to take several years to remediate. The situation is a significant, but not catastrophic damage to the environment.

Therefor, EN2A was chosen.

During:
During cleanup, the condition of the groundwater environment will improve over time, but, at least in the early stages of cleanup, will remain at significant levels. This will gradually improve to match the "After" condition.

Therefore, EN2A was chosen.

After:
After pump and treat, concentrations will be substantially reduced on site, but residual contamination in the water will remain. Natural attinuation, however, is considered as part of the clean-up process and will bring the contamination down to a level with less than 10% likelihood of even a minor level of damage.

Therefore, EN3C was chosen.

25. Compliance:
Before (likelihood methodology - P/T):P
Groundwater is contaminated above MCLs off site. This in in violation of state and Federal codes and regulations. Not completing this cleanup would place BNL in major noncompliance the the Compliance Agreement signed by DOE, EPA, and NYS-DEC).

Therefore CO1A was chosen.

After:
After cleanup and natural attinuation takes place, the facility should be in compliance.

Therefore, CO4D was chosen.

26. Mission Impact:
Before (likelihood methodology - P/T):P
The public controversy over the off-site groundwater plume has led to a level of public outrage that threatens major missions of the laboratory, e.g., reactor operations. Moreover, a $1 billion lawsuit has been served on the laboratory. While it is unlikely that this could threaten a major mission within a year, the threat seems quite real over a 2-10 year time frame.

Therefore, MI1B was chosen.

After:
After cleanup, the threat of mission impact may decrease, but the residual threat is unlikely to go away. A 10-100 year time frame is estimated as the likelihood.

Therefore, MI2C was chosen.

27. Mortgage Reduction:
Before (likelihood methodology - P/T):P.
A contaminated groundwater plume with concentrations well above MCLs has migrated off-site toward a residential area partically served with domestic wells. DOE has already committed to a cost of over $900,000. to provide public water to homes in the immediate area. Were this plume allowed to further disperse into a larger area down-gradient that is

also served by domestic wells an equal or larger cost could be incurred. The pump-and-treat system will prevent the continued flow of highly contaminated groundwater beyond the site boundary. Failure to complete the cleanup would also subject the laboratory to fines, penalties and law suits (a $1 billion lawsuit has already been filed).

Therefore, MR2B was chosen.

After:
Following completion of the cleanup, groundwater will still exceed MCLs in some locations, especially on-site, but the extent and nature of contamination will be much better characterized, eliminating -- or at least minimizing -- the need for additional hook-ups to public water.

Therefore, MR2D was chosen.

28. Social/Cultural/Economic Impacts:
Before (likelihood methodology - P/T):P.
Public awareness of groundwater contamination off-site and underlying a residential area with domestic wells raised considerable social impact through fear and outrage in the community. This served as an ignition for a broader public outcry, extending to concers about BNL going well beyond the realm of the groundwater contamination, spurred by regional TV reports and local and national news coverage. The groundwater is a focal point because it provides a forum. Although groundwater modeling indicates domestic wells are unlikely to be affected and that wells showing contamination were probably contaminated by an industrial source and not BNL, DOE has offered to provide public water supply to the areas impacted as a precaution. This has actually increased fear in the community. People are afraid to drink their well water and going to more expensive substitutes. Many residents have expressed concern about loss of economic value of their homes. The existing climate of fear and outrage probably feeds the economic damage as much as the actual contamination. This impact is not a irrevocable loss of social value in the community. It is a social disruption and probably involves economic loss. It is clearly occuring and is therefore assigned a probability of 1.

Therefore, SO2A was chosen.

During:
Action to clean up the contamination is, at least initially, not expected to mitigate the social and economic impacts. The possibility that increased efforts at involving the community during the cleanup process might lead to a greater public understanding of the problem and a reduction in the level of fear and outrage was considered. It appears more likely, however, that the activity of the cleanup effort may increase the visibility of the problem and even increase the socio-economic impact. No decrease in the probability was therefore assigned.

Therefore, SO2A was chosen.

After:
Following a successful clean up, including improved public involvement in the process, as well as the passage of time, one would a decrease in the level of socio-economic impact. This may be wishful thinking. It may also be that the assignment of socio-economic impact in the nearby community is switched to other cleanup projects. It seems reasonable to decrease the expected probability level of this impact to medium.

Therefore, SO2C was chosen.

29. Quantative Data: YES
30. Assessment Status Comments

31. Other Site Appraisal Issue: NO
32. Site Issue Comments:

33. Site Issue Contact.....:
34. Site Issue Contact Phone:

Resource Data Section
35. Funding Case.....: 1 - Funded
36. B & R Code.....: EX2010302 or Allocable Cost Pool:
37. Project Lifecycle Cost ($K): 0.0
38. Min. Safe Cost Percentage..: 0 38.1 Annual Cost Savings ($K): 0

39.

FY	OE	CE	GPP	LIP	TOTAL	S&H %	40. FED FTE	CONTR FTE
1996	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
1997	232.0	0.0	0.0	0.0	232.0	0	0.00	0.00
1998	1,452.0	0.0	0.0	0.0	1,452.0	0	0.00	0.00
1999	2,950.0	0.0	0.0	0.0	2,950.0	0	0.00	0.00
2000	1,792.0	0.0	0.0	0.0	1,792.0	0	0.00	0.00
2001	1,735.0	0.0	0.0	0.0	1,735.0	0	0.00	0.00
2002	1,688.0	0.0	0.0	0.0	1,688.0	0	0.00	0.00

41. Project Start Year: 42. Expected Year of Completion:

RDS Safety and Health Section
43. Functional Area Breakdown:
FA.SA Pct Functional Area/Sub-Area Title

RDS Identification Section

1. Facil Code: BNL - BROOKHAVEN NATIONAL LABORATORY
   RDS Number: R96Z0011
3. Location.....: NY
4. RDS Title.....: Brookhaven Graphite Reactor D&D
5. EM Office.....: 40
6. EM ADS Number.....: CH 2322
7. WBS Code.....:
8. Reference RDS Number.:
9. Ops Project Manager..: Michael Ferrigan
10. Ops Office Phone.....: 708-252-2570
11. Dependent RDS Numbers:
12. Safety & Health Act.?: NO
13. A-106 Activity?.....: NO
    Voided RDS?.....: NO

14. RDS Summary Description

The Brookhaven Graphite Research Reactor (BGRR) operated from 1950 to 1968. It was the first reactor built for the sole purpose of providing neutrons for research. Currently, the facility is used as a visitors' center, museum and office area for other projects.

It consisted of a graphite cube benetrated by horizontal channels for the uranium fuel elements. Air was drawn through the fuel channels, sent through underground concrete ducts, filtered, cooled and discharged through a 320-foot stack. Failure of fuel-element cans resulted in dispersion of uranium and fission product particles to the graphite channels, the air ducts, fans, fan house and other equipment, despite the use of air filters. Irradiated fuel elements were stored under water in a fuel storage canal. Failed elements and chopping elements into pieces for transport resulted in contamination of the canal shute and water. It has not been established whether canal water leaked during operation, although leakage is suspected.

After BGRR operations ceased, fuel rods and experimental apparatus were removed and all penetrations were sealed. The canal was drained and cleaned. One opening on top of the reactor now vents the shielded ara through an absolute filter. Monitoring indicates no airborne activity is escaping through this vent.

RDS Evaluation Section

15. Category

		Be	Du	Af	Be	Du	Af
Public Safety & Health	PS	3D	2D	3D	L	L	L
Site Personnel Safety & Health	SP	4C	2D	4D	L	L	L
Environmental Protection	EN	3A	3B	3D	M	M	L
Compliance	CO	3B		4D	M		L
Mission Impact	MI	2D		2D	L		L
Mortgage Reduction	MR	2C		2D	M		L
Social/Cultural/Economical	SO	2D	1B	1B	L	H	H

16. Assessed By: S.C. Morris
17. Date Assessed: 03/06/1996
18. Assessment Completed: NO
19. Site Priority: 0.0
20. Standard Assumptions Exceptions/Additions:
    None

21. Evaluation Scenario:

Before:
The BGRR is currently being used as a visitor center, museum, and office area. Radioactivity in the reactor core is collected on an absolute filter in an air vent. Surface contamination and contaminated liquids (e.g., in sumps or ducts) exist, but these areas are not accessable to the public. Radiation dose to visitors or people working in the museum or offices is neglegable. Limited radiation exposure to the public is conceivable were the ventilation system to shut down while people were in the museum.

