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FINAL

FOCUSED FEASIBILITY STUDY
AREA A LANDFILL

INSTALLATION RESTORATION PROGRAM
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CONNECTICUT

Prepared For:

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EXECUTIVE SUMMARY

PART ONE: INTRODUCTION

This executive summary of the Focused Feasibility Study (FFS) conducted on the Area A Landfill site within the overall Naval Submarine Base-New London (NSB-NLON) site in Groton, Connecticut, addresses the major environmental policy, regulatory, and technical issues associated with implementation of an interim source control measure at the Area A Landfill. The second part of this summary provides a brief update on activities conducted thus far on the Area A Landfill site, including why and how this FFS report was prepared. The third part discusses the purpose and scope of the FFS. The fourth part then describes the historical uses on the site, which form the basis of the fifth part, which describes the contamination present at the site. Based upon the nature of the contamination found, the sixth part presents the remedial action objectives pertaining to the Area A Landfill site. To accomplish these objectives, part seven discusses the technologies which were screened to assess each technology's effectiveness, implementability, and cost. A detailed analysis of alternatives was then conducted on the alternatives which passed the screening process, as described in part eight. In conclusion, the final part of this executive summary presents a comparative analysis of the alternatives on which a detailed analysis was conducted. As shown in the table accompanying part nine, areas of differences rather than areas of commonality are cited to aid in making unique distinctions among the similar alternatives, all but one of which call for some form of capping.

PART TWO: SITE ACTIVITY TO DATE

In 1975, the Department of Defense developed a program to investigate and clean up problem areas involving hazardous waste at federal facilities such as the NSB-NLON. That program, known as the Installation Restoration Program (IRP), is being conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly referred to as the Superfund law. In 1986, Congress passed Amendments to CERCLA which contain provisions for federal facilities. The Subase was placed on the National Priorities List (NPL) of federal Superfund sites on August 30, 1990, by the U.S. Environmental Protection Agency (EPA).

A Phase I Remedial Investigation (RI) was completed for nine sites at the Subase, including Area A Landfill site, in August of 1992. The Phase I report evaluated potential risks to human health and the environment from contaminants at each site. Several of the nine sites, including the Area A Landfill site, were determined to pose potential risks.

To address the potential risks at these sites, a Feasibility Study (FS) to identify and evaluate cleanup alternatives began for each of the sites. As work on the FS progressed, EPA expressed concern about the data on which the FS was based. As a result, work on the FS was terminated, and a Phase II RI Work Plan was developed to fill data gaps, to better calculate the extent of soil contamination, to address EPA's concerns, and to implement recommendations

made in the Phase I RI. EPA approved the Phase II RI Work Plan and portions of the Work Plan applicable to the Area A Landfill content/soils were implemented in the fall and winter of 1993.

The time required for full implementation of the Phase II RI Work Plan, preparation of a Phase II RI report, FFS, and selection of final remedial alternatives for the sites may take several years. Therefore, the Navy decided to accelerate remedial activities for selected media (in this case, landfill contents/soil) at four of the sites for which risks had been identified, in order to eliminate or minimize risks from those areas. The Area A Landfill site is one of the four sites selected for accelerated action. The accelerated plan of action will enable the Navy to collect design data, complete focused feasibility studies, and design accelerated remedial action programs to eliminate or lessen risk. The accelerated plan also provides for the simultaneous preparation of focused feasibility study reports and final plans/specifications.

PART THREE: PURPOSE AND SCOPE

The purpose of this FFS was to evaluate and select remedial actions to mitigate risks to human health and the environment posed by contaminated soil at the Area A Landfill site. The document—the FFS report on the Area A Landfill (soils/landfill contents)—therefore offers descriptions and evaluations on remedial alternatives for the prevention of human health risks posed by the contaminated soil. To achieve its stated purpose, the FFS report describes the rationale to support the implementation of a *presumptive remedy* to control the source of contamination (i.e., landfill contents/soils). Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and EPA scientific and engineering evaluation of performance data on technology implementation. The EPA has evaluated technologies that historically have been selected consistently at other sites using the remedy-selection criteria set out in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Having reviewed currently available performance data on the application of remedial technologies, the EPA has determined what remedy or set of remedies are *presumptively* the most appropriate ones to address specific types or categories of sites. The EPA expects presumptive remedies to be considered at all appropriate sites. Presumptive remedies for landfills consist of containment remedies, such as landfill caps, and groundwater remediation remedies, such as standard pump-and-treat systems. The presumptive remedies also specify that all hot spots shall be removed or treated.

As described throughout the FFS report, a selected remedial alternative will be implemented as an interim source control remedial action at the Area A Landfill site. The study is therefore described as an FFS rather than a conventional feasibility study (FS) for three reasons. The study *focused* on: (1) the development and selection of potential remedial alternatives for one operable unit (i.e., contaminated soils/landfill contents); (2) implementation of a presumptive remedy to control the source of contamination; and (3) several selected remedial alternatives that use commercially available, proven technologies.

The Area A Landfill remedial action will be implemented in accordance with all administrative procedures in the NCP for remedial actions. The remedial actions selected, based on the FFS, are intended to be final remedial actions in that: the cap selected will be the final cap, all hot spots will be removed, and no further excavation is expected to take place. However, the remedial actions are interim source control remedies for the operable unit addressed (i.e., soil and landfill contents) and interim actions for the site. The remedial actions in this FFS do not address all potential ecological and applicable or relevant and appropriate requirements (ARARs), in particular those due to contaminated groundwater; therefore, they are not final for the Area A Landfill site. Neither do the remedial actions recommended address all potential source control measures that may be required; therefore, they are not final source controls for the Area A Landfill. Monitoring wells in the Area A Landfill will be sampled periodically to assess site groundwater quality and site hydrology, as specified in the Phase II RI Work Plan. Based on this assessment, a determination will be made whether on-site groundwater remediation or additional source control measures are necessary to protect water quality as part of the final remedy for this site.

PART FOUR: SITE HISTORY

NSB-NLON consists of approximately 550 acres of land in southeast Connecticut in the towns of Ledyard and Groton, on the east bank of the Thames River, approximately six miles north of Long Island Sound. For almost 100 years, the Submarine Base (Subase) has served as a major support center for the U.S. Atlantic fleet. Of necessity, the Subase has used, handled, stored, and disposed of hazardous materials, some of which have contaminated soil and/or ground or surface water in areas of the Subase.

The Area A Landfill site is located in the northeastern and north-central section of the Subase. The site, covering approximately thirteen acres, is a relatively flat area bordered by a steep, wooded hillside to the south, a steep wooded ravine to the west, and the Area A wetland to the north. Aerial photographs show that the landfill appears to have extended eastward along the wetland as far as the present position of the tennis courts. The aerial photographs indicate that landfilling in the eastern portion of the site near the tennis courts occurred separately from landfilling in the western portion; soil borings and sample analyses indicate that the eastern portion may consist of clean fill rather than solid wastes. Additional investigations of this area are proposed by the Navy. If these studies indicate the eastern portion consists of clean fill, the cap will not extend into this area. Runoff from the landfill drains as overland flow north into the Area A wetland; the runoff discharges to the Area A downstream and into the Thames River.

The landfill opened sometime before 1957. After the Subase incinerator closed in 1963, all wastes, including all nonsalvageable materials generated by submarines and base operations, were disposed of in the landfill. The landfill closed in 1973.

After closure, a bituminous concrete pad was constructed in the southwest portion of the landfill for aboveground storage of industrial wastes. Steel drums, transformers, and electric switches were stored on the pad. All of these materials have been properly disposed of off site. The remainder of the landfill is not paved.

In recent years, sand bags and contractor supplies and equipment have been stored over the former landfill. Several transformers, excavated underground storage tanks, crane weights, and other equipment, are stored on the bituminous concrete pad in the southwest portion of the landfill. A gravel-covered parking lot also exists at the former landfill.

PART FIVE: SOIL CONTAMINATION AT THE AREA A LANDFILL

Surface and subsurface soil samples were collected at the Area A Landfill. Each sample was analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, PCBs, and inorganics. Chemical concentrations found in the soil were then compared to Applicable or Relevant and Appropriate Requirements (ARARs) and "to be considered" (TBC) values. ARARs and TBC values are based on cleanup standards or other environmental protection requirements or criteria, either set forth in the law or in relevant federal or state guidance materials. Tests revealed the presence of the following contaminants:

- VOCs were detected at one or more sampling locations, predominantly consisting of toluene, ethylbenzene, and total xylenes.
- SVOCs, predominantly PAHs, were detected in soils collected across the site.
- PCBs were detected at several of the sampling locations.
- Pesticides were detected at all of the locations sampled across the site, primarily at low concentrations.
- Dioxin was found in only one sample, at low concentration. Dioxin is not considered to be a chemical of concern at this site.
- Lead was found in significant concentrations in only two samples. Levels of other inorganics were found at slightly elevated levels. These constituents do not appear to be of concern at this site.

A risk assessment was performed using these analytical results; the only potential risks of concern identified regarded PCB-contaminated soils near the bituminous concrete storage pad located in the Area A Landfill.

PART SIX: REMEDIAL ACTION OBJECTIVES

Remedial action objectives are designed to protect human health and should reduce or eliminate potential health risks posed by the site. Cleanup objectives, at a minimum, must comply with the statutory requirements for CERCLA remedies as promulgated in the National Contingency Plan (NCP). They must also meet all ARARs. In order to define remedial action objectives for this site, the following are established:

- the contaminants of concern (in this case, PCBs);
- the media (air, soil, or water) in which the contaminants occur (in this case, soil);
- the potential exposure routes or pathways by which the contaminants may reach potential receptors (persons, animals, or the environment);
- the remediation goals (the elimination or reduction of contamination to acceptable levels).

Based on the information gathered thus far, along with the results of the human health risk assessment, a remedial action objective was developed that would reduce exposure of workers to PCBs in both surface and subsurface soils. Individuals considered to be at risk are workers involved in loading and unloading wooden pallets and those involved in excavation for storm sewers. PCBs are the only contaminant of concern in the soil at the Area A Landfill.

Although elevated concentrations of other contaminants (VOCs, PAHs, and inorganics, including lead) were of general concern, they do not pose a risk to worker human health or the environment in the soil. To address these concerns, and meet ARAR requirements regarding closure of hazardous waste disposal areas, a second general remedial action objective was developed to control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of hazardous substances to the environment. This objective also protects ecological receptors by preventing the migration of contaminants from the landfill to the adjacent wetlands, and should improve groundwater quality by preventing the migration of contaminants in unsaturated materials to groundwater.

Target remedial levels are designed to ensure that there is little opportunity for individuals to encounter hot spots where patches of contaminants may be present at elevated levels and that overall risks associated with activities at the Area A Landfill are low. Because contaminants have been observed to occur in patches within the landfill, remediation focused at addressing these patches should ensure that risk reduction objectives are met. These measures should also ensure that risks to other receptors (animals or the environment) are at acceptable levels.

The soils being considered for remediation were selected based on elevated levels of PCBs. The remedial action at this site is specifically aimed at remediating source or hot spot areas and providing engineering controls for the landfill to minimize the escape of hazardous substance. Hot spot areas are defined as areas where levels of PCBs in surface soils exceed 10

ppm or where levels of PCBs in subsurface soils exceed 50 ppm. Only surface and accessible subsurface soils, down to a depth of 10 feet, are being considered for removal. Two distinct areas near the concrete pad have been identified for soil excavation and removal. The total volume of PCB-contaminated soils is estimated to be approximately 300 cubic yards. The landfill itself covers nine acres and contains greater than 200,000 cubic yards of material. Specific target goals for PCBs at the Area A Landfill site are as follows:

Surface Soils: The remedial objective for surface soils is based on the continued industrial use of the landfill. Worker health risk was calculated using a number of very conservative assumptions, including the amount of exposure to PCBs in the soil for a specified number of days a year, for three years. A target level of 10 parts per million (ppm) in surface soil was suggested because it is consistent with levels that have been used elsewhere to guide cleanup efforts. This concentration will ensure that there are no hot spots for exposure to soils within the Area A Landfill.

Subsurface Soils: Workers involved in excavation activities could periodically encounter PCBs in subsurface soils. A target level of 50 ppm is suggested for subsurface soils. The assumptions used to calculate worker health risk assume less frequent exposure to subsurface soils than to surface soils because excavation of subsurface soils will occur infrequently as compared to pallet moving activities. For this reason, a concentration of 50 ppm (as compared to 10 ppm) should provide adequate health protection. The target level is consistent with levels that have been used to evaluate PCBs and to guide remedial efforts elsewhere.

PART SEVEN: SCREENING OF TECHNOLOGIES AND ALTERNATIVES

All potential feasible technologies were screened on a preliminary basis, and those technologies that passed this initial screening were evaluated based on effectiveness, implementability, and cost. Based on these screenings 12 technologies were retained to be assembled into remedial alternatives as follows:

Technology	Applicability	
	Landfill Contents Soils	PCB-Contaminated Hot Spot
No Action	•	•
Access Restrictions	•	•
Horizontal Barrier Cap	•	•
Site Grading & Storm Water Management	•	•
Excavation - Backhoe		•
Solvent Extraction		•
On-Site Incineration		•
On-Site Thermal Desorption		•
Off-Site Incineration		•
Off-Site RCRA Landfill		•
On-Site Backfill		•

Development and Screening of Remedial Alternatives. Eight alternatives incorporating the retained technologies were developed and evaluated regarding effectiveness, implementability, and cost. The following four alternatives which are described herein were retained for detailed analyses:

Alternative 2L-1	No Action
Alternative 2L-3	Cap Placement of impervious landfill cap.
Alternative 2L-4	Incineration Placement of an impervious landfill cap; and removal and off-site incineration of PCB-contaminated soils.
Alternative 2L-5	RCRA Landfill Placement of an impervious landfill cap, and removal and off-site landfill of PCB-contaminated soils.

PART EIGHT: DETAILED ANALYSIS OF ALTERNATIVES

Each of the retained alternatives was evaluated against nine criteria. The final remedial alternative selected for this site must represent the best balance among the evaluation criteria.

The first two criteria must be met before any alternative may be carried forward for further evaluation.

1. *Overall protection of human health and the environment* addresses how an alternative as a whole will protect human health and the environment over time. This criterion includes an assessment of whether risks are properly eliminated, reduced, or controlled.

2. *Compliance with applicable or relevant and appropriate requirements (ARARs)* addresses whether or not a remedy complies with all state and federal environmental and public health laws and requirements that apply or are relevant and appropriate to the site conditions and cleanup options.

The next five criteria are used as primary balancing criteria when evaluating alternatives:

3. *Short-term effectiveness* refers to the likelihood of any adverse effects on human health or the environment that may be posed during the construction and implementation of the alternative.

4. *Long-term effectiveness and permanence* refers to the ability of the alternative to maintain reliable protection of human health and the environment over time once the cleanup activity has been completed.

5. *Reduction of toxicity, mobility, or volume* measures the overall performance of an alternative. The 1986 amendments to the Superfund statute (SARA) emphasize that, whenever possible, the selected remedy should utilize a treatment process that permanently reduces the level of toxicity of contaminants at the site, the spread of contaminants away from the source (mobility), and the volume, or amount, of contamination at the site.

6. *Implementability* evaluates the technical and administrative feasibility of an alternative, including the availability of materials and services needed for the alternative.

7. *Cost* includes the capital (up-front) cost of implementing the alternative as well as the cost of operating and maintaining the alternative over the long term.

The final two criteria are considered in the final selection among otherwise viable alternatives:

8. *State acceptance* addresses whether, based on its review of the RI/FFS and Proposed Plan, the State concurs with, opposes, or has no comment on the alternative the Navy is proposing as the remedy for the site.

9. *Community acceptance* addresses whether the public concurs with the Proposed Plan, a public document that explains the rationale behind the selection of the preferred remedial alternative. Community acceptance of this Plan will be evaluated based on comments received at the upcoming public meeting and during the public comment period.

Presented below is a summary description of each alternative and the evaluation of each alternative.

Alternative 2L-1: No Action. Analysis of the No Action alternative is required by Federal law and is included for comparison with other alternatives. A No Action alternative is developed for each Superfund site to assess impact on public health and the environment if no measures are taken to correct current site conditions. The no-action alternative would only be used if the site posed little or no risk to public health and the environment.

The No Action alternative for the Area A Landfill would consist of taking no action to either contain, treat, or otherwise minimize risk. In addition, no long-term maintenance, monitoring, or institutional controls would be implemented at the site.

Risks associated with this alternative. The alternative provides no control of exposure to contaminated soils, and therefore, does not reduce the risk to human health or the environment. It also allows for further migration of contaminated soils. This alternative is unacceptable, as it would not provide adequate protection to either persons or the environment.

Estimated Time for Construction: no construction
Estimated Total Cost: 0

Alternative 2L-3: Capping Only. This alternative consists of the installation of a thirteen-acre impervious cap over areas of the site where wastes have been disposed of. The cap would consist of a bentonite composite liner overlain with an impervious flexible membrane liner, and with drainage netting, geotextiles, and an operating surface. The operating surface would be 12 inches thick and its composition would consist of non-compacted granular soils overlain by asphalt. The cap would be graded to prevent run-on and promote runoff.

A subsurface drainage trench would be installed to collect water in the shallow overburden flowing to the site and reroute it around the landfill to prevent this water from contacting landfill contents/soils. Access to the site would be controlled by continued maintenance of the existing perimeter fence and security procedures.

Proper maintenance of the cap would be necessary to ensure its long-term integrity. The Subase would develop operations and maintenance procedures that prevent any digging or other activities (without prior approval) that could jeopardize the integrity of the cap. Also, institutional controls would be implemented that would provide notice of hazardous materials at the site, and could include a provision for proper approval of any site excavation/construction activities to ensure the integrity of the cap, adequate worker protection, and other environmental considerations.

Risks associated with this alternative. The cap alternative effectively eliminates the principal threats posed by this site which are risks to human health due to direct contact. This alternative also minimizes infiltration and erosion, thereby reducing off-site migration of contaminated soils.

In the short term, any potential exposure to fugitive dust particles and gases would be controlled through procedures designed to control such exposure. In the long term, the installation of the cap would effectively eliminate human exposure to surface soils and landfill contents since they become inaccessible, thereby eliminating risks due to direct contact or ingestion. However, construction workers performing excavations to maintain utilities or who engage in similar below-surface activities would still be exposed to contaminants in both surface and subsurface soils, since they would need to penetrate the cap to accomplish the work. Such construction activities are unlikely, and operations and maintenance procedures would be developed to prevent unauthorized activities.

Capping does not eliminate the possibility that contaminants in the saturated zone could leach into the groundwater.

A five-year review would be required with this alternative, as no hazardous substances would be removed. If a remedial action results in any hazardous substance remaining on site, CERCLA requires that a remedy must be reviewed at least every five years to assure human health and the environment are being protected.

Estimated time for construction:	*12 months*
Estimated capital cost:	*$2,833,000*
Estimated operation and maintenance cost:	*$1,774,000*
Estimated total cost:	*$4,607,000*

Alternative 2L-4: Off-Site Incineration. This alternative includes the removal and off-site incineration of all contaminated soil hot spots. The soil removal/disposal would be followed by the placement of an impervious cover over the entire area where wastes have been disposed. All surficial soils containing PCBs greater than 10 ppm and all deeper, accessible soils (to a depth of 10 feet) containing PCBs greater than 50 ppm would be excavated and incinerated off site. The excavation areas, totalling approximately 300 cubic yards, are located near the bituminous concrete pad. After completion of the initial excavation, additional soil samples would be taken and analyzed to confirm that target-cleanup levels were met. If not, excavation would continue until samples confirmed that target cleanup levels were met or until a depth of 10 feet is reached.

The impervious cap, which would cover thirteen acres of the site, would consist of an impervious bentonite composite liner overlain with an impervious flexible membrane liner and with a drainage netting, nonwoven geotextiles, and an operating surface. The operating surface would be 12 inches thick and consist of non-compacted granular soils overlain by asphalt. The cap would be graded to prevent run-on and promote runoff.

A subsurface drainage trench would be installed to collect water in the shallow overburden flowing to the site and reroute it around the landfill to prevent this water from contacting landfill contents/soils. Access to the site would be controlled by continued maintenance of the existing perimeter fence and security procedures.

Proper maintenance of the cap would be necessary to ensure its long-term integrity. The Subase would develop operations and maintenance procedures that prevent any digging or other activities (without prior approval) that could jeopardize the integrity of the cap. Also the institutional controls would be implemented that would provide notice of hazardous materials at the site, and could include a provision for property approval of any site excavation/construction activities to ensure the integrity of the cap, adequate worker protection, and other environmental considerations.

Risks associated with this alternative. This alternative would effectively eliminate the principal threats posed by this site which are risks to human health from direct contact of contaminated soils. In addition, workers involved in future subsurface construction projects would be protected from risks because accessible soils containing contaminants above target-cleanup levels would be removed.

Because this alternative would require a substantial amount of material handling, there may be a short-term potential for exposure to contaminants from dust generated during removal, grading, and transport of soil. These short-term exposures would be reduced through the use of protective clothing and other measures specified by an on-site health and safety plan.

In the long term, removal and disposal of surface and subsurface soils off site would permanently eliminate exposure to accessible contaminated soils, since all of these soils would be removed. In addition, installation of the impervious cap would effectively eliminate human exposure to any unidentified isolated hot spots or to contaminants in inaccessible soils. Installation of the cap does not eliminate the possibility that contaminants in the saturated zone may leach to the groundwater.

A five-year review would be required with this alternative, as not all hazardous substances are being removed. If a remedial action results in hazardous substances remaining on site, CERCLA requires that a remedy must be reviewed at least every five years to assure human health and the environment are being protected.

Estimated time for construction:	*less than 14 months*
Estimated capital cost:	*$3,332,000*
Estimated operations and maintenance cost:	*$1,774,000*
Estimated total cost:	*$5,106,000*

Alternative 2L-5: Off-Site RCRA Landfill. This alternative includes the removal and off-site landfill of all contaminated soil hot spots. The soil removal/disposal would be followed by the placement of an impervious cover over the entire area where wastes have been disposed. All accessible soils in hot spot areas would be excavated and disposed of at an off-site licensed hazardous waste (RCRA) landfill. All surface soil containing PCBs greater than 10 ppm and deeper accessible soils (up to 10 feet) containing PCBs greater than 50 ppm would be removed. Accessible soils are defined as those soils that a person could potentially be exposed to, from the ground surface to a depth of 10 feet. The excavation areas are located adjacent to the bituminous concrete pad and consist of about 300 cubic yards in all. After completion of the initial excavation, additional soil samples would be taken and analyzed to confirm that target cleanup levels were met. If target levels are not met in any area sampled, excavation would be continued until excavation samples confirm that target cleanup levels were met or until a depth of 10 feet is reached.

The disposal would be followed by the placement of an impervious cap over the entire thirteen-acre area where wastes have been disposed of. The cap would consist of an impervious bentonite composite liner, overlain with an impervious flexible membrane liner and with a drainage netting, nonwoven geotextile, and an operating surface. The operating surface would be 12 inches thick and consist of non-compacted granular soils overlain by asphalt. The cap would be graded to prevent run-on and promote runoff. Although the cap would be designed to allow continuation of current Area A Landfill operations, proper maintenance of the cap and fence would be required to ensure its long-term integrity. Operations and Maintenance procedures to prevent any unauthorized digging or other activities that could jeopardize the integrity of the cap would be developed as well.

A subsurface drainage trench would be installed to collect water in the shallow overburden flowing to the site and reroute it around the landfill to prevent the water from contacting landfill contents/soils. Access to the site would be controlled by continued maintenance of the existing perimeter fence and security procedures.

Risks associated with this alternative. This alternative would effectively eliminate the principal threats posted by this site which are risks to human health due to direct contact and off-site migration of contaminants via erosion and infiltration. In addition, future workers involved in subsurface construction would be protected from risks because accessible soils containing concentrations above target cleanup levels would be removed. Such activities are unlikely to occur since operations and maintenance procedures to be followed at the Landfill, along with

institutional controls, would protect the cap by preventing unauthorized excavation or other activities that could jeopardize the integrity of the cap. Future construction activities could involve disturbing contaminated soils; however, no future construction projects are planned for the Area A Landfill.

Short term exposures to contaminated soil under this alternative would be of potential concern, as removal, grading, and transport of soil may allow some ingestion of soil or dermal (through the skin) exposure. Fugitive dust particles and gases are also a concern in the short term. These risks are controllable through a health and safety plan which calls for protective clothing and other measures designed to reduce this exposure.

In the long term, the disposal of surface and subsurface soils in an off-site location would permanently eliminate risk of exposure to accessible contaminated soils since all of these soils would be removed. Installation of the cap in the long term would also effectively eliminate human exposure to any unidentified isolated hot spots or to inaccessible soils. Installation of the cap does not eliminate the possibility that contaminants in the saturated zone may leach to groundwater.

A five year review would be required with this alternative as not all hazardous substances are being removed. If a remedial action results in hazardous substances remaining on site, CERCLA requires that a remedy must be reviewed at least every five years to assure human health and the environment are being protected.

Estimated Time for Construction:	*less than 13 months*
Estimated Capital Cost:	*$3,050,000*
Estimated Operation and Maintenance Cost:	*$1,774,000*
Estimated Total Cost:	*$4,824,000*

PART NINE: COMPARATIVE ANALYSIS OF ALTERNATIVES

The last section of the FFS compares the four alternatives evaluated in detail. A summary of this analysis is presented in the following table. As shown therein, areas of differences are demonstrated rather than areas of commonality since all but one alternative, the No Action alternative, require capping.