During:
Final disposition of the BGRR has not been determined. Considerably more investigation is required of the extent of contamination. If one assumes the contamination in the canal, in the ducts, on various surfaces, and in the core is substantial, and that it is decided to undertake D&D, it will be a major undertaking.

After:
It is assumed that the decision eventually made regarding the final disposition of the BGRR will provide for the safety and health of workers and the public and the protection of the environment.

22. Public Safety and Health:

Before (likelihood methodology - P/T):P
Sources of potenial public exposure are: (a) visitors to the BGRR building coming in contact with contaminated surfaces or liquids; (b) ventilation system failure while the building is filled with visitors; and (c) contaminated groundwater reaching domestic supply wells. The potential exposure for any of these is believed to be low-level and the likelihood of any is very low.

Therefore, PS3D was chosen.

During:
If major D&D operations are undertaken, the primary hazards to the public are airborne dust and traffic accidents from

vehicles carrying waste material off site. It is assumed that extraordinary precautions would be taken to avoid dispersial of airborne dust. Vehicle accidents pose a greater risk, but have a low likelihood.

Therefore PS2D was chosen.

After:
Following completion of D&D, the facility should pose no further risk.

23. Site Personnel Safety and Health:
Before (likelihood methodology - P/T):P
Site personnel working in offices in the building have no significant risk of exposure. Personnel monitoring contamination in the building may be subject to low-level exposures (less than 20% of allowable) at a likelihood of less than 10% per year.

Therefore, SP4C was chosen.

During:
A major D&D operation will involve a substantial workforce, the possibility of higher exposures (but exposures still would be expected to be below occupational limits), and at least a small (less than 1%) possibility of serious injury, especially if demolition work were involved.

Therefore, SP2D was chosen.

After:
Following completion of D&D, the facility would pose no risk.

Therefore, SP4D was chosen.

24. Environmental Impact:
Before (likelihood methodology - P/T):P
While its extent is not yet defined, there is certainly at least a minor amount of localized impact on groundwater. There may be (less then 10% likelihood) more significant and widespread damage. Other than this, no other environmental damage is foreseen.

Therefore, EN2C was chosen.

During:
During operations, groundwater contamination will be cleaned up and the impacted environment will gradually improve.

Therefore EN3B was chosen.

After:
Following completion of D&D, the facility will pose no further risk to the environment.

Therefore, EN3D was chosen.

25. Compliance:
Before (likelihood methodology - P/T):P
D&D of the BGRR is not scheduled under the compliance agreement. Failure to address the contamination in and around the BGRR could be considered noncompliance with the Compliance Agreement. The time-scale on action, the apparently flexibility in the action taken, however, suggest that the likelihood of action being taken in the foreseeable by regulatory agencies is less than 100%.

Therefore, CO3B was chosen.

After:
Following successful completion of D&D, the facility will pose no risk and should be in compliance.

Therefore, CO4D was chosen.

26. Mission Impact:
Before (likelihood methodology - P/T):P
Assuming monitoring of contaminatino continues, action or lack of action on this facility would not be expected to have any significant mission implications.

Therefore, MI2D was chosen.

After:
Following D&D, no mission implications would be expected.

Therefore, MI2D was chosen.

27. Mortgage Reduction:
Before (likelihood methodology - P/T):P
If no action is taken, soil and ground water contamination could spread, increasing the cost of future remediation efforts. Only a medium likelihood is considered.

Therefore, MR2C was chosen.

After:
Following completion of D&D, all cost-effective efforts should have been completed.

Therefore, MR2D was chosen.

28. Social/Cultural/Economic Impacts:
Before (likelihood methodology - P/T):P
Adverse social, cultural, or economic impact associated with the current status of the BGRR is judged to be nil.

Therefore, SO2D was chosen.

During:
The BGRR, as the first reactor built for the sole purpose of providing neutrons for research, is a cultural resource. Photographs of the facility and other related items are on display in the Smithsonian Institution. There would appear to be at least a 10% likelihood that a D&D decision could result in this cultural value being irrevocable lost.

Therefore, SO1B was chosen.

After:
Same as "During"

Therefore SO1B was chosen.

29. Quantative Data: NO
30. Assessment Status Comments

31. Other Site Appraisal Issue: NO
32. Site Issue Comments:

33. Site Issue Contact.....:
34. Site Issue Contact Phone:

Resource Data Section
35. Funding Case.....: 1 - Funded
36. B & R Code.....: or Allocable Cost Pool:
37. Project Lifecycle Cost ($K): 0.0
38. Min. Safe Cost Percentage..: 0 38.1 Annual Cost Savings ($K): 0

39.

FY	OE	CE	GPP	LIP	TOTAL	S&H %	40. FED FTE	CONTR FTE
1996	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
1997	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
1998	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
1999	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
2000	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
2001	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00
2002	0.0	0.0	0.0	0.0	0.0	0	0.00	0.00

41. Project Start Year: 42. Expected Year of Completion:

RDS Safety and Health Section
43. Functional Area Breakdown:
FA.SA Pct Functional Area/Sub-Area Title
----- --- ----------

44. S&H Drivers:
P/S Typ Driver Code Driver Title
--- --- ---------- ----------

45. S&H Activity Type: 4 - [Unknown]
46. Safety & Health Narrative

47. General Comments

RDS Identification Section

1. Facil Code: BNL - BROOKHAVEN NATIONAL LABORATORY
   RDS Number: R96Z0012
3. Location.....: NY
4. RDS Title.....: OU I Landfills Removal Action
5. EM Office.....: 40
6. EM ADS Number.....: CH 2321
7. WBS Code.....:
8. Reference RDS Number.:
9. Ops Project Manager..: Michael Ferrigan
10. Ops Office Phone.....: 708-252-2570
11. Dependent RDS Numbers:
12. Safety & Health Act.?: NO
13. A-106 Activity?.....: NO
    Voided RDS?.....: NO

14. RDS Summary Description
The Former Landfill and the "Current" Landfill are, or will have been, capped. A series of "glass holes" and "animal holes" are planned for removal. This is expected to begin in FY97 but will continue into FY98. These landfills are part of the source of the groundwater contamination addressed in the RDS "OU I Groundwater Removal Action (Pump and Treat).

RDS Evaluation Section

15. Category

		Be	Du	Af	Be	Du	Af
Public Safety & Health	PS	3C	3C	3D	L	L	L
Site Personnel Safety & Health	SP	4C	1C	4D	L	M	L
Environmental Protection	EN	2B	2B	3D	M	M	L
Compliance	CO	1A		4D	H		L
Mission Impact	MI	1B		2D	H		L
Mortgage Reduction	MR	2B		2D	M		L
Social/Cultural/Economical	SO	2A	2A	2C	H	H	M

16. Assessed By: S.C. Morris
17. Date Assessed: 03/06/1996
18. Assessment Completed: NO
19. Site Priority: 0.0
20. Standard Assumptions Exceptions/Additions:
The Former Landfill and the "Current" Landfill are, or will have been, capped.

21. Evaluation Scenario:
Before:
A series of "glass holes" and "animal holes" are planned for removal. This is expected to begin in FY97 but will continue into FY98.

During:
Excavation of the "glass holes" and "animal holes" is subject to some concern because of the uncertainty of the content, including possibly explosive mixtures. Various new technolgies will be tested for this application.

After:
Following remediation, the various landfills should be eliminated as a potential future source of groundwater pollution.

22. Public Safety and Health:
Before (likelihood methodology - P/T):T
Left unremediated, these landfills are likely to leach chemical or radiological contaminants into the groundwater. These could intersect domestic wells within 10-100 years. The extent of the impact would most likely be moderate to low-level, since a high-concentration groundwater plume would be identified and addressed.

Therefore, PS1C was chosen.