COMPARATIVE ANALYSIS SUMMARY
AREA A LANDFILL

Assessment Factors	Alternative 2L-1 No Action	Alternative 2L-3 Cap	Alternative 2L-4 Off-Site Incineration	Alternative 2L-5 Off-Site RCRA Landfill
1. Overall Protection of Human Health and the Environment	No significant reduction in risk.	Eliminates risk due to direct contact and ingestion/inhalation. Prevents erosion and infiltration.	Eliminates risk due to direct contact and ingestion/inhalation and by removing hot spots protects future utility construction workers. Prevents erosion and infiltration. Eliminates some contaminated material.	Eliminates risk due to direct contact and ingestion/inhalation and by removing hot spots protects future utility construction workers. Prevents erosion and infiltration. Eliminates some contaminated material.
2. Compliance with ARARs	The following ARARs are not met: - Federal and state RCRA hazardous waste disposal area closure standards ARARs for ground and surface water quality are not within the scope of this interim remedial action. This alternative does not improve water quality.	This alternative meets all ARARs. ARARs for ground and surface water quality are not within the scope of this interim remedial action. This alternative would improve water quality to the extent that infiltration is prevented.	This alternative meets all ARARs. ARARs for ground and surface water quality are not within the scope of this interim remedial action. This alternative would improve groundwater quality to the extent that some contaminated soils are removed and infiltration is prevented.	This alternative meets all ARARs. ARARs for ground and surface water quality are not within the scope of this interim remedial action. This alternative would improve groundwater quality to the extent that some contaminated soils are removed and infiltration is prevented.
3. Long-Term Effectiveness and Permanence • Magnitude of Residual Risk	No reduction in constituent concentrations in any media.	By preventing direct contact, risks to human health are prevented except for risks to potential future construction workers which are low.	By preventing direct contact, human health risks due to direct contact are eliminated and risks to future utility/construction workers are reduced to very low levels by removal of contaminated PCB hot spots.	By preventing direct contact, human health risks due to direct contact are eliminated and risks to future utility/construction workers are reduced to very low levels by removal of contaminated PCB hot spots.
• Adequacy and Reliability of Controls	No controls over remaining contamination.	Controls considered reliable and adequate, however if utility/ construction activities took place without adequate protection there would be potential health risks.	Controls considered reliable and adequate. Contaminated soil hot spots are removed thus long-term protection will be provided in these areas.	Controls considered reliable and adequate. Contaminated soil hot spots are removed thus long-term protection will be provided in these areas.
4. Reduction of Toxicity Mobility, or Volume	No reduction of toxicity, mobility or volume.	No reduction in toxicity or volume. Contaminants in unsaturated zone will be less mobile due to the reduced infiltration.	No reduction in toxicity or volume for the majority of landfill soils. Contaminants in the unsaturated zone will be less mobile due to the reduced infiltration. Soil hot spots will be eliminated, thereby reducing the total volume of contaminated materials on site. Ultimately, these soil hot spots will be incinerated, thereby destroying the PCBs which will result in a net reduction in toxicity.	No reduction in toxicity or volume for the majority of landfill soils. Contaminants in the unsaturated zone will be less mobile due to the reduced infiltration. Soil hot spots will be eliminated, thereby reducing the total volume of contaminated materials on site. Ultimately, these soil hot spots will be landfilled, therefore there is no net reduction in toxicity. However, mobility will be reduced at the off-site RCRA landfill.

COMPARATIVE ANALYSIS SUMMARY (continued)
AREA A LANDFILL

Assessment Factors	Alternative 2L-1 No Action	Alternative 2L-3 Cap	Alternative 2L-4 Off-Site Incineration	Alternative 2L-5 Off-Site RCRA Landfill
5. Short-Term Effectiveness • Time until protection is achieved	Not applicable.	Cap placed within 12 months.	Soils excavated and removed within 14 months.	Soils excavated and removed within 13 months.
• Protection of community during remedial action	Risks to community not increased, however, contaminants still have potential to migrate off site.	Potential for windblown dust during grading activities. Protection provided by use of dust suppressants.	Potential for windblown dust during grading and excavation activities. Protection provided by use of dust suppressants. Small potential for spills during transport.	Potential for windblown dust during grading and excavation activities. Protection provided by use of dust suppressants. Small potential for spills during transport.
• Protection of workers during remedial action	Not applicable.	Protection from ingestion, direct contact, and inhalation of soil provided by proper health and safety procedures.	Protection from ingestion, direct contact, and inhalations of soil provided by proper health and safety procedures.	Protection from ingestion, direct contact, and inhalations of soil provided by proper health and safety procedures.
6. Implementability • Technical feasibility	No activities to implement.	Cover installation easy to implement.	Cover installation and removal activities easy to implement.	Cover installation and removal activities easy to implement.
• Administrative feasibility	No approval necessary.	Some coordination required with hazardous waste agencies to ensure that cap and closure meet relevant and appropriate requirements and with water discharge agencies to ensure that the groundwater discharge to the wetlands meets substantive requirements.	Some coordination required with hazardous waste agencies to ensure that cap and closure meet relevant and appropriate requirements and with water discharge agencies to ensure that the groundwater discharge to the wetlands meets substantive requirements. Approvals required for disposition of PCB hot spots in the off-site incineration. No difficulties are anticipated.	Some coordination required with hazardous waste agencies to ensure that cap and closure meet relevant and appropriate requirements and with water discharge agencies to ensure that the groundwater discharge to the wetlands meets substantive requirements. Approvals required for disposition of PCB hot spots in the off-site landfill. No difficulties are anticipated.
• Availability of services and materials	No services or material required.	Contractors and materials are locally available.	Contractors and materials are locally available. Off-site incineration capacity is available. Temporary capacity shortfalls are possible.	Contractors and materials are locally available. Adequate off-site landfill capacity is available.
7. Cost • Capital cost	$0	$2,834,000	$3,332,000	$3,050,000
• O&M (Present Worth) Costs	$0	$1,774,000	$1,774,000	$1,774,000
• Total Cost	$0	$4,608,000	$5,106,000	$4,824,000
8. State Acceptance	To be determined following state review.	To be determined following state review.	To be determined following state review.	To be determined following state review.
9. Community Acceptance	To be determined based on public comment.	To be determined based on public comment.	To be determined based on public comment.	To be determined based on public comment.

1.0 INTRODUCTION

This focused feasibility study (FFS) report was developed under the Navy's Installation Restoration Program. The FFS pertains to the Area A Landfill site located within the Naval Submarine Base - New London (NSB-NLON) in Groton, Connecticut. The overall process leading up to the development of this FFS is presented in the subsection 1.1, while subsection 1.2 describes the purpose and scope of the FFS.

1.1 The Process Resulting In This FFS

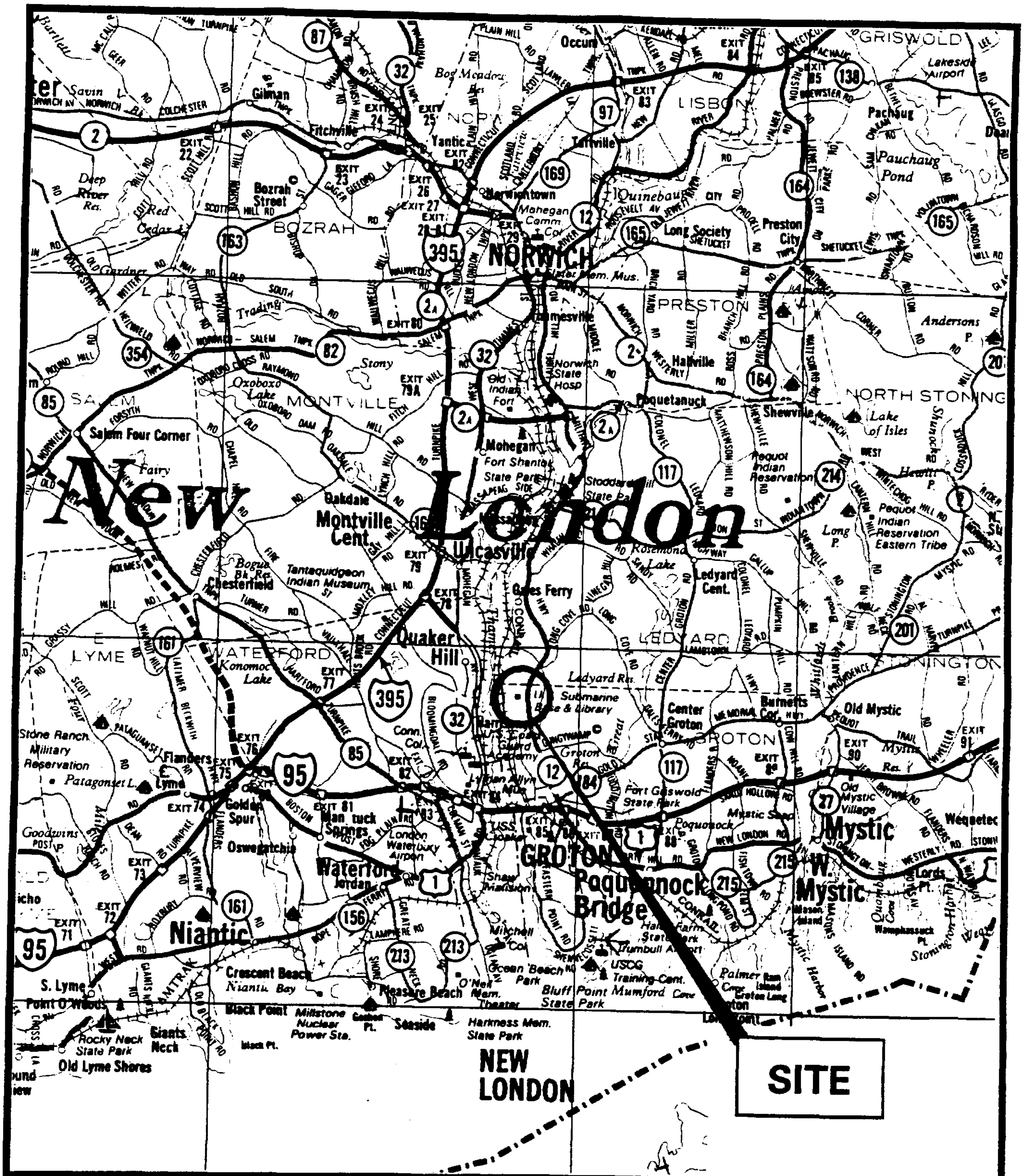
To offer an overview of the *overall site* on which the Area A Landfill site is located, the NSB-NLON consists of approximately 547 acres of land and associated buildings in southeastern Connecticut in the towns of Ledyard and Groton. NSB-NLON is on the east bank of the Thames River, approximately six miles north of Long Island Sound. Figures 1-1 and 1-2 show the overall NSB-NLON site vicinity and location, respectively. NSB-NLON was placed on the National Priorities List (NPL) on August 30, 1990, by the U.S. Environmental Protection Agency (hereinafter referred to as the EPA) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980.

A Phase I Remedial Investigation (RI) was completed on nine sites within the overall NSB-NLON site. Area A, which includes the Area A Landfill, was one of the nine sites included in the Phase I RI. The Phase I RI report (Atlantic, August 1992) evaluated potential risks to human health and the environment posed by the presence of various chemical constituents in soils and groundwater at each site. Based on the RI results, several of the nine sites, including the Area A Landfill site, were determined to pose potential risks.

To address the potential risks at these sites, a feasibility study (FS) was initiated to identify and evaluate remedial alternatives for the sites. As work on the FS progressed, the EPA expressed concern about the adequacy of the data with respect to the extent of contamination; the FS was based on that data. Work on the FS was subsequently terminated, and a Phase II RI Work Plan (Atlantic, May 1993) was developed to address the EPA concerns and to implement recommendations made in the Phase I RI. The Navy obtained approval of the Phase II Work Plan from the EPA and the Connecticut Department of Environmental Protection (CTDEP) and has provided supplemental data to the EPA. The EPA agreed to allow the Navy to go ahead with the FFS, based on the aggregate of the preliminary and supplemental data collected.

The time required for full implementation of the Phase II RI Work Plan, preparation of a Phase II RI report, FS, and selection of final remedial alternatives for all of the NSB-NLON sites placed on the NPL may take several years. Therefore, the Navy decided to implement an initiative to accelerate remedial activities at four of the sites where risks had been positively identified. The intent of these accelerated remedial actions is to eliminate or minimize risks in a timely manner. These four sites and associated operable units (i.e., media) are:

- Area A Landfill — Soils/Landfill Contents
- Area A Downstream/Over Bank Disposal Area (OBDA) — Sediments
- Defense Reutilization Marketing Office (DRMO) — Soils
- Spent Acid Storage and Disposal — Soils



INSTALLATION RESTORATION STUDY

NAVAL SUBMARINE BASE - NEW LONDON

GROTON, CT

SOURCE: Marshall Penn-York Co. Inc.

Miles

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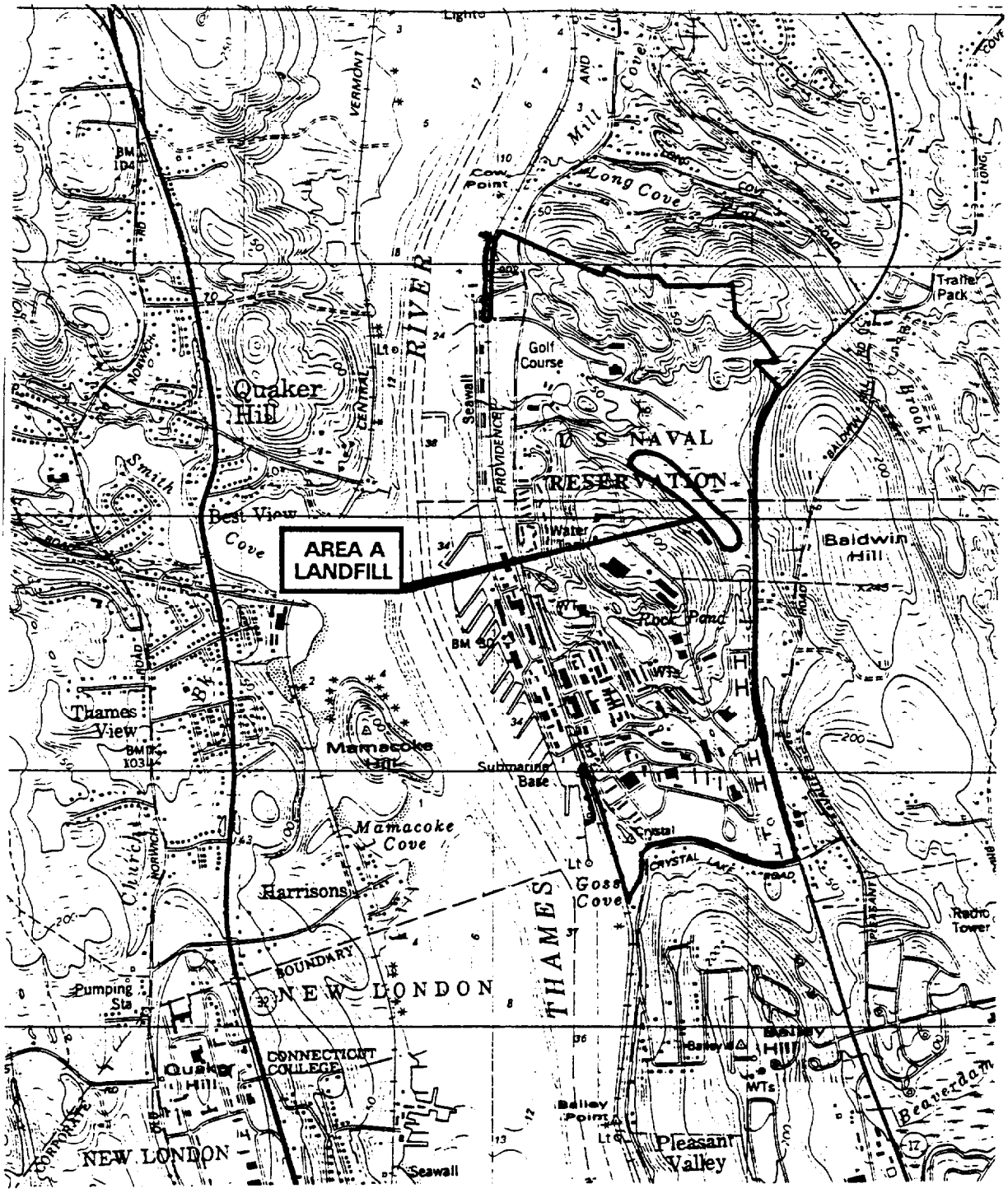
APPROXIMATE SCALE

FIGURE 1-1

SITE VICINITY

ATLANTIC ENVIRONMENTAL SERVICES, INC.



INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CT

SOURCE: Uncasville, CT
U.S.G.S. Topographic Map
1984

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FIGURE 1-2
SITE LOCATION

ATLANTIC ENVIRONMENTAL SERVICES, INC.

The locations of these four sites are depicted in Figure 1-3.

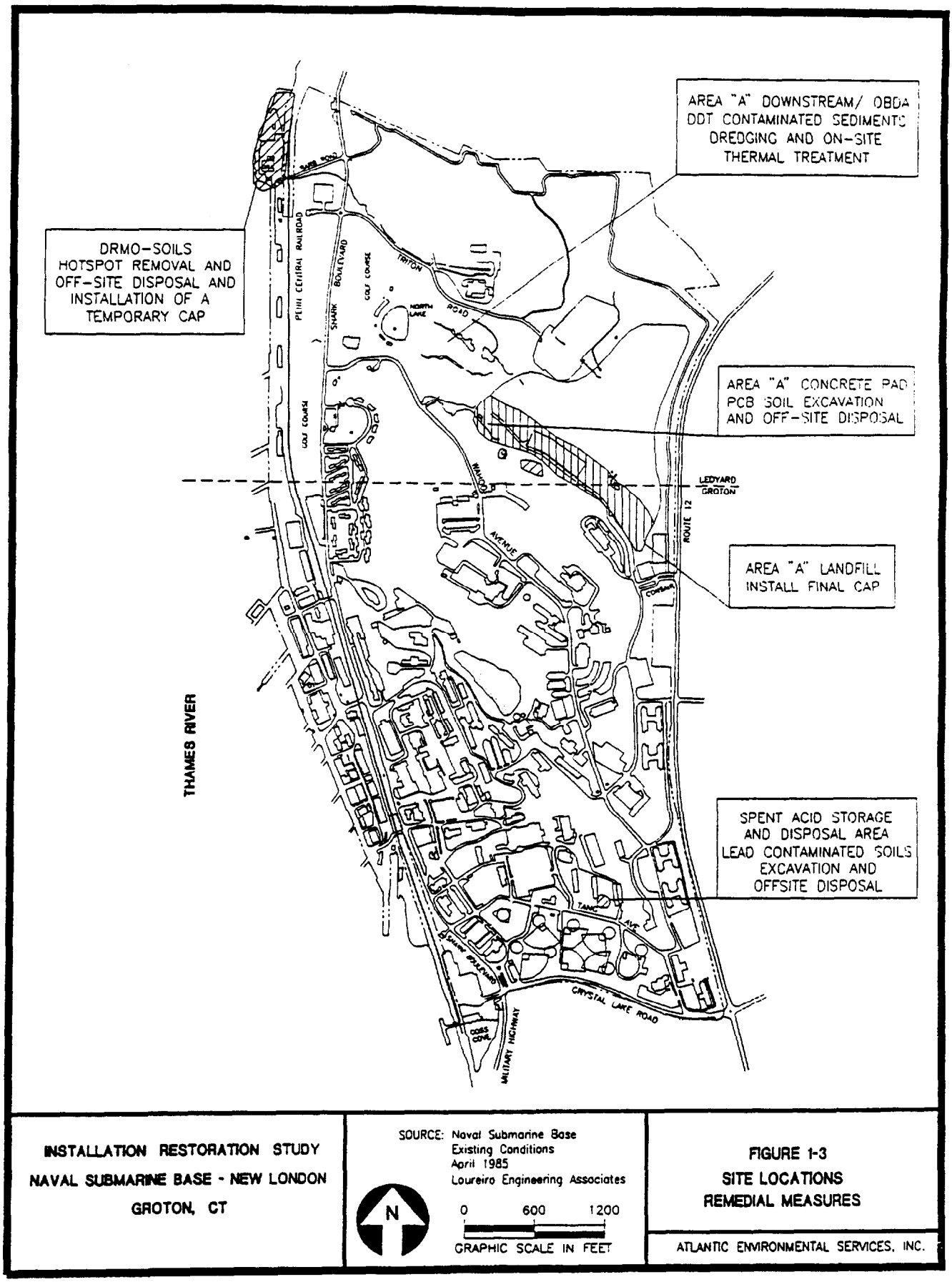
The Navy, in its initiative to accelerate the Superfund process, developed a plan of action for selecting and implementing remedial actions at these four sites. This plan of action was described in a Briefing Document which was distributed to the EPA, CTDEP, and the Restoration Advisory Board (RAB) for review and comment (Atlantic, May 1993). The plan of action for the Area A Landfill site included the "fast tracking" of portions of the Phase II RI Work Plan for the timely collection of design data, completion of the FFS, and the design of remedial actions to mitigate risks. To avoid some of the long implementation time periods associated with the Superfund process, the Navy's plan of action provided for the simultaneous preparation of FFS report and final design plans/specifications.

1.2 Purpose and Scope

The purpose of this FFS was to evaluate and select remedial actions to mitigate risks to human health and the environment posed by contaminated soil at the Area A Landfill site. This document—the FFS report on the Area A Landfill (soils/landfill contents)—therefore offers descriptions and evaluations on remedial alternatives for the prevention of human health risks posed by the contaminated soil. To achieve its stated purpose, this FFS report describes the rationale to support the implementation of a *presumptive remedy* to control the source of contamination (i.e., landfill contents/soils). Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and EPA scientific and engineering evaluation of performance data on technology implementation. The EPA has evaluated technologies that historically have been selected consistently at other past sites using the remedy-selection criteria set out in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Having reviewed currently available performance data on the application of remedial technologies, the EPA has determined what remedy or set of remedies are *presumptively* the most appropriate ones to address specific types or categories of sites. The EPA expects presumptive remedies to be considered at all appropriate sites. Presumptive remedies for landfills consist of containment remedies, such as landfill caps, and groundwater remediation remedies, such as the standard pump-and-treat systems. The presumptive remedies specify that all hot spots will be removed or treated.

As described throughout this FFS report, a selected remedial alternative will be implemented as an interim source control remedial action at the Area A Landfill site. This study is therefore described as an FFS rather than a conventional feasibility study (FS) for three reasons. The study *focused* on: (1) the development and selection of potential remedial alternatives for one operable unit (i.e., contaminated soils/landfill contents); (2) implementation of a presumptive remedy to control the source of contamination; and (3) several selected remedial alternatives that use commercially available, proven technologies.

A Proposed Plan on the Area A Landfill, which is a public document describing the preferred remedy and the basis for its selection, was developed concurrently with the preparation of this FFS report. Following completion of the FFS and the Proposed Plan, final concurrence from EPA/CTDEP will be obtained for the FFS report, proposed plan, and target-remediation levels. Public participation will consist of a public notice, an informal public hearing, and a public comment/interaction period. A draft Record of Decision (ROD) and responsiveness summary will then be prepared for review by the EPA, CTDEP, RAB, and the general public



INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CT

SOURCE: Naval Submarine Base
Existing Conditions
April 1985
Loureiro Engineering Associates

FIGURE 1-3
SITE LOCATIONS
REMEDIAL MEASURES

ATLANTIC ENVIRONMENTAL SERVICES, INC.

community. The ROD will then be signed by the Navy upon full consideration of all comments received.

The Area A Landfill remedial action will be implemented in accordance with all administrative procedures in the NCP for remedial actions. The remedial actions selected, based on this FFS, are intended to be final remedial actions in that: the cap selected will be the final cap, all hot spots will be removed, and no further excavation is expected to take place. However, the remedial actions are interim source control remedies for the operable unit addressed (i.e., soil and landfill contents) and interim actions for the site. The remedial actions in this FFS do not address all potential ecological and applicable or relevant and appropriate requirements (ARARs), in particular those due to contaminated groundwater; therefore, they are not final for the Area A Landfill site. Neither do the remedial actions recommended address all potential source control measures that may be required; therefore, they are not final source controls for the Area A Landfill. Monitoring wells and surface water in the Area A Landfill will be sampled periodically to assess site groundwater and surface water quality and site hydrology, as specified in the Phase II RI Work Plan. Based on this assessment, a determination will be made whether on-site groundwater remediation or additional source control measures are necessary to protect water quality.

1.3 Report Organization

The FFS process is a progressive screening process consisting of the following elements:

- the identification and screening of technologies;
- the development and screening of remedial alternatives;
- the detailed analysis of remedial alternatives; and
- the comparative analysis of remedial alternatives.

In addressing these elements, subsections 1.3.1 through 1.3.5 provide a brief overview of the remaining major sections (i.e., Sections 2 through 6) of this report. The primary purpose of Section 1.0, in addition to providing an overview of the purpose and scope of this FFS, is to provide a summary background of information obtained and data collected on the Area A Landfill site. Summary information from past reports on the Area A Landfill site is provided to describe the initial basis from which this FFS report was generated and to make this FFS report a stand-alone document. Section 1.0 herein therefore describes:

- the purpose and scope of the FFS;
- the organization and content of the FFS report;
- historical and current descriptions of the overall NSB-NLON site in general and the Area A Landfill site in particular;
- physical characteristics of the NSB-NLON site followed by one on the Area A Landfill site;
- the nature and extent of contamination at the Area A Landfill site;
- contaminant fate and transport at the Area A Landfill site;
- potential risks to human health at the Area A Landfill site;
- risks to ecological receptors at the Area A Landfill site; and
- a summary of the ecological risks therein.

The organization of this FFS report therefore substantively follows EPA CERCLA guidance for conducting feasibility studies (U.S. EPA, 1988).

1.3.1 Section 2 Content: Identification and Screening of Remedial Technologies

Section 2.0 of this report (Identification and Screening of Technologies) provides the following information:

- an overview of the identification and screening process (subsection 2.1);
- a discussion of contaminants of interest, allowable exposure based on risk assessment and ARARs, and the development of remedial action objectives (subsection 2.2);
- a discussion of general response actions which potentially may achieve the remedial action objectives (subsection 2.3);
- estimates of volumes of materials that may require remediation (subsection 2.4); and
- results of the identification of potential remediation technologies and process options, including the screening of these technologies/process options based on effectiveness, implementability, and cost (subsection 2.5).

1.3.2 Section 3 Content: Development and Screening of Alternatives

Section 3.0 of this FFS report describes the rationale for combining various technologies/process options into alternatives. (That is, alternatives consist of a combination of process options organized for the remediation of a particular site.) Alternatives developed are described and evaluated with respect to effectiveness, implementability, and cost.

1.3.3 Section 4 Content: Detailed Analysis of Alternatives

Section 4.0 of this report contains a detailed analysis of all alternatives that have made it through the screening process. Each remaining alternative is described and evaluated with respect to each of the nine evaluation criteria stipulated by the EPA.

1.3.4 Section 5 Content: Comparative Analysis of Detailed Alternatives

Section 5.0 of this report provides a comparison of and summary on the detailed analysis of each alternative.

1.3.5 Section 6 Content: References

Section 6.0 provides a list of all reports, guidance documents, and other information used in compiling the data to generate this FFS report.

1.4 Site Background Overview

This site background overview is presented at two different levels: (1) the NSB-NLON site in general, and (2) the Area A Landfill site within the overall NSB-NLON site. A site history profile, followed by a more current site description, is presented at both levels. Information provided in the following subsections has been summarized from the Phase I RI.