During:
During excavation of the glass holes, it is possible that bottles containing contaminants could be broken, increasing or speeding the rate of release of contaminants to the groundwater. The effect of this is judged insufficient to increase the likelihood category, i.e., impact would no occur in less than 10 years.

Therefore, PS3C was chosen.

After:
Following remediation, these landfills will no longer be a potential source of groundwater contamination.

Therefore, PS3D was chosen.

23. Site Personnel Safety and Health:
Before (likelihood methodology - P/T):P
Activity is limited to monitoring. Risk of exposure is low.

Therefore, SP4C was chosen

During:
The most significant risk to remediation workers would be an explosion resulting from disturbing unknnown explosive

mixtures in glass containers in the glass holes or from an overexposure to chemical or radiological material. The latter risk is minimized by the need for workers to wear level B protection suits before entering these trenches, but these suits lead to awkwardness in handling materials, increasing the likelihood of an accident. Because of the uncertainty of what might be found in the trenches, the risk of such an event is placed at 1-10%. It may be possible to avoid these risks through the application of robotics or other technological innovation and tests of such applications are being made.

Therefore, SP1C was chosen.

After:
Following excavation and closure, risks to on-site personnel will be nil.

Therefore, SP4D was chosen.

24. Environmental Impact:
Before (likelihood methodology - P/T):P
There is leakage or leaching from material in the glass and animal holes into the groundwater. This results in certain (probability = 1) moderate, localized environmental damage to the groundwater and the possibility (probability greater than 10%) of signficant damage to the groundwater resource.

Therefore, EN2B was chosen.

During:
During excavation of the trenches, breakage of bottles could cause an short-term increase in releases to soil and groundwater.

Therefore, EN2B was chosen

After:
Following completion of remediation action and closure, the glass holes and animal holes should no longer be a source of contamination. Clean up of residual groundwater contamination from any earlier leachate is addressed under a separate RDS.

Therefore EN3D was chosen.

25. Compliance:
Before (likelihood methodology - P/T):P
In addition to requrements under the Compliance Agreement, BNL is under a state order to remove the glass holes. Failure to do so would result in major noncompliance with the Compliance Agreement and Enforcement Actions.

Therefore CO1A was chosen.

After:
Following completion of remedial action and closure, the facility should be in compliance.

Therefore, CO4D was chosen.

26. Mission Impact:
Before (likelihood methodology - P/T):P
These sources of soil and groundwater pollution pose no direct impact on the laboratory's mission. Public concern and anger over past environmental practices that are now inappropriate already have begun to threaten the major research missions of BNL. Failure to correct these problems will increase opposition, raise concern over the committment of DOE and BNL to protect the environment, and pose a continuing threat to the research mission.

Therefore, MI1B was chosen.

After:
Following completion of remedial action and closure, public confidence should increase and the threat to mission decrease. It is unrealistic, however, to expect it will disappear completely.

Therefore, MR2D was chosen.

27. Mortgage Reduction:
Before (likelihood methodology - P/T):P
The glass holes and animal holes contribute to a plume of groundwater contamination. Failure to remediate them will allow this contribution to continue. This will lead to further costs in the future due to a greater volume of water being contaminated or to the need to run treatment processes for a longer time. These costs could be greater then 0.1% of the BNL EM budget, but are unlikely to be greater than 1%. The likelihood of these greater costs is judged to be over 10%.

Therefore, MR2B was chosen.

After:
Following completion of cleanup and closure, these facilities will no longer be sources of soil and groundwater pollution.

Therefore, MR2D was chosen.

28. Social/Cultural/Economic Impacts:
Before (likelihood methodology - P/T):P
Public concern, fear and anger has already surfaced in regard to the groundwater contamination to which these facilities contribute. Failure to correct these problems will increase these problems, raise concern over the committment of DOE and BNL to protect the environment, aggregate social disruption in the community and economic loss such as decreases in real estate value.

Therefore, SO1A was chosen.

During:
The remedial action is, at least initially, not expected to mitigate social and economic impacts. The possibility that increased efforts at involving the community during the cleanup process might leas to a gfreater public understanding of tghe problem and a reduction in the level of fear and outrage was considered. It appears more likely, however, that the activity of the cleanup effort may increase the visibility of the problem and even increase the socio-economic impact in the short term. No decrease in level of damage or likelihood was therefore assigned.

Therefore, SO1A was chosen.

After:
Following completion of remedial action and closure, public confidence should increase over time and social and economic damage be mitigated. It is unrealistic, however, to expect it will disappear completely.

Therefore, SO2C was chosen.

29. Quantative Data: NO
30. Assessment Status Comments

31. Other Site Appraisal Issue: NO
32. Site Issue Comments:

33. Site Issue Contact.....:
34. Site Issue Contact Phone:

Resource Data Section
35. Funding Case.....: 1 - Funded
36. B & R Code.....: EX2010304 or Allocable Cost Pool:
37. Project Lifecycle Cost ($K): 0.0
38. Min. Safe Cost Percentage..: 0 38.1 Annual Cost Savings ($K): 0

39.

FY	OE	CE	GPP	LIP	TOTAL	S&H %	40. FED FTE	CONTR FTE
1996	3,810.0	0.0	0.0	0.0	3,810.0	0	0.00	0.00
1997	10,446.0	0.0	0.0	0.0	10,446.0	0	0.00	0.00
1998	776.0	0.0	0.0	0.0	776.0	0	0.00	0.00
1999	416.0	0.0	0.0	0.0	416.0	0	0.00	0.00
2000	494.0	0.0	0.0	0.0	494.0	0	0.00	0.00
2001	298.0	0.0	0.0	0.0	298.0	0	0.00	0.00
2002	216.0	0.0	0.0	0.0	216.0	0	0.00	0.00

41. Project Start Year: 42. Expected Year of Completion:

RDS Safety and Health Section
43. Functional Area Breakdown:

FA.SA	Pct	Functional Area/Sub-Area Title

44. S&H Drivers:

P/S	Typ	Driver Code	Driver Title

45. S&H Activity Type: 4 - [Unknown]
46. Safety & Health Narrative

47. General Comments

RDS Identification Section

1. Facil Code: BNL - BROOKHAVEN NATIONAL LABORATORY
   RDS Number: R96Z0013
3. Location.....: NY
4. RDS Title.....: OU I Groundwater Removal Action
5. EM Office.....: 40
6. EM ADS Number.....: CH 2321
7. WBS Code.....:
8. Reference RDS Number.:
9. Ops Project Manager..: Michael Ferrigan
10. Ops Office Phone.....: 708-252-2570
11. Dependent RDS Numbers:
12. Safety & Health Act.?: NO
13. A-106 Activity?.....: NO
    Voided RDS?.....: NO

14. RDS Summary Description

Contaminanted ground water plumes from the Former Landfill, "Current" Landfill and the Hazardous Waste Management Facility. These are combined because they have similar contaminants and they are to some degree comingled. The proposed treatment (pump-and-treat) would address contaminants from The Current Landfill and the HWMF. It is planned to treat the plume from the Former Landfill by natural attinuation since the levels are low (6-7 ppb of VOCs). The Former Landfill operated from 1947 to 1966, the "Current" Landfill from 1967 to 1990. Both landfills are expected to have been capped before 1998. Animal Pits and Glass Holes, expected to be removed before 1998, may have contributed to this plume also. The HWMF remains in operation. Contaminants exceeding MCLs in the plume are PCE, TCE, TCA, carbon tetrachloride, chloroethane, 1,1-DCA, vinyl chloride, tritium, and Sr-90 (RI, p.ES18-25 and 4-70). Tritium levels are below MCLs at the site boundary and Sr-90 is not detected. Groundwater modeling indicates that Sr-90 will not reach the site boundary. Volatile organic solvents, however, are south of the site boundary, below a residential area served by private wells, at concentrations above MCL, but believed to be at depths below the private wells. VOCs were found in a few domestic wells, but the Suffolk County Department of Health has stated its belief that this contamination is from a nearby industrial site, not from BNL. DOE initiated an offer to provide public water to the area. Groundwater monitoring and a pump-and-treat system is being planned for implementation in 1997 or 1998 and will operate for an estimated 7 years.
[Refs: Draft Remedial Investigation/Risk Assessment Report Operable Unit I/VI, 21 Sep 95, CDM; Draft EE/CA, Vol. 1, 10 Feb 95, CDM].