1.4.1 The Overall NSB-NLON Site

In addressing the overall NSB-NLON site, subsection 1.4.1.1 presents a brief historical narrative of how the site has been developed to its current configuration. A summary of previous environmental investigations and enforcement activities is also provided in subsection 1.4.1.1.

Subsection 1.4.1.2 describes the overall NSB-NLON site in terms of current operations, adjacent land use, economic profile, future development potential, and climate.

1.4.1.1 NSB-NLON Site History

In 1867, the state of Connecticut donated a 112-acre parcel on the east bank of the Thames River to the Navy. The Navy began using the property in 1868 when it was officially designated as a Navy Yard. The property was then used as a mooring site for small craft and obsolete warships, and as a coaling station for the Atlantic fleet.

The Navy Department designated the site a Submarine Base (Subase) in 1916. During World War I, facilities at the base were expanded extensively; six piers and 81 buildings were added. In 1917, a Submarine School was established and in 1918 the Submarine Medical Center was founded. NSB-NLON experienced another period of growth during World War II. Between 1935 and 1945 the Navy built in excess of 180 buildings and expanded NSB-NLON from 112 to 497 acres through the acquisition of adjacent land. The growth of NSB-NLON continued after World War II. The Medical Research Laboratory was established in 1946. In 1968 the status of the Submarine School was changed from an activity to a command and became the largest tenant on the base. The Naval Submarine Support Facility was established in 1974 and the Naval Undersea Medical Institute was established in 1975. NSB-NLON currently consists of over 300 buildings on 547 acres of land (U.S. Navy, 1988).

Therefore, for almost 100 years, the Subase has served as a major support center for the U.S. Atlantic fleet. Of necessity the Subase has used, handled, stored, and disposed of hazardous materials, some of which have contaminated soil and or water. Some of the contamination is the result of accidental spills and leaks that happened in the past. The remainder is the result of disposal practices that were common in the past, but that are now known to be inadequate (i.e., landfilling). Currently, there are 23 sites which are known or presumed to be contaminated, as identified in the proposed Federal Facility Agreement (FFA), which is an interagency agreement that provides the framework for EPA, CTDEP, and the Navy to address environmental problems. A brief discussion of each of these sites is provided in the *Community Relations Plan* (Atlantic/Jordan Communications, Inc., February 1994).

Previous investigations and enforcement histories for NSB-NLON are summarized as follows:

- ***Installation Restoration Program (IRP), 1975.*** In response to the growing awareness of the potential effects of hazardous materials on human health and the environment, the Department of Defense (DOD) developed the IRP to investigate and clean up potential problem areas created by past events at federal facilities. The IRP was the catalyst for environmental investigations at the NSB-NLON.

- ***Initial Assessment Study (IAS), Envirodyne Engineers, Inc. (Envirodyne), 1982.*** The purpose of the IAS was to identify and evaluate past hazardous waste disposal practices at NSB-NLON and to assess the associated potential for environmental contamination.

- ***Verification Study, Wehran Engineering, Inc., 1988.*** The purpose of the Verification Study was to determine whether toxic and hazardous materials identified in the IAS were present on site and to further assess the potential impact of the contamination on human health and the environment. The presence of contamination at Area A was confirmed during this study.

- ***NSB-NLON is Placed on the National Priorities List (NPL) by the U.S. EPA, 1990.*** Area A Landfill is included among the list of sites of concern.

- ***Phase I Remedial Investigation (RI) NSB-NLON, Atlantic Environmental Services, Inc. (Atlantic) 1992.*** Area A Landfill was identified as one of several NSB-NLON sites posing potential risks to human health and the environment.

- ***Phase II RI NSB-NLON Work Plan, Atlantic, 1993.*** Work to be performed during a Phase II RI, which addresses questions resulting from the Phase I RI, is detailed in this work plan. Additional investigations of Area A Landfill are included in the work plan. The purpose of the investigations is to fill data gaps from the previous investigation to define completely the extent and degree of contamination.

- ***Federal Facility Agreement (FFA) for NSB-NLON, 1994.*** The Navy has entered into an FFA with U.S. EPA and the Connecticut Department of Environmental Protection (CTDEP) regarding the cleanup of environmental contamination at NSB-NLON. The document has been signed by all three parties and became effective on January 5, 1995. The FFA establishes the roles and responsibilities of each agency, sets deadlines for the investigation and cleanup of hazardous waste sites, and establishes a mechanism for the resolution of disputes among the agencies.

- ***Draft Focused Feasibility Study (FFS), Atlantic, March 1994.*** This report, which is a revised draft of the March 1994 FFS report for the Area A Landfill site, includes: all relevant supplemental data from the Phase II RI collected by Atlantic for this FFS; the remedial action objectives, based on risk and ARARs; and an evaluation of several remedial alternatives to address Area A Landfill contents (i.e., soils).

1.4.1.2 NSB-NLON Site Description

NSB-NLON provides a base command for naval submarine activities in the Atlantic Ocean. Additionally, NSB-NLON includes housing for Navy personnel and their families, submarine training facilities, military offices, medical facilities, and facilities designed for the maintenance, repair, and overhaul of submarines.

Land use adjacent to the site is generally residential or commercial. Adjacent land use is shown in Figure 1-4. Residential development along Military Highway, Sleepy Hollow, Long Cove Road, and Pinelock Drive borders the site to the north and extends north into the Gales Ferry section of Ledyard. Property along Route 12 to the east of the site consists of private homes and open, wooded land. Further south on Route 12, development is mixed commercial/ residential and includes a church, automobile sales and repair facilities, convenience stores, restaurants, and a gas station. Private residences and an automobile service station are located along the south side of Crystal Lake Road; housing for Navy personnel is further south. Based on its position along the Thames River, Subase activities also affect the towns of Waterford and New London, which are located on the opposite shore of the river.

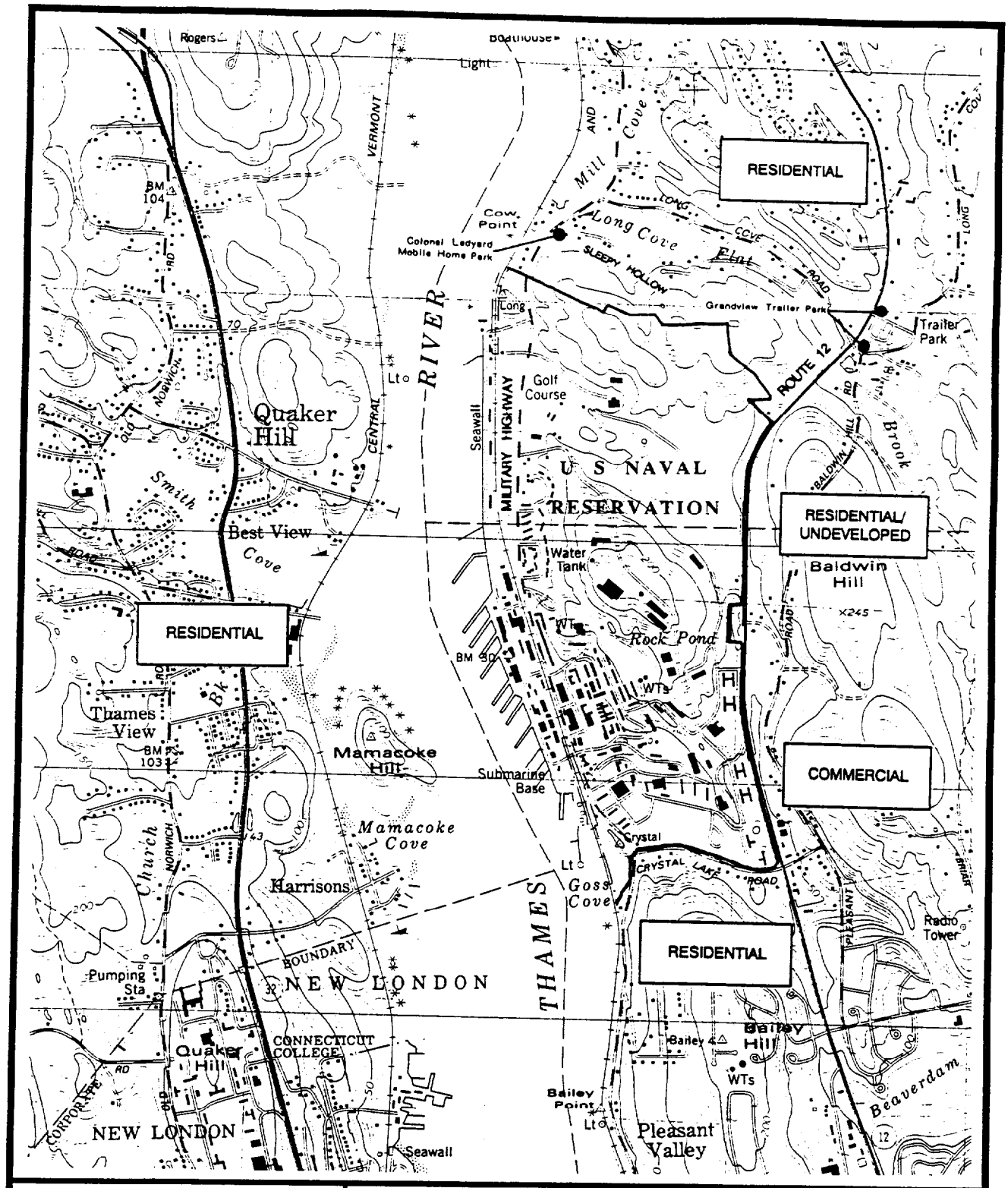
The economy of the region is heavily dependent upon industry and government employment. Approximately 15,000 military personnel are assigned to facilities in the region, including the Navy Submarine Base, the Coast Guard, and the Naval Underwater Systems Center. Industries allied closely with national defense include the Electric Boat Division of General Dynamics in Groton, which once employed approximately 20,000 civilians at its facility; that number is steadily decreasing because of Department of Defense cutbacks. Other major industries in the area include Dow Chemical; Pfizer, Inc.; and Northeast Utilities.

Tourism is becoming economically important to the region. Major tourist attractions include Mystic Seaport and Aquarium in Stonington and the Nautilus museum in Groton. Fishing and agriculture play a smaller role. Dairy and poultry farming are the major agricultural activities. Except for some commercial lobstering and other shellfish harvesting, fishing in the area is primarily recreational. Boating traffic on the river has increased in the past decade, as evidenced by the marinas on the river which cater to recreational boaters and fishermen.

The effects of contaminants from NSB-NLON on the natural resources in the Thames River is the subject of on-going investigations and will be addressed in an appendix to the Phase II Remedial Investigation. The proposed remedy described herein should minimize contaminants present in the landfill from migrating into the Thames River.

A major new economic force in the region is the Foxwoods Casino Complex, which opened in February 1992 in the town of Ledyard. Owned by the Mashantucket Pequot Indians, the Complex contains one of the largest casinos in the country, as well as hotel and resort facilities. During its first year of operation, Foxwoods employed over 3,800 people; the complex has since proposed plans for expansion into surrounding communities, a subject of intense local debate among potentially affected towns.

The southeastern Connecticut region is proud of its recreational facilities, which include several beautiful beaches, coastal reserves and wetlands, and state forests. These features provide residents with year-round recreational, educational, and historical opportunities. The area contains much open land with potential for future development.



INSTALLATION RESTORATION STUDY

NAVAL SUBMARINE BASE - NEW LONDON

GROTON, CT

SOURCE: Uncasville, Ct.
U.S.G.S. Topographic Map 1984

● Active Water Supply Well

N

0 1000 2000'

SCALE

FIGURE 1-4

AREA LAND USE

ATLANTIC ENVIRONMENTAL SERVICES, INC.

The towns of Ledyard and Groton typify the differences in the region's local communities. Ledyard is primarily a residential community of approximately 15,000 people. Its expansive land area includes the village of Gales Ferry, which abuts the Subase. Like many other communities in New England, Ledyard has felt the effects of a slowing economy and is actively seeking ways to expand its tax base, which is 73% residential. It is governed by a mayor, an elected town council, and various commissions and boards.

The town of Groton is a much more commercial and industrial community than Ledyard. It has two political subdivisions: the city of Groton and Groton Long Point. Other special districts are organized units of government within the town, having separate governing bodies. The districts were established by special acts of the state legislature for specific purposes such as fire and police protection. The districts are: (1) the Center Groton Fire District; (2) the city of Groton; (3) the Groton Long Point Association; (4) Mystic Fire District; (5) the Noank Fire District; (6) the Old Mystic Fire District; and (7) the Poquonnock Bridge Fire District.

The town of Groton's 45,000 residents are governed by a Town Council, assisted by a Town Manager, and use a representative town meeting structure. Council members are elected for two-year terms. The Town Manager is appointed by and directly responsible to the Council and serves for no definite term.

Industry makes up more than 32% of the tax base for the town of Groton. Major industries include Electric Boat, Pfizer Inc., and Arwood Corp. Along Route 12 in Groton, seven parcels of land are residential complexes owned by the Navy.

Southeastern Connecticut has a variable climate that is defined by both continental and maritime air masses and modified by its proximity to the Atlantic Ocean. The region lies in the path of prevailing westerlies and cyclonic disturbances that cross the country from the west or southwest toward the east and northeast. The prevailing winds are southwesterly in the summer and northwesterly in the winter. The average wind speed is around ten miles per hour. The region is exposed to occasional storms that ravel up the Atlantic coast. Storms in the region are laden with moisture from the ocean; in addition, some storms are tropical and occasional storms are of hurricane intensity.