RDS Evaluation Section

15. Category

Category		Be	Du	Af	Be	Du	Af
Public Safety & Health	PS	2C	3D	2D	M	L	L
Site Personnel Safety & Health	SP	4D	3C	4D	L	L	L
Environmental Protection	EN	2A	2A	3C	H	H	L
Compliance	CO	1A		4D	H		L
Mission Impact	MI	1B		2C	H		M
Mortgage Reduction	MR	2B		2D	M		L
Social/Cultural/Economical	SO	2A	2A	2C	H	H	M

16. Assessed By: S.C. Morris
17. Date Assessed: 02/16/1996
18. Assessment Completed: NO
19. Site Priority: 0.0
20. Standard Assumptions Exceptions/Additions:
Assume the landfills are capped and removal of contamination in the animal pits and glass holes is well underway.

21. Evaluation Scenario:

Before:
Homes in the residential area potentially impacted with the contaminated groundwater plume are provided public water (this has already begun), but no remedial action is taken to reduce contamination in the plume itself. No public health effects are expected, since no one is presumed to be exposed to the groundwater. Without further monitoring, however, it may be possible that, either currenly or at some time in the future, the contaminated plume intersects some homes with private wells.

During:
Assume a pump-and-treat system is in operation on-site to reduce the level of contamination and to provide hyraulic control of the identificed contaminated plumes. The plume from the Former landfill will continue to be treated with natural attinuation. Groundwater monitoring wells will be operated on- and off-site. In addition, domestic well water would be monitored. Operators may be exposed to contaminated water during an accidental release. On-site workers in nearby areas may be exposed to airborne concentrations of solvents and tritium that are well below State standards.

After:
Assume a pump-and-treat system is operated on-site. The system will prevent contaminated water on site from spreading and will reduce the existing levels of contamination on site. Natural attenuation and decay will be used as part of the treatment process to restore groundwater to below MCLs. On-site institutional controls will prevent installation of supply wells or other pumping wells that could interfere with cleanup.

22. Public Safety and Health:
Before (likelihood methodology - P/T):T;
Groundwater modeling indicates water contaminated above MCLs has migrated off-site to the south under a residential area partially served by domestic wells. Although modeling indicates that the contaminated groundwater is below the level of domestic wells and measurements in a large number of domestic wells indicate they are not impacted by the BNL

contaminated plume, there is uncertainty in the modeling, the plumes are not completely characterized, especially off-site, and there may be unidentified or future domestic wells that are deep. The exact depth of all the domestic wells is not known. Estimate that if no cleanup action is taken, groundwater on-site that is contaminated in higher concentrations than that now off-site, could intersect domestic wells within the next 10 years. This is possible, even though public water is being provided, because (1) some people may not accept the offer of public water or; (2) due to the uncertainty of the characterization of the groundwater plume over the next 10 years, wells outside the area provided public water might be affected. Since over the next year there will be intensive measurements made of household water, monitoring of test wells, etc., it is unlikely that there will be exposures within the year. Thus a likelihood based on timing of greater than 1 year but less than 10 years was assigned. Likelihood is only one aspect however. Given an exposure above MCLs, it is still unlikely that adverse effects would occur because of conservatisms built into the MCLs. The probability of an adverse health impact given an exposure in drinking water and the size of the population was judged to be between greater than 1% (equivalent to 10-100 years on the RDS likelihood scale). Since hooking up to public water does not require that domestic wells be capped, contaminated ground water could still be used for irrigation or filling swimming pools. Summing the two time equivalents (<10 years and 10-100 years) results in a medium likelihood. The Impact level is PS2 because off-site concentrations are above MCLs. PS1 was considered with a low likelihood, and PS3 was considered with a high likelihood. These all resulted in the same medium risk level.

Therefore, PS2C was chosen.

During:
Implementing and operating the monitoring and pump and treat operations results in little risk to the public. Most of the operation is on-site. Construction and operation of monitoring wells in or near the residential area may pose a slight hazard for injury (e.g., traffic accident, children trespassing on construction site). Exposure to the public of the off-gases from the pump and treat operation are expected to be well below New York State standards. The activity is expected to last 7 years; a probability of occurence of 1% per year results in about a 7% probability of an occurance. We would estimate it to be much lower than that.

Therefore, PS3D was chosen.

After:T. The rationale is the same as in the "before" case, except that since a pump and treat system is assumed to be in place, further contributions to off-site contaminated water will be stopped or substantially reduced so the likelihood of exposure is less. The time to exposure was judged to be greater (1-100 years). Likelihood of adverse health effects given exposure remains the same with the sum resulting in a low likelihood, yielding a low risk.

Therefore, PS2D was chosen.

23. Site Personnel Safety and Health:
Before (likelihood methodology - P/T):P.
The contaminated groundwater plumes currently do not impact the safety or health of site personnel.

Therefore SP4D was chosen.

During:
During operation of the cleanup, site personnel are exposed to airborne levels of volatile organics and tritium removed in a pump-and-treat system. These are designed to be below New York State standards and will usually be well below those standards. This for two reasons: (1) the design of the technology is based on the most stringent contaminant. If that contament meets emission standards, all others are below emission standards. For example, estimates of trichloroethene emissions are 1% of allowable, estimates of 1,1,1-trichloroethane emissions are 0.003% of allowable. (2) The emissions estimates are based on the highest known concentrations in the groundwater. During most of the expected 7-year period of ooperation, the system will be pumping ground water that has lower concentrations than the maximum. It is possible that during inversion conditions higher concentrations may occur or that a mix of multiple compounds, combined with emissions from other sources (e.g., passing vehicles) may increase exposures. The workers employed on the pump-and-treat system may be exposed to contaminated water during accidents (e.g., pipe rupture). Exposures are expected to be no more than marginal and the likelihood of occurance is estimated to be less than 10%/y.

Therefore SP3C was chosen.

After:P.
Same as "Before."

Therefore SP4D was chosen.

24. Environmental Impact:
Before (likelihood methodology - P/T):P.
The groundwater environment is contaminated (probability=1) at high levels on site and at lower levels off-site. The effect is confined to a limited area (perhaps 100 acres) and is estimated to take 7 years to reverse. This corresponds to "significant damage" in the MEM impact categories.

Therefore EN2A was chosen.

During:
During cleanup, the condition of the environment will improve over time, but, at least in the early stage of cleanup, will remain at n EN2 level.

Therefore, EN2A was chosen.

After:
After pump and treat, concentrations will be substantially reduced on site, but residual contamination in the water will remain. Natural attinuation, however, is considered as part of the clean-up process and will bring the contamination down to a level with less than 10% likelihood of even a minor level of damage.

Therefore, EN3C was chosen.

25. Compliance:
Before (likelihood methodology - P/T):P.
Groundwater is contaminanted above MCLs. This is in violation of state and Federal codes and regulation. Not completing this cleanup would place BNL in violation of the compliance agreement among DOE, EPA and New York State (probability=100%).

Therefore CO1A was chosen.

After:
The cleanup is designed to satisfy the parties to the compliance agreement. Once accomplished, the facility should be in complience, although groundwater will not be brought below MCLs in all locations at the end of the 7 year pump-and-treat system but will depend on natural attinuation and decay to eventually meet MCLs.

Therefore, CO4D was chosen.

26. Mission Impact:
Before (likelihood methodology - P/T):T.
The public controversy over the off-site groundwater plume has led to a level of public outrage that threatens major missions of the laboratory, e.g., reactor operations. Moreover, a $1 billion lawsuit has been served on the laboratory. While it is unlikely that this could threaten a major mission within a year, the threat seems quite real over a 2-10 year time frame.

Therefore, MI1B was chosen.

After:
After cleanup, the threat of mission impact may decrease, but the residual threat is unlikely to go away. A 10-100 year time frame is estimated as the likelihood.

Therefore, MI2C was chosen.

27. Mortgage Reduction:
Before (likelihood methodology - P/T):P.
A contaminated groundwater plume with concentrations above MCLs has migrated off-site into a residential area partically served with domestic wells. DOE has already committed to a cost of over $900,000. to provide public water to homes in the immediate area. Were the plume allowed to further disperse into a larger area down-gradient that is also served by domestic wells an equal or larger cost could be incurred. The pump-and-treat system will prevent the continued flow of highly contaminated groundwater beyond the site boundary. Failure to complete the cleanup would also subject the laboratory to fines, penalties and law suits (a $1 billion lawsuit has already been filed).

Therefore, MR2B was chosen.

After:
Following completion of the cleanup, groundwater will still exceed MCLs in some locations, especially on-site, but the extent and nature of contamination will be much better characterized, eliminating -- or at least minimizing -- the need for additional hook-ups to public water.

Therefore, MR2D was chosen.

28. Social/Cultural/Economic Impacts:
Before (likelihood methodology - P/T):P.
Public awareness of groundwater contamination off-site and underlying a residential area with domestic wells raised considerable social impact through fear and outrage in the community. This served as an ignition for a broader public outcry, extending to concers about BNL going well beyond the realm of the groundwater contamination, spurred by regional TV reports and local and national news coverage. The groundwater is a focal point because it provides a forum. Although groundwater modeling indicates domestic wells are unlikely to be affected and that wells showing contamination were probably contaminated by an industrial source and not BNL, DOE has offered to provide public water supply to the areas impacted as a precaution. This has actually increased fear in the community. People are afraid to drink their well water and going to more expensive substitutes. Many residents have expressed concern about loss of economic value of their homes. The existing climate of fear and outrage probably feeds the economic damage as much as the actual contamination. This impact is not a irrevocable loss of social value in the community. It is a social disruption and probably involves economic loss. It is clearly occuring and is therefore assigned a probability of 1.

Therefore, SO2A was chosen.

During:
Action to clean up the contamination is, at least initially, not expected to mitigate the social and economic impacts. The possibility that increased efforts at involving the community during the cleanup process might lead to a greater public understanding of the problem and a reduction in the level of fear and outrage was considered. It appears more likely, however, that the activity of the cleanup effort may increase the visibility of the problem and even increase the socio-economic impact. No decrease in the probability was therefore assigned.

Therefore, SO2A was chosen.

After:
Following a successful clean up, including improved public involvement in the process, as well as the passage of time, one would a decrease in the level of socio-economic impact. This may be wishful thinking. It may also be that the assignment of socio-economic impact in the nearby community is switched to other cleanup projects. It seems reasonable to decrease the expected probability level of this impact to medium.

Therefore, SO2C was chosen.

29. Quantative Data: YES
30. Assessment Status Comments

31. Other Site Appraisal Issue: NO
32. Site Issue Comments:

33. Site Issue Contact.....:
34. Site Issue Contact Phone:

Resource Data Section
35. Funding Case.....: 1 - Funded
36. B & R Code.....: EX2010304 or Allocable Cost Pool:
37. Project Lifecycle Cost ($K): 0.0
38. Min. Safe Cost Percentage..: 0 38.1 Annual Cost Savings ($K): 0

39.

FY	OE	CE	GPP	LIP	TOTAL	S&H %	40. FED FTE	CONTR FTE
1996	2,432.0	0.0	0.0	0.0	2,432.0	0	0.00	0.00
1997	669.0	0.0	0.0	0.0	669.0	0	0.00	0.00
1998	639.0	0.0	0.0	0.0	639.0	0	0.00	0.00
1999	679.0	0.0	0.0	0.0	679.0	0	0.00	0.00
2000	728.0	0.0	0.0	0.0	728.0	0	0.00	0.00
2001	756.0	0.0	0.0	0.0	756.0	0	0.00	0.00
2002	783.0	0.0	0.0	0.0	783.0	0	0.00	0.00

41. Project Start Year: 42. Expected Year of Completion:

RDS Safety and Health Section
43. Functional Area Breakdown:

FA.SA	Pct	Functional Area/Sub-Area Title

44. S&H Drivers:

P/S	Typ	Driver Code	Driver Title

45. S&H Activity Type: 4 - [Unknown]
46. Safety & Health Narrative

47. General Comments

APPENDIX II: RELATIVE RISK EVALUATION DATA SHEETS

0002 AOC 24E Recharge Basin #5.
OU5/VII RI 29 Feb 96 Vol 1
Table 4-22

SURFACE WATER/SEDIMENT

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l - SW; mg/kg - sediment)	Standard (µg/l - SW; mg/kg - sediment)	Ratio[1]
gross α	19 pCi/g	—	—
gross β	27 pCi/g	—	—
Sr-90	3.2 pCi/g	1400.	—
Benzo(b)fluoranthene	1400 µg/l	—	—
Aroclor-1254	510 µg/kg	—	—
Aroclor 1260	300 µg/kg	—	—
Al	32 700 µg/l	3.7 E4	—
Arsenic	9 µg/l	4.5	2
Beryllium PD	1.1 29. 297 µg/l	1.6 — 4	Total 7.4 9.4

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) ✓

Minimal (Total < 2) —

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination in the media is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates a low potential for contaminant migration from to a potential point of exposure (could be due to presence of geological structures or physical controls)

(Place an "X" next to one below)

Evident —

Potential ✓

Confined —

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to surface water or sediment

Potential - Potential for receptors to have access to surface water or sediment

Limited - Little or no potential for receptors to have access to surface water or sediment

(Place an "X" next to one below)

Identified —

Potential ✓

Limited —

Brief Rationale for Selection: _____

Surface Water/Sediment Category: M
(High/Medium/Low)

D MPP

(0003) AOC 24F New SW Recharge Weaver Dr

DU 1/U16 RI 29 Feb 92 Vol 1. Table 4-23

SURFACE WATER/SEDIMENT

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l - SW; mg/kg - sediment)	Standard (µg/l - SW; mg/kg - sediment)	Ratio[1]
Pb	11 8 mg/kg	400	—
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) ✓

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination in the media is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates a low potential for contaminant migration from to a potential point of exposure (could be due to presence of geological structures or physical controls)

(Place an "X" next to one below)

Evident __

Potential __

Confined __

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to surface water or sediment

Potential - Potential for receptors to have access to surface water or sediment

Limited - Little or no potential for receptors to have access to surface water or sediment

(Place an "X" next to one below)

Identified __

Potential __

Limited __

Brief Rationale for Selection: _____

Surface Water/Sediment Category: L
(High/Medium/Low)

DNPP

(0004) EDB Plume Areas

OU I/VI RI VM 2A Table 6-18

29 Feb 96

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg4)	Standard (µg/l)	Ratio[1]
1,2, Dibromoethane	0.28	0.076	3.68
Arsenic	5.8	4.5	1.29
Be	1.9	1.6	1.19
Pb	17.7	4	—
Manganese	234	180	1.3
		Total	7.5

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) ✓

Minimal (Total < 2) —

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident ✓

Potential —

Confined —

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified ✓

Potential —

Limited —

Brief Rationale for Selection: _____

Groundwater Category: H
(High/Medium/Low)

DMEI

(0005)

(0005) Former landfill AOC 2A

OU I/VI RI ~~Table~~ Vol 2A
Table 6-16 29 Feb 96

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
Manganese	3940	180	22

(1) Ratio = Max. Concentration/Standard

Total 22

(Place an "X" next to one below)

Significant (Total > 100) __

Moderate (Total = 2-100) X

Minimal (Total < 2) __

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident __

Potential __

Confined __

Brief Rationale for Selection: Moving away downgradient

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified __

Potential __

Limited __

Brief Rationale for Selection: moving toward downgradient wells used for swimming pools / irrigation.

Groundwater Category: M
(High/Medium/Low)

? MPP

0006 AOC 2 B Chemical/Chemical Pits

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
Cd	20.	18.	1.1
Pb	930.	4	232.
1,1,1-Trichloroethane	5.0	1300	—
Tetrachloroethene	10.	120	—
Hg	1.2	3.7	0.3
Sr-90	260 pCi/l	85	3.1
		Total	1 2365

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) (X)

Moderate (Total = 2-100) —

Minimal (Total < 2) —

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure (X)

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident (X)

Potential —

Confined —

Brief Rationale for Selection: Contaminants in downgradient wells.