According to data from New London, Connecticut, the average annual temperature is approximately 50°F. Average monthly temperatures vary from 58-72°F in July and August to 23-30°F in January and February.

Precipitation averages approximately 44 inches per year as measured at New London over an 81-year interval. Precipitation ranges from 32 to 65 inches per year. The greatest amount of precipitation occurs in the months of March and August and the least in June and September. Evaporation averages approximately 23 inches per year (NSB-NLON Master Plan, 1988).

1.4.2 Area A Landfill Site

In addressing the Area A Landfill site in particular, subsection 1.4.2.1 provides a summary of its historic operations or uses. A summary of previous environmental investigation and enforcement activities pertaining to the Area A Landfill site is also provided in subsection 1.4.2.1.

Subsection 1.4.2.2 provides a brief description of the main features and location of the Area A Landfill site.

1.4.2.1 Area A Landfill Site History

According to the IAS report, the landfill opened sometime before 1957. However, a 1957 aerial photograph shows no apparent landfilling, indicating a somewhat later startup date. All materials generated by base operations that were not salvageable were incinerated, and the residues were disposed in the Goss Cove and Area A Landfills. The base incinerator ceased operating in 1963, and from 1963 to 1973 all wastes were disposed in the landfill, unburned. During this time, all non-salvageable materials generated by the submarines and base operations were disposed in the Area A Landfill and include: radioactive wastes and medical wastes from the hospital, industrial wastes from ship repair and maintenance facilities, commercial/residential wastes from housing and office facilities, and bulky wastes from construction activities. There are no records indicating the volume or type of waste disposal in the landfill. The former incinerator was located north of the Lower Subase along the waterfront at the present location of Building 478.

The area fill method was reportedly used in landfill operations. The area fill method consists of filling an area in a sequence of cells and lifts. Each lift is a specified thickness and consists of several cells. Each cell can be viewed as a rectangular area which is filled from back to front. The front area is the "working face" and is the location where new refuse is placed and is the area that is covered on a daily basis. The cover material used on the landfill was gravel obtained from the Groton water supply reservoir.

Landfilling operations ceased in 1973. After closure, a bituminous concrete pad was constructed in the southwest portion of the landfill for the aboveground storage of industrial wastes. The pad is still in existence and is located adjacent and to the northeast of Building 373, and south of the dirt road that extends through this area. At the time of the IAS survey, 42 steel drums, 87 transformers (mineral and PCB), and 60 to 80 electric switches were stored on the pad. Two transformers and several electrical switches were leaking. Past leakage of oil was also evident. Most drums were stacked on wooden pallets and those having PCB labels were covered and bound with plastic sheeting. All of these materials have since been properly disposed off site. There are no written records regarding storage of materials on the concrete pad. All available information regarding use of the pad is based on the IAS survey and interviews with Subase personnel, and has been provided herein.

The IAS report also noted that refuse, including steel drums, oxygen candles, wood scrap, metal scrap, concrete, and tires, was exposed at the edge of the landfill adjacent to the wetland. The IAS reported that petroleum compounds had recently been poured from containers and had flowed into the wetland at two locations (northwestern portions of landfill). The IAS report also stated that when batteries were overhauled, spent sulfuric acid solution was transferred to barrels and transported to Area A for disposal. The acid was poured into trenches dug with a bulldozer and subsequently covered with soil.

Atlantic personnel performed an inspection of the Area A Landfill on September 30, 1988. Orange leachate was observed along the toe of the slope of the landfill extending from the dike to the east end of the deployed parking lot. The slope of the landfill had been covered with fill and waste material in the landfill was not visible.

Sand bags and contractors' supplies and equipment were stored over the former landfill at the time of the inspection. Several transformers, removed underground storage tanks, crane weights, and other equipment were stored on the bituminous concrete pad in the southwest portion of the landfill. The remainder of the landfill is not paved.

The construction of a paved parking lot on the southeast end of the Area A Landfill was planned but has been delayed indefinitely.

1.4.2.2 Area A Landfill Site Description

Area A is located in the northeastern and north central section of the Subase. Area A includes four separate sites: (1) Area A Landfill (the subject of this report); (2) Area A Wetland; (3) Area A Downstream Watercourse; and (4) Area A Overbank Disposal Area (OBDA). The Area A Landfill site is relatively flat with a steep ridge sloping down to the landfill on the south and the Area A wetland to the north. Aerial photos show the landfill extending easterly along the southern edge of the wetland area. The landfill is approximately 9 acres in size. Access is via a dirt road off Wahoo Avenue. Drainage from the landfill is from south to north through the wetlands and ultimately into streams which discharge to the Thames River. Figure 1-5 indicates the site drainage pattern and relative location of the Area A Landfill.

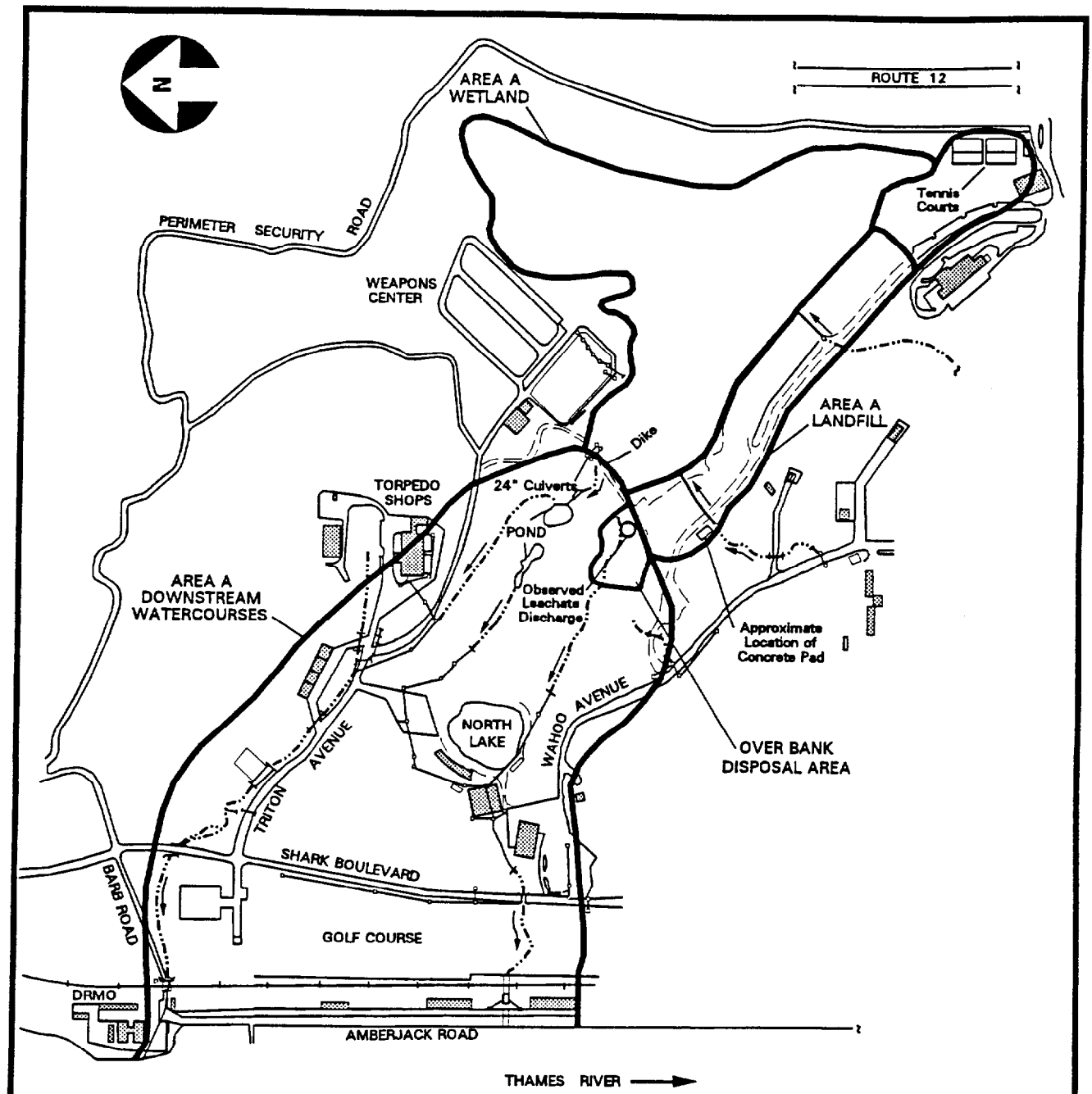
As stated in subsection 1.4.1.1, the Area A Landfill may have operated for an undetermined number of years prior to 1957, although aerial photographs indicate otherwise. For 10 years (1963-1973) following the closing of the base incinerator, all non-salvageable materials generated by the submarines and base operations were disposed of in this nine-acre landfill. After the landfill closed, a bituminous concrete pad was built in the southwest portion of the landfill for aboveground storage of industrial wastes. Materials included steel drums, wood and metal scrap, concrete, tires, transformers (mineral and PCB) and electric switches, and some petroleum compounds.

1.5 Site Physical Characteristics Overview

Similarly to the site background overview, this site physical characteristics overview is presented at two different levels: (1) the NSB-NLON site in general, and (2) the Area A Landfill site within the overall NSB-NLON site. Characteristics including topography, soils, surficial geology, bedrock geology, surface-water hydrology, and groundwater hydrology are presented at both levels.

1.5.1 Overall NSB-NLON Site Characteristics

Topography. The land around NSB-NLON is a series of low bedrock ridges that trend generally north-south. Lowlands between ridges are commonly wetlands and poorly drained



NOTE:

1. Underground utility locations are approximate.
2. Base map and utility information from maps of NSB-NLON prepared by Loureiro Engineering Associates, Dec 1980. Elevations are based on NSB-NLON datum which is 1.41 feet below NGVD.

INSTALLATION RESTORATION STUDY NAVAL SUBMARINE BASE - NEW LONDON GROTON, CT	LEGEND - Storm Culvert - Watercourse - Building Approximate Scale 0 200 400'	FIGURE 1-5 SITE PLAN AREA A DRAINAGE PATTERN ATLANTIC ENVIRONMENTAL SERVICES, INC.

stream valleys. The Thames River adjacent to the west of NSB-NLON is flanked by glacially derived terrace deposits and more recent flood plain deposits.

The topography of NSB-NLON (see Figure 1-2) is dominated by bedrock ridges in the northern (elevation 180 feet above mean sea level, or MSL) and central (elevation 230 feet MSL) portions of the site as well as an off-site ridge (Baldwin Hill, elevation 245 feet MSL) located adjacently east of the site. The low-lying area (elevation 50 feet above MSL) between these ridges slopes to the west (USGS, 1984). The eastern portion of this area is a wetland (Area A) which drains through an earthen dike into an area that is 30 to 40 feet below the elevation of the wetland. A review of historical topographic maps and other historical information suggests that the construction of the dike in 1957, and the subsequent filling of the area east of the dike with sediments dredged from the Thames River, contributed to this difference in elevation.

The southern and western portions of NSB-NLON are generally flat with sparse bedrock outcrops.

Soils. Figure 1-6 is a soils map of NSB-NLON prepared by the Soil Conservation Service (SCS, 1983). In general, soils at NSB-NLON have moderate to moderately rapid permeability according to the SCS information. Available water capacity is moderate to low, and runoff is rapid or very rapid. The pH is strongly to moderately acidic. Erosion hazard is severe. A detailed description of each soil follows (SCS, 1983). Figure 1-6 shows soil classifications found at NSB-NLON.