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use (X)

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified (X)

Potential —

Limited —

Brief Rationale for Selection: Moving toward area with domestic wells used for swimming pools & irrigation.

Groundwater Category: H
(High/Medium/Low)

DSE

0006

AOC 2B Chemical/animal pits

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
Hg	13 mg/kg	6.5	2
Pb	42	400	0.1
Cd	0.82	3.8	0.2
Co-60	0.05 pCi/g	0.44	0.1
		Total	2.4

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) __

Moderate (Total = 2-100) X

Minimal (Total < 2) __

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident X

Potential __

Confined __

Brief Rationale for Selection: Contaminants observed in downgradient wells.

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified X

Potential __

Limited __

Brief Rationale for Selection: Moving toward area w/ domestic wells used for swimming pools & irrigation.

(H) DMEI

67

0007 AOC 2C Glass Holes

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
Chloroform	18 µg/l	16	1.1

(1) Ratio = Max. Concentration/Standard

Total 1.1

(Place an "X" next to one below)

Significant (Total > 100) __

Moderate (Total = 2-100) __

Minimal (Total < 2) ✓

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident ✓

Potential __

Confined __

Brief Rationale for Selection: Moving away from Water.

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified ✓

Potential __

Limited __

Brief Rationale for Selection: Moving toward domestic wells used for swimming pools & irrigation

Groundwater Category: _____
(High/Medium/Low)

H

DNEI

0007

AOC 2C Glass Holes.

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
Hg	~~0.9~~ 0.9 mg/kg	6.5	0.1
CO-60	0.02 pCi/g	0.44	—
U-238	3.0 pCi/g	74.	—
		Total	0.1

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) ✓

PATHWAY FACTOR (PF)

(Evident) Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident ✓

Potential —

Confined —

Brief Rationale for Selection: Contaminants (Rubble in dam gradient wells - Cat Mound not the same contaminants)

RECEPTOR FACTOR (RF)

(Identified) Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified ✓

Potential —

Limited —

Brief Rationale for Selection: Mowing treated domestic wells used for swimming pools & irrigation.

AOC 2C
Glass Hole

H DNET

(1009)

(0010)

Ash RF

AOC2F

ref OUII RI Jan 96

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
Benzo-a-anthracine	0.380 mg/kg	61	
3H	0.7 pCi/g		
^{90}Sr	0.7 "	1900	
^{137}Cs	0.1	2.1	
^{232}Th	0.32	5	
	Total		/

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) X

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident __

Potential __

Confined __

Brief Rationale for Selection: Uncertain

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified __

Potential __

Limited __

Brief Rationale for Selection: Workers may have access.

DNPP Low

(0011) AOC3 Current Landfill

HWMF / Current Landfill gw plume

OU IVI RI Vol 2A, Table 6-
29 Feb 96

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
1,1 Dichloroethane DCA	360	810	—
AKA 1,1 dichloroethylene → 1-1 dichloroethene	34	4.6 *	7.4
Vinyl chloride	3	2	1.5
arsenic	9.8	4.5	2.2
Pb	18.3	4.	4.6
Manganese	11700	180	65
EO/CA 1.2.57 → 3H at landfill boundary 1990-91	50,000 PCi/L	20 000	2.5
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) X

Minimal (Total < 2) —

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident L

Potential —

Confined —

Brief Rationale for Selection: Identified gw plume off site in residential areas with domestic wells.

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified X

Potential —

Limited —

Brief Rationale for Selection: Public water being supplied, but gw still available as swimming pools, etc., irrigation, etc.

Note: This groundwater plume includes contaminants from current landfill and HWMF

Groundwater Category: H
(High/Medium/Low)

PMEI

(0013) AOC 10 - 6 USTs at WCF

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) __

Moderate (Total = 2-100) __

Minimal (Total < 2) __

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident __

Potential __

Confined __

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified __

Potential __

Limited __

Brief Rationale for Selection: _____

These tanks are not known to be leaking.

(L)

ANPP

(0014) AOC10 Waste Concentration Facility (Bldg 811)
Preliminary 1995 measurements

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
^{137}Cs	500 pCi/g	2.1	238
^{60}Co			
		Total	238

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) X

Moderate (Total = 2-100) —

Minimal (Total < 2) —

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident —

Potential —

Confined —

Brief Rationale for Selection: Not confined.

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified —

Potential —

Limited —

Brief Rationale for Selection: Workers have access

H D SPP

(0014)

AOC 10
WCF Bldg 811
1995 measurements.

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
Sr-90	250 pCi/l	~~8~~ 85. pCi/l	2.9
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) X

Minimal (Total < 2) —

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident X

Potential —

Confined —

Brief Rationale for Selection: Observed in down gradient well, Some question as to whether source is WCF itself or leak sewer pipe from WCF

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified —

Potential —

Limited X

Brief Rationale for Selection: Distance to site boundary; control of access to ground water on site

Groundwater Category: M
(High/Medium/Low)

DMEL

(001-b)

AOC 10B
Underground Pipe.

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
~~Sr-90~~ Cs-137	1230 pCi/L	150	8.2
Th-232	1080	-	
Ra-228	601	5	120
Pb 212	1520	-	
K-40	9830	-	
		Total	128

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) X

Moderate (Total = 2-100) —

Minimal (Total < 2) —

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

Brief Rationale for Selection: groundwater contamination moving.

(Place an "X" next to one below)

Evident X

Potential

Confined —

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Brief Rationale for Selection:

(Place an "X" next to one below)

Identified —

Potential ✓

Limited —

Groundwater Category: H
(High/Medium/Low)

ASEP

DNFT
Ref. OU II/VII RI 1994
Table A-9

75

0021

AOC 16E
16F

Radiologically Contaminated Soil
1983 EG+G Survey, cited in
1994 IT Corp Draft RI OU II/VII
6 Dec 94
p. 3-3

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
Cs-137	310 pCi/g	2.1 pCi/g	148.
		Total	148

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) X

Moderate (Total = 2-100) —

Minimal (Total < 2) —

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident —

Potential ✓

Confined —

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified ✓

Potential —

Limited —

Brief Rationale for Selection: workers have access to many of these sites

Draft OU II/VII
KI Dec 94

High DSPI

0022

AOC 16F Field behind Chemistry

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
Cs 137	360 pCi/g	2.1	171
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) __ (circled)

Moderate (Total = 2-100) __

Minimal (Total < 2) __

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident __

Potential __ (circled)

Confined __

Brief Rationale for Selection: not confined

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified __ (circled)

Potential __

Limited __

Brief Rationale for Selection: accessable to employees

H DSPI

0023

AOC 16G Field East of Brookhaven Center

Ref Draft OU II / V11

RI Dec 94

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
Cs-137	28 pCi/g	2.1	13
		Total	13

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) __

Moderate (Total = 2-100) __ (circled)

Minimal (Total < 2) __

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined (circled)

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident __

Potential ✓

Confined __

Brief Rationale for Selection: not confined.

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil (circled)

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified ✓

Potential __

Limited __

Brief Rationale for Selection: ~~The~~ accessible to employees & visitors

(H)

DMPI

(0032) Landscape No. 1
AOC 16S

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
Cs 137	34 Pci/g	2.1 Pci/g	16
		Total	16

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) X

Minimal (Total < 2) —

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident —

Potential —

Confined —

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified —

Potential —

Limited —

Brief Rationale for Selection: _____

Draft RI
OU II/VII
Dec 94

H MPI

0033

Rad contam Soil

AOC17

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
CS 137	1-7 PCi/g	2.1	0.Y
		Total	0.Y

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) ↓

Minimal (Total < 2) ✓

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident __

Potential __

Confined __

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified __

Potential __

Limited __

Brief Rationale for Selection: _____

Low

Draft OU II/VII RI Dec 94

DNPP

(0034) AOC 18 AGS Scrapyard

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
Cs137	100 pCi/L	150	0.7
K40	8700 pCi/L		—
Sr Ctot	130 pCi/L	85 (as Sr-90)	1.5
Co-60	24 pCi/L	250	0.1
		Total	2.3

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) X

Minimal (Total < 2) —

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident —

Potential —

Confined —

Brief Rationale for Selection: Contaminants in GW clearly may move down gradient

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified —

Potential —

Limited X

Brief Rationale for Selection: Reasonably far from Site boundary. Ground water carefully tracked. No access to GW on Site

Groundwater Category: LOW
(High/Medium/Low)

OU II/VII
RI
Dec 94
Table 3.18-1

DMPL

81

(0035) AOC 20 Particle Beam Dump

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) X

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident —

Potential —

Confined ✓

Brief Rationale for Selection: >1m deep low possibility for migration to exposure

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified —

Potential —

Limited ✓

Brief Rationale for Selection: >1 m deep in soil

L ANCL

(0036) AOC 11 Bldg 830 Pipe Leak

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) ✓

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident _

Potential _

Confined _✓

Brief Rationale for Selection: This area was remediated, some contam. left but at >1 m depth and no evidence of migration.

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified _

Potential _

Limited _✓

Brief Rationale for Selection: >1 m deep in soil.

(L) ANCL

(0037) AOC 12 UST's @ Bldg 830

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) ✓

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident —

Potential —

Confined ✓

Brief Rationale for Selection: UST's are intact. Leaky valve box contamination >1 m deep; no evidence of migration.

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified —

Potential —

Limited ✓

Brief Rationale for Selection: >1 m deep.

(L)

ANCL

(0038) AOC 14 Bubble Chamber Spill Areas

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
No data			
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) __

Moderate (Total = 2-100) __

Minimal (Total < 2) __

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident __

Potential __

Confined __

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified __

Potential __

Limited __

Brief Rationale for Selection: _____

Not evaluated. - No data.

(0039) AOC 19 TCE Spill Area

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) __

Moderate (Total = 2-100) __

Minimal (Total < 2) __

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident __

Potential __

Confined __

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified __

Potential __

Limited __

Brief Rationale for Selection: _____

Source. N.I.

~~Expo~~

(L)

ANCL

0040 AOC21 Leaky Sewer Pipes in OU III

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) _

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident _

Potential _

Confined _

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified _

Potential _

Limited _

Brief Rationale for Selection: _____

— Not evaluated —

It is possible that this is the source of the contamination attributed to the Waste Concentration Facility (AOC 1D)

(0041) AOC 22

Old Firehouse Soil

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
n.)			

(1) Ratio = Max. Concentration/Standard

Total

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) ✓

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident __

Potential __

Confined __ ✓

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified __

Potential __

Limited __ ✓

Brief Rationale for Selection: _____

(L)

ANCL

(6042) AOC 24 B Recharge basin HP

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
VOCs	< 20 ppb		—
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) _ ✓

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident _

Potential _ ✓

Confined _

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified _

Potential _ ✓

Limited _

Brief Rationale for Selection: _____

Groundwater Category: L
(High/Medium/Low)

A NPP

(0043) AOC 24C Recharge Basin HN.

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
N1			
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) —

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident —

Potential —

Confined —

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified —

Potential —

Limited —

Brief Rationale for Selection: _____

(L) ANCL

(6047) OU III Plume
AOC 15A

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Specific Source(s) not known.

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
TCA	1500	1300	1.15
PCE	2500	110	23
CCl_4	100	17	5.9
		Total	30

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) ✗

Moderate (Total = 2-100) ✗

Minimal (Total < 2) _

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident ✗

Potential _

Confined _

Brief Rationale for Selection: moving off site

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified ✗

Potential _

Limited _

Brief Rationale for Selection: ~~Deep~~ underlies - or soon will underly - residential area ~~see~~ w/ domestic wells - drinking water being provided - but wells could still be used for swimming pools, irrigation, etc.

Groundwater Category: H
(High/Medium/Low)

DME I

0048 AOC 7 Paint Shop Bld. 244

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
Ni			
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) __

Moderate (Total = 2-100) __

Minimal (Total < 2) __

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident __

Potential __

Confined __

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified __

Potential __

Limited __

Brief Rationale for Selection: _____

(L) ANCL

(0051) AOC 5A 1977 Oil/Solvent Spill
Ref: 044 ROD 1996

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
Acetone	0.7	2000	-
Benzene	2.1	140	.015
Tetrachloroethene	4.3	700	.006
Toluene	180.	1900	.095
Ethylbenzene	64.	690	.093
Xylenes	330.	990	0.333
phenol	0.6	39000	~~0.092~~
Chrysene	2.2	24	0.092
benzo(b) fluoranthene	2.9	61.	0.048
benzo(a) pyrene	1.8	6.1	0.30
		Total	0.98

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) _

Moderate (Total = 2-100) _

Minimal (Total < 2) ✓

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident _

Potential ✓

Confined _

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified _

Potential ✓

Limited _

Brief Rationale for Selection: _____

(L)

DNPP

0051 1977 0.1 Solvent Spill

Ref 1996 OU4 - ROD

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
1,2-dichloroethene (trans)	64 µg/l	~~50~~ 61	1.05
1,1,1 Trichloroethane	14	1300	0.01
Trichloroethene	20	160	0.13
Tetrachloroethene	43	110	0.39
Toluene	2700	720	3.75
Ethyl benzene	590	1300	0.45
xylenes	2200	1400	1.57
1,2-dichloroethene (Trans)	100	120	0.83
		Total	8.18

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) __

Moderate (Total = 2-100) X

Minimal (Total < 2) __

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident ✓

Potential __

Confined __

Brief Rationale for Selection: detected in downgradient wells.

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified __

Potential ✓

Limited __

Brief Rationale for Selection: Could degrade before moving off site to downgradient/irrigation wells.

Groundwater Category: H
(High/Medium/Low)

DMEP

(0054) AOC 5D CSF Fuel Unloading Area

SOIL Vapor

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
Xylene	10,000 ppb		
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) __

Moderate (Total = 2-100) __

Minimal (Total < 2) __

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident __

Potential __

Confined __

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified __

Potential __

Limited __

Brief Rationale for Selection: _____

Not Evaluated

(0055) AOC 6 Reclamation Bldg 650 outfall

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
Pu 239/240	170 PCi/g	250	0.7
Sr 90	140	1400	0.1
Cs 137	1800	2.1	857.
Europium 152	580	1.1	527
Europium 154	350	0.92	380.
Radium 226	63	5	12.6
		Total	1777

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) X

Moderate (Total = 2-100) __

Minimal (Total < 2) __

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident __

Potential X

Confined __

Brief Rationale for Selection: ~~Workers may be exposed~~

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified X

Potential __

Limited __

Brief Rationale for Selection: Workers may be exposed

H

DSPI

(0055) ~~(0055)~~ AOC 6 Bldg 650 Sump

Draft RI / Risk Assessment OU 1/VI Sep 95

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
Cs-137	734 pCi/g	2.1	350
		Total	350

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) X

Moderate (Total = 2-100) _

Minimal (Total < 2) _

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident _

Potential _

Confined _

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified _

Potential _

Limited _

Brief Rationale for Selection: _____

M (DSPL)

tt DSPP

97

(0056) AOC 21 Leaky Sewer line

Ref: 045 Preliminary Data

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) ✓

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident __

Potential ✓

Confined __

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified __

Potential ✓

Limited __

Brief Rationale for Selection: _____

Geoprobe not valid results.
all show low

Low ANPP

In Pecatica River

Ref: DU5
Preliminary data

SURFACE WATER/SEDIMENT

SOURCE HAZARD FACTOR (SHF)

(NOAA ER-L)

Contaminant	Max. Concentration (µg/l - SW; mg/kg - sediment)	Standard (µg/l - SW; mg/kg - sediment)	Ratio[1]
Cr	125 mg/kg	3000 mg/kg (80)	— (1.6)
Hg	25 mg/kg	23 mg/kg (0.15)	1.1 (167)
3H	2000 pCi/L	20,000 pCi/L	0.1
	Total		1.2 (168)

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) X

Moderate (Total = 2-100) —

Minimal (Total < 2) —

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination in the media is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates a low potential for contaminant migration from to a potential point of exposure (could be due to presence of geological structures or physical controls)

(Place an "X" next to one below)

Evident _

Potential _

Confined _

Brief Rationale for Selection: Downstream - in river fish & shellfish taken.