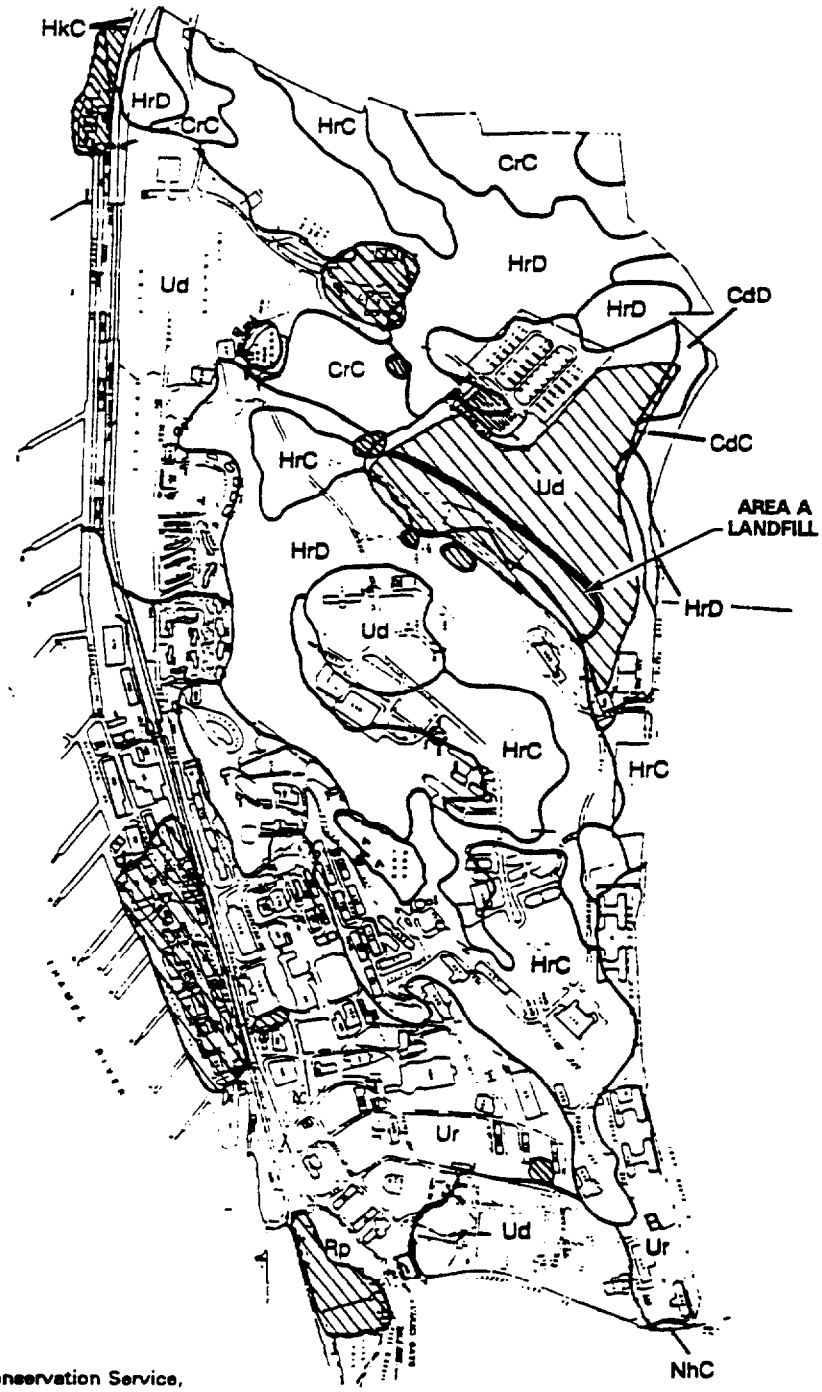
Regarding SCS soil descriptions, the following remarks are noted: (1) SCS soil grain size ranges are different from those used in geological and engineering practice; (2) SCS descriptions are based only upon the first five feet of soil from the surface; and (3) descriptive permeability ranges for a given soil type correspond to specific numerical values.

Surficial Geology. Information regarding the surficial geology present at the site was obtained from the USGS Surficial Geology of the Uncasville Quadrangle Map (USGS, 1960). Figure 1-7 shows the surficial geology of the site.

Most of the surficial deposits on site are unconsolidated glacial materials deposited during the Pleistocene Age. The remainder of the surficial deposits are the products of post-glacial geologic processes and man-made modifications.

The glacial deposits are divided into two types: nonstratified drift (also known as till or ground moraine) and stratified drift (also known as outwash). Nonstratified drift was deposited in direct contact with the glaciers. Stratified drift was deposited by meltwater streams from a near or distant ice mass.

Most of the bedrock on site is mantled by a thin layer of till which consists of a dense, heterogeneous mixture of clay, silt, sand and rock fragments ranging in size from cobbles to boulders. The majority of the material is unstratified but locally contains small pockets or lenses of stratified sand and gravel. Till is exposed on most of the upland surface and underlies outwash materials in the valleys. It varies considerably in thickness and in some places is



SOURCE: Soil Conservation Service,
U.S. Department of Agriculture

INSTALLATION RESTORATION STUDY

NAVAL SUBMARINE BASE - NEW LONDON

GROTON, CT

LEGEND

CdC - Canton and Charlton, 3-15% slopes
CdD - Canton and Charlton, 15-35% slopes
CrC - Charlton -Hollis, 3-15% slopes
HrC - Hollis-Charlton Rock, 3-15% slopes
HrD - Hollis-Charlton Rock, 15-45% slopes
HkC - Hinkley Sandy Loam, 3-15% slopes
NhC - Narragansett Silt Loam, 3-15% slopes
Rp - Rock Outcrop-Hollis, 3-45% slopes
Ud - Udorthents-Urban Land, 0-15% slopes
Ur - Urban Land, surface covered by pavements or structures

FIGURE 1-6

SOILS MAP

ATLANTIC ENVIRONMENTAL SERVICES, INC.

Definitions for Figure 1-6, Soils Map

CdC - Canton and Charlton, 3-15 % Slopes - This complex consists of sloping to gently sloping, well drained, extremely stony fine sandy loams found on glacial till upland hills, plains and ridges. Stones and boulders cover eight to 25 percent of the surface.

Charlton, Canton and a number of other soils are mapped together because there are no major differences in use or management. The mapped acreage of this group is approximately 55 percent Canton soil, 25 percent Charlton soil and 20 percent other soils.

Typically, the Canton soil has a black, fine sandy loam surface layer one inch thick. The subsoil is dark, yellowish-brown, fine sandy loam and sandy loam 23 inches thick. The substratum is grayish brown gravelly sand to a depth of 60 inches or more. Permeability of the Canton Soil is moderately rapid in the surface layer and subsoil and rapid in the substratum. Available water capacity is moderate. Canton soil warms up and dries out rapidly in the spring. It is strongly acidic to medium acidic.

The Charlton soil typically has a very dark grayish brown, fine sandy loam surface layer three inches thick. The subsoil is dark yellowish brown, yellowish brown and light olive brown fine sandy loam 26 inches thick. The substratum is grayish brown fine sandy loam to a depth of 60 inches or more. Permeability of the Charlton soil is moderate or moderately rapid. Available water capacity is moderate. Charlton soil warms up and dries out rapidly in the spring. It is strongly acidic to medium acidic. The hazard of erosion is moderate or severe.

CdD - Canton and Charlton, 15-35 % Slopes - This group consists of extremely stony, fine sandy loams with steep to moderately steep slopes. Stones and boulders cover eight to 25 percent of the surface. Most areas mapped CdD are irregular or long and narrow in shape and from two to 50 acres in size. Erosion hazard in these areas is severe. Other characteristics of the Canton and Charlton soils are as described above.

CrC - Charlton-Hollis, 3-15 % Slopes - This gently sloping to sloping complex consists of very rocky fine sandy loams that are somewhat excessively drained to well drained. Rock outcrops cover up to ten percent of the surface. Stones and boulders cover one to eight percent of the surface. Most areas mapped CrC are irregular in shape and two to 60 acres. This complex is about 55 percent Charlton soil, 20 percent Hollis soil, and 25 percent other soils and rock outcrops. Erosion hazard is moderate to severe.

The Hollis soil typically has a very dark brown, fine sandy loam surface layer two inches thick. The subsoil is dark brown and dark yellowish brown fine sandy loam 15 inches thick. Hard unweathered bedrock is usually at a shallow depth. Permeability of the Hollis soil is moderate to moderately rapid above bedrock. Available water capacity is low, and runoff is medium or rapid. Hollis soil warms up and dries out rapidly in the spring. It is strongly acidic to medium acidic.

Characteristics of the Charlton Soils are described above.

HrC - Hollis-Charlton Rock, 3-15 % Slopes - This gently sloping to sloping complex consists of somewhat excessively drained and well drained soils and rock outcrop on glacial till uplands. Stones and boulders cover one to eight percent of the surface. Mapped areas are irregular in shape and two to 45 acres in size. The complex consists of 40 percent Hollis soil, 25 percent Charlton soil, 20 percent rock outcrop, and 15 percent other soils. The hazard of erosion is moderate to severe. Characteristics of Hollis and Charlton soils are described above.

HrD - Hollis-Charlton Rock, 15-45 % Slopes - This moderately steep to very steep complex consists of somewhat excessively drained and well drained soils and rock outcrop on glacial till uplands. Stones and boulders cover one to eight percent of the surface. Mapped areas are irregular in shape and two to 45 acres in size. The complex consists of 40 percent Hollis soil, 25 percent Charlton soil, 20 percent rock outcrop, and 15 percent other soils. The hazard of erosion is severe. Characteristics of Hollis and Charlton soils are described above.

HkC - Hinckley Sandy Loam, 3-15 % Slopes - This gently sloping and sloping excessively drained soil is a gravelly, sandy loam that is found on stream terraces, outwash plains, kames and eskers. Most mapped areas are irregular in shape and between two and 25 acres in size. Erosion hazard is moderate or severe.

Typically, the Hinckley soil has a dark brown, gravelly sandy loam surface layer seven inches thick. The subsoil is yellowish-brown gravelly loamy sand 15 inches thick. The substratum is brownish-yellow very gravelly coarse sand to a depth of 60 inches or more. Permeability is rapid in the surface layer and subsoil and very rapid in the substratum. Available water capacity is low, and runoff is medium or rapid. Hinckley soil warms up and dries out rapidly in the spring. It is strongly acidic or medium acidic.

NhC - Narragansett Silt Loam, 3-15 % Slopes - This extremely stony silt loam is a gently sloping to sloping, well drained soil which is found on glacial till uplands hills, ridges and plains. Stones and boulders cover eight to 25 percent of the surface. Most mapped areas are irregular in shape and from 2 to 40 acres in size. The hazard of erosion is moderate or severe.

Typically, this Narragansett soil has a dark brown, silt loam surface layer three inches thick. The subsoil is dark yellowish-brown and yellowish-brown silt loam 25 inches thick. The substratum is light olive brown gravelly, loamy coarse sand to a depth of 60 inches or more. Permeability of the Narragansett soil is moderate in the surface layer and subsoil and moderately rapid or rapid in the substratum. The available water capacity is high, and runoff is medium to rapid. Narragansett soil warms up and dries out rapidly in the spring. It is strongly acidic or medium acidic.

Rp - Rock Outcrop-Hollis, 3-45 % Slopes - This gently sloping to very steep complex consists of rock outcrop and a somewhat excessively drained soil on glacial till uplands. Stones and boulders cover one to eight percent of the surface. Mapped areas are irregular in shape and mostly 2 to 15 acres in size. This complex is about 50 percent rock outcrop, 30 percent Hollis soil, and 20 percent other soils. The hazard of erosion is severe. Rock outcrop is hard, unweathered, exposed bedrock.

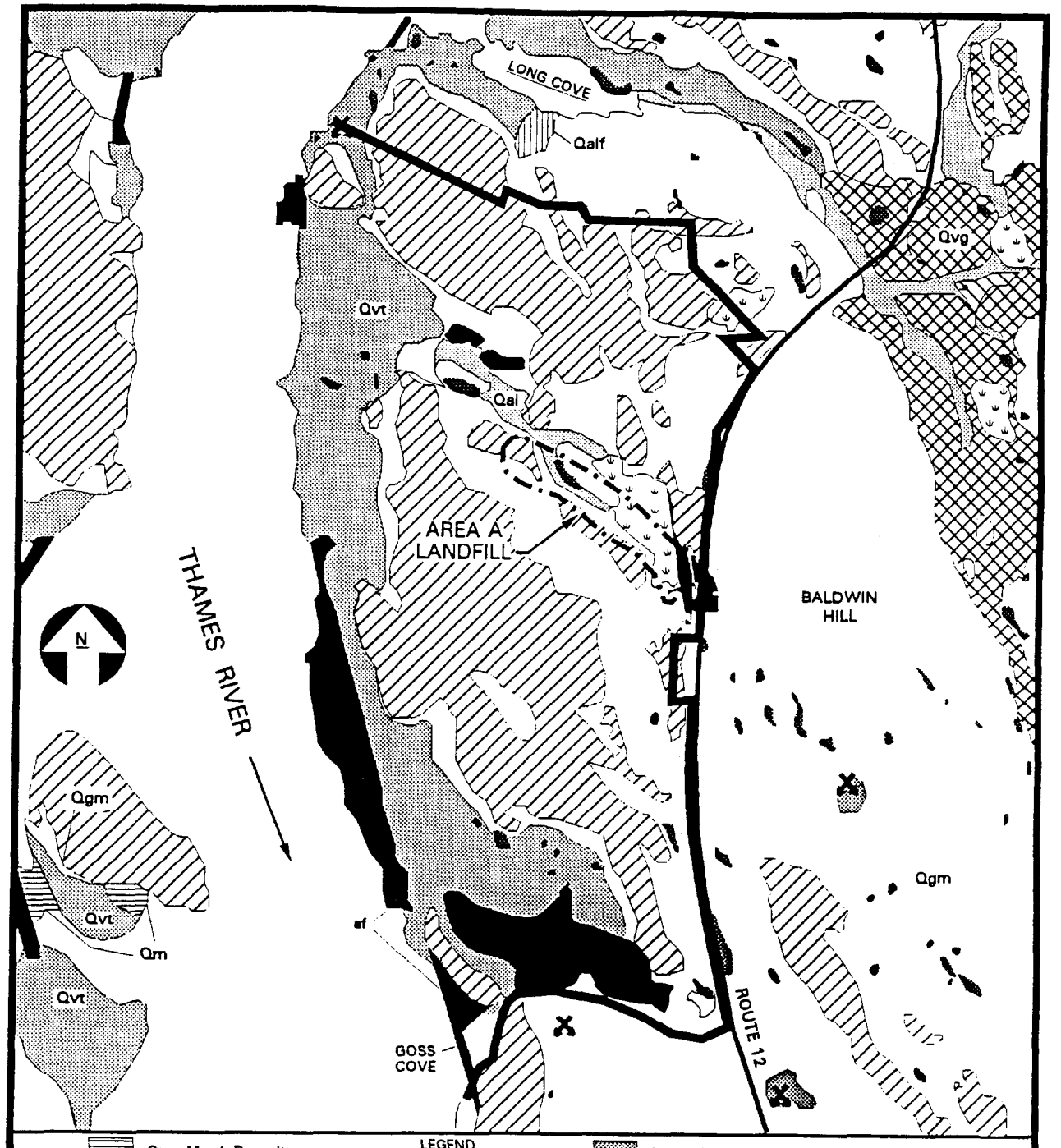
The characteristics of the Hollis soil are described above.