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to surface water or sediment

Potential - Potential for receptors to have access to surface water or sediment

Limited - Little or no potential for receptors to have access to surface water or sediment

(Place an "X" next to one below)

Identified _

Potential _

Limited _

Brief Rationale for Selection: fish & shellfish

Surface Water/Sediment Category: H
(High/Medium/Low)

Some of this may come from sewage effluent, but also comes from groundwater.

1) SEE

But is this EM 40? (yes - DOE Response)

A04 Sewage Plant

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
Sr 90	9.4 pCi/L	85	0.1
Pb	55 µg/l	4	13.8
		Total	13.9

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) ✓

Minimal (Total < 2) ~~✓~~

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident ✓

Potential —

Confined —

Brief Rationale for Selection: In ground water down gradient

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified ~~✓~~

Potential ✓

Limited —

Brief Rationale for Selection: plume moving East - either gets in to Pecos river or could intercept domestic wells.

Groundwater Category: ~~M~~ H

(High/Medium/Low)

~~DNEP~~ (D MEP)

(6058) A00496 Imhoff Tanks 28 Mar 96

SOIL

Kf OU5 Preliminary Data.

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
Benz(a)anthracene	6.2	61	0.1
Benz(a)pyrene	5.6	6.1	0.9
Chrysene	19	24	0.8
		Total	1.8

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) X

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident __

Potential __

Confined __

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified __

Potential __

Limited __

Brief Rationale for Selection: _____

Low DNPP

Soil way below benchmark level.

101

(0059) AOC 4E Satellite Disposal Area

Ref OU5 Preliminary data.

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
Cr	Low		—
Be	Low		—
~~As~~	as Be		—
Manganese	960 µg/L	180	5.3
Sr 90	1.5 pCi/l	85	—
(1) Ratio = Max. Concentration/Standard		Total	5.3

(Place an "X" next to one below)

Significant (Total > 100) — 1

Moderate (Total = 2-100)

Minimal (Total < 2) __

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident ✓

Potential __

Confined __

Brief Rationale for Selection: found downgradient in monitoring well

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified __

Potential ✓

Limited __

Brief Rationale for Selection: Moving East - to Pecos River or domestic/irrigation wells.

Groundwater Category: (High/Medium/Low) H

Soil values all low.

DMEP

(0061) AOC 13 Cesspools

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) ✓

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident —

Potential —

Confined ✓

Brief Rationale for Selection: _____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified —

Potential —

Limited ✓

Brief Rationale for Selection: _____

All contamination of concern has been removed. (L) DNCL

Reference, Draft Completion Report, Apr 1996.

(0063) Removed Action VIII Bldg 208 AOC 26

SOIL

Certified Ships

28 May 96 All Phase II Results ICF-Kaiser Jan 96

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
VOC	all in low µg/kg		—
		Total	—

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) X

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

(Place an "X" next to one below)

Evident —

Potential —

Confined —

Brief Rationale for Selection: ground water - concentration down-gradient

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

(Place an "X" next to one below)

Identified —

Potential ✓

Limited —

Brief Rationale for Selection: plume heading toward area w/ domestic wells. (swimming pools, irrigation)

M

(DNEP)

- (0063) Removal action VIII

bldg 208
AOC 26
28 Mar 96

Ref: Phase II results
ICF Kaiser Jan 96

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
111 TCA	340	1300	0.3
		Total	0.3

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) __

Moderate (Total = 2-100) __

Minimal (Total < 2) ✓

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident ✓

Potential __

Confined __

Brief Rationale for Selection: gw contamination downgradient

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified __

Potential ✓

Limited __

Brief Rationale for Selection: plume heading toward area w/domestic wells (swimming pools, irrigation)

Groundwater Category: M
(High/Medium/Low)

DNEP

(0065) AOC1 HWMF

HWMF / Current Landfill gw plume

OU1 IN1 RI VOL 2A, TABLE 6-17 29 FEB 96

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
1,1 Dichloroethane DCA	360	810	—
AKA 1,1 dichloroethylene → 1-1 dichloroethene	34	4.6 x	7.4
vinyl chloride	3	2	1.5
arsenic	9.8	4.5	2.2
Pb	18.3	4.	4.6
Manganese	11700	180	65
3H at landfill boundary 1990-91	50,000 PCi/L	20 000	2.5
EB/CA 1.2.57 →			
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) X

Minimal (Total < 2) —

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident X

Potential —

Confined —

Brief Rationale for Selection: Identified gw plume off site in residential areas with domestic wells.

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified X

Potential —

Limited —

Brief Rationale for Selection: Public water being supplied, but gw still available as swimming pools, ~~etc.~~, irrigation, etc.

Note: This groundwater Plume includes ~~both~~ Contamination from current landfill and HWMF.

Groundwater Category: H
(High/Medium/Low)

PMEI

106

(0065)

HWMF Surface Soil
OU I/VI RI Vol 1, Fig 4-13A.
29 Feb 96

SOIL

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (mg/kg)	Standard (mg/kg)	Ratio[1]
Cs-137	810,000 pCi/g	2.1	38571.
Sr-90	1300 pCi/g	1400	—
benzo(a)anthracene	3,200	61	—
benzo(b) fluoranthene	3,500	61	—
benzo(a) pyrene	2200	61	—
		Total	38571.

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) X

Moderate (Total = 2-100) __

Minimal (Total < 2) __

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Low possibility for contamination to be present at or migrate to a point of exposure

Soil

Brief Rationale for Selection: ~~Potential~~ chemical/rad gw plume ~~moving~~ off site in residential area.
No evidence from movement from unconfined source.

(Place an "X" next to one below)

Evident __

Potential X

Confined ~~X~~

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to contaminated soil

Potential - Potential for receptors to have access to contaminated soil

Limited - Little or no potential for receptors to have access to contaminated soil

Brief Rationale for Selection: People work in the HWMF

(Place an "X" next to one below)

Identified X

Potential __

Limited ~~X~~

H - DSPI

0065 HWMF

HWMF
EE/CA

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
Sr-90 (P.49)	290 pCi/L	85 pCi/l	3.4
		Total	

(1) Ratio = Max. Concentration/Standard

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) __

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident __

Potential __

Confined __

Brief Rationale for Selection: _____

_____

_____

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified __

Potential __

Limited __

Brief Rationale for Selection: _____

_____

_____

Groundwater Category: _____
(High/Medium/Low)

(not numbered)

OU-IV Plume Entering OU I

GROUNDWATER

SOURCE HAZARD FACTOR (SHF)

Contaminant	Max. Concentration (µg/l)	Standard (µg/l)	Ratio[1]
TCA	100 µg/l	1300	0.07
Sr-90	unknown		

(1) Ratio = Max. Concentration/Standard

Total

(Place an "X" next to one below)

Significant (Total > 100) —

Moderate (Total = 2-100) —

Minimal (Total < 2) X

PATHWAY FACTOR (PF)

Evident - Analytical data or observable evidence that contamination is moving away from the source or is present at, is moving towards, or has moved to a point of exposure

Potential - Possibility for contamination in the media to move away from the source, or information is not sufficient to make a determination of Evident or Confined

Confined - Information indicates that the potential for contaminant migration from the source is limited (due to geological structures or physical controls)

(Place an "X" next to one below)

Evident X

Potential —

Confined —

Brief Rationale for Selection: clearly moving southward

RECEPTOR FACTOR (RF)

Identified - Receptors identified that have access to groundwater as a drinking water supply or other beneficial use

Potential - Potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

Limited - Little or no potential for receptors to have access to groundwater as a drinking water supply or other beneficial use

(Place an "X" next to one below)

Identified X

Potential —

Limited —

Brief Rationale for Selection: ~~Potential~~ Approaching residential area off site w/ domestic wells providing water for irrigation and swimming pools.

Groundwater Category: H
(High/Medium/Low)

DNEI