Ud - Udorthents-Urban Land, 0-15 % Slopes - This complex consists of excessively drained to moderately well drained soils that have been disturbed by cutting and filling, and areas that are covered by buildings or pavement. Mapped acres are mostly 5 to 40 acres in size. About 60 percent of the complex is Udorthents, 25 percent is urban land, and 15 percent is other soils. Some areas of Udorthents have been cut to a depth of two feet or more, and some have been covered with more than two feet of fill. Permeability of the Udorthents is slow to very rapid. The available water capacity and runoff are variable.

Urban land consists mainly of areas of developed or disturbed land.

Ur - Urban Land - This group consists of land where more than 85 percent of the surface is covered by streets, parking lots, buildings and other structures. Most urban land is in densely populated areas and units are 5 to 30 acres in size.

Most of the underlying soils have been altered by excavating or have been covered with fill material.



INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CT

LEGEND
- Bedrock Exposures
- Artificial Fill
- Borrow Pit, Active
- Sites Investigated

Refer to Figure 3-4A for sediment descriptions.
SOURCE: U.S.G.S. Surficial Geology Map, 1960

FIGURE 1-7
SURFICIAL GEOLOGY MAP

ATLANTIC ENVIRONMENTAL SERVICES, INC.

absent, but averages less than ten feet thick. The till is thickest on the north slopes of hills and thin to absent on the summit and south sides. Till on the site consists of either locally fissile, bouldery sand and gravel or a fissile, bouldery, silt and clay.

Till has been mapped in many areas of the site.

Stratified drift is stratified silt, sand and gravel that was deposited by glacial meltwater. As the ice melted and local base levels of streams were lowered, the stratified deposits were left as ridges, mounds, terraces and pitted valley floors. At NSB-NLON, stratified drift is shown as terrace deposits of the Thames River and is mapped in the western portion of the site, at the southwestern end of the site adjacent to the former location of Crystal Lake.

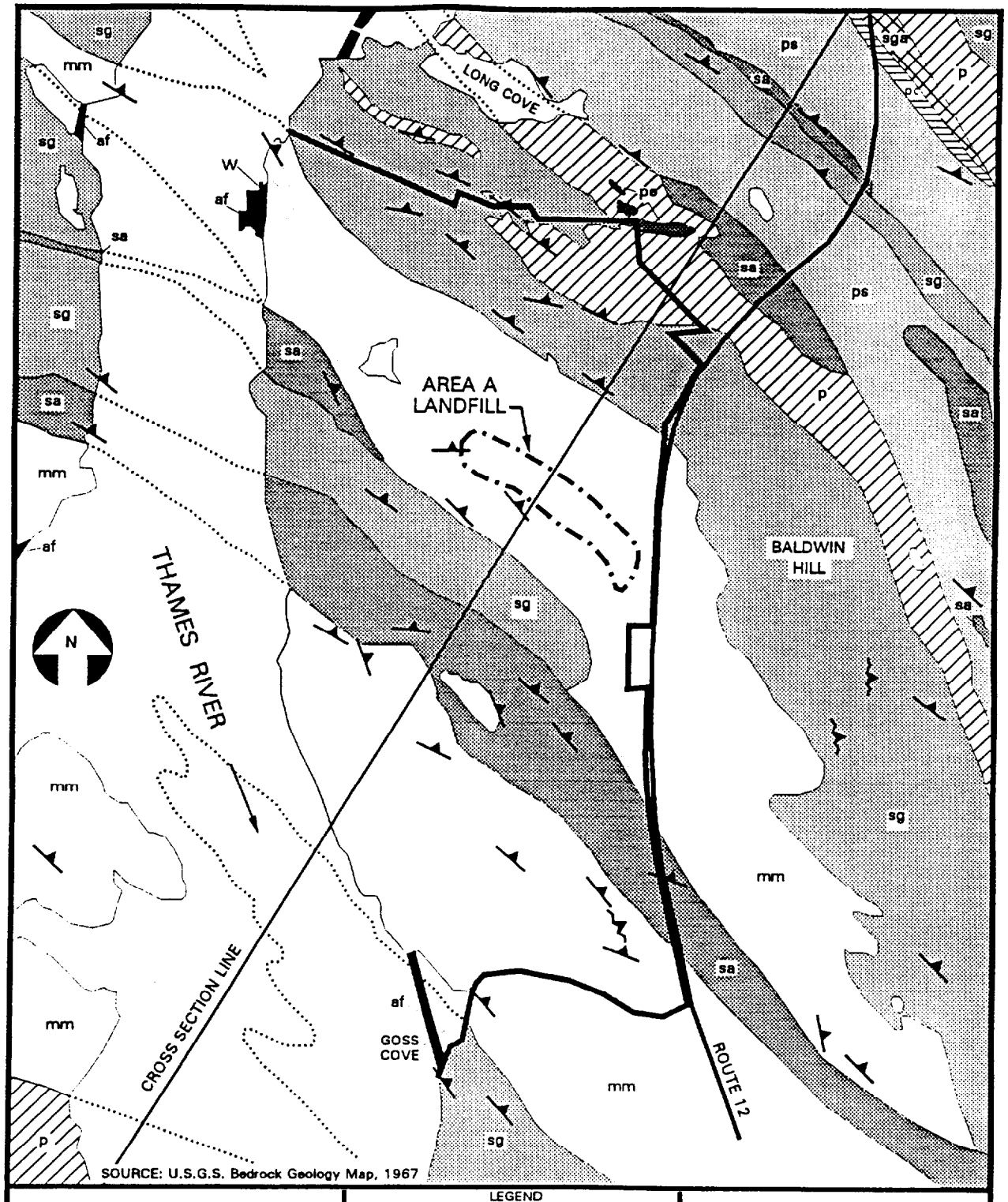
The northwestern end of the Area A Wetland, as well as the Over Bank Disposal Area and the Area A Downstream Watercourses, is mapped as Quaternary Alluvium. Quaternary alluvium consists of recently deposited sand, silt and gravel in flood plains.

Artificial fill is mapped in many areas of the site. Extensive bedrock outcrops are mapped and were observed throughout NSB-NLON.

Bedrock Geology. Information regarding the geology of the site and surrounding area is based on data published by the United States Geological Survey (USGS, 1967) and supplemented by field observations.

NSB-NLON is situated in the Eastern Uplands region of Connecticut, an area that is characterized by irregular hilly areas with many swamps, exposed bedrock, and poorly drained, uneven valleys. The Eastern Uplands can be divided into two geologic terrains according to their origins - the Avalonian Terrane which originated from continental crust, and the Iapetus Terrane which originated from oceanic crust (Rodgers, 1985). The Avalonian Terrane is considered to be the remnant of a relatively small continental land mass that collided with the North American continent in the late Permian Period (approximately 250 million years ago). The Iapetus Terrane is composed of sediments from the ocean that lay between the Avalonian continent and the North American continent and were intensely deformed prior to and during the collision (Bell, 1985). The northern portion of eastern Connecticut is part of the Iapetus Terrane. The southeasternmost portion of Connecticut, including NSB-NLON, consists of intensely deformed rocks that make up the Avalonian Terrane. A major east-west trending fault, the Honey Hill Fault, separates the two terrains approximately six miles north of NSB-NLON. Avalonian rocks, including the bedrock at NSB-NLON, consist of metamorphosed sedimentary and igneous rocks.

According to the USGS Bedrock Geologic Map (USGS, 1967), the bedrock at NSB-NLON can be divided into three age groups, Pre-Silurian, Pre-Pennsylvanian, and Pennsylvanian or younger. The local bedrock contains a complex series of folds, faults, anticlines and synclines. Figure 1-8 shows the bedrock geology of the site and Figure 1-9 presents a generalized geologic cross-section of the site area.



INSTALLATION RESTORATION STUDY

NAVAL SUBMARINE BASE - NEW LONDON

GROTON, CT

LEGEND

Refer to Figure 1-9 for formation descriptions.

- mm
- sa
- p
- ps
- pe
- sga
- sg
- af
- pc

w - Westerly Granite — Sites Investigated

Strike & Dip of Mineral Foliation

- Inclined
- Gently Folded

FIGURE 1-8

BEDROCK GEOLOGY MAP

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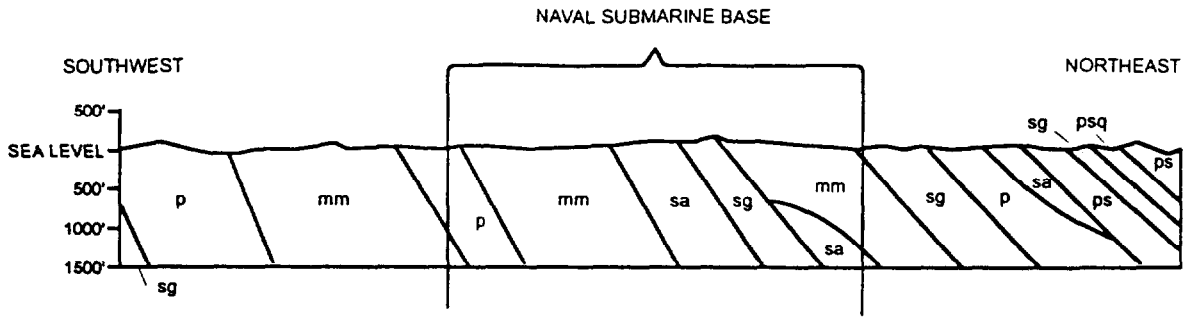


Cross-section location shown on Figure 1-8

Legend

Alaskite gneiss

sa - orange-pink to light-grey, fine to medium-grained, equigranular gneissic granite composed of about equal amounts of quartz, microcline and albite tosodic oligoclase, and about 1 percent magnetite or as much as 2 percent magnetite and biotite.

Granite gneiss

sg - orange-pink to light-grey, medium-grained, gneissic biotite granite, main constituents quartz - microcline oligoclase with 2-7 percent biotite and iron oxides. Locally contains muscovite and garnet; somewhat uneven in mineral distribution. Foliation typically marked
by parallelism of alternate flat lenses of quartz and feldspars, and parallelism of biotite flakes. Biotite tends to be concentrated on surfaces between lenses. Some masses have
slightly coarser grained streaks rich in orange-pink microcline in finer grained grey quartz-microcline-plagioclase rock. Locally mafic-poor similar to biotitic phases of the alaskite gneiss (sob).

Mamacoke Formation

mm - indistinctly layered light- to dark-grey, biotite-, quartz-feldspar gneiss and minor hornblende-biotite-quartz-feldspar gneiss; locally granitoid and migmatic. Thin layers of amphibolite and quartzite. Biotite flakes typically small and mostly evenly distributed.

Plainfield Formation

p - dark-green hornblende-biotite-quartz-plagioclase gneiss, in part diopsidic; dark biotite-quartz-plagioclase gneiss with variable amounts of microcline; garnet-biotite-quartz-feldspar schist and gneiss; amphibolite; light-grey sugary textured biotite-feldspar-quartz
gneiss; thin grey quartzite, rare thick white quartzite.

pc - calc-silicate quartzite and gneiss.

pa - garnet-sillimanite-biotite-quartz-feldspar schist and gneiss; garnet-biotite-quartz-feldspar gneiss; biotite-quartz-feldspar gneiss; minor biotite-quartz-andesine gneiss with diopside and colorless amphibole; thin-bedded quartzite, locally pyritic.

psq - thick- to thin-bedded, white or tan, to light-grey, rarely greenish quartzite; thin-bedded micaceous quartzite, locally graphitic; thin interlayers of garnet and sillimanite-bearing schist and gneiss.

INSTALLATION RESTORATION STUDY NAVAL SUBMARINE BASE - NEW LONDON GROTON, CT	LEGEND SOURCE U.S.G.S. Bedrock Geology Map, 1967 N	FIGURE 1-9 BEDROCK GEOLOGY CROSS-SECTION LINE ATLANTIC ENVIRONMENTAL SERVICES, INC.

Pre-Silurian rocks at the site consist primarily of members of the Mamacoke Formation and, to a lesser extent, the Plainfield Formation. Mamacoke Formation rocks are composed of indistinctly layered light-to-dark gray, medium-grained, biotite-quartz-feldspar gneiss. Minor layers contain sillimanite, garnet, hornblende and microcline as well. Members are locally granitoid and migmatic. Rocks from a member of the Plainfield Formation underlie the northeast portion of the site. The unit is a dark green hornblende-biotite-quartz-plagioclase gneiss. Pre-Pennsylvanian rocks occurring at NSB-NLON are members of the Sterling Plutonic Group and consist of igneous intrusives that have been metamorphosed to granitic gneisses. The Sterling Plutonic Group is further divided into the Alaskite Gneiss and the Granite Gneiss.

The Alaskite Gneiss is an orange-pink to light gray, fine- to medium-grained, equigranular, gneissic granite composed of equal amounts of quartz, microcline and albitic-to-sodic oligoclase, with small amounts of magnetite and biotite.

The Granitic Gneiss is an orange-pink to light gray, medium-grained gneissic biotite granite. The main constituents are equal amounts of quartz and microcline, oligoclase, and from two to seven percent biotite and iron oxides. In both the Granitic and Alaskite Gneisses, the biotite tends to be concentrated on the boundaries of lenses.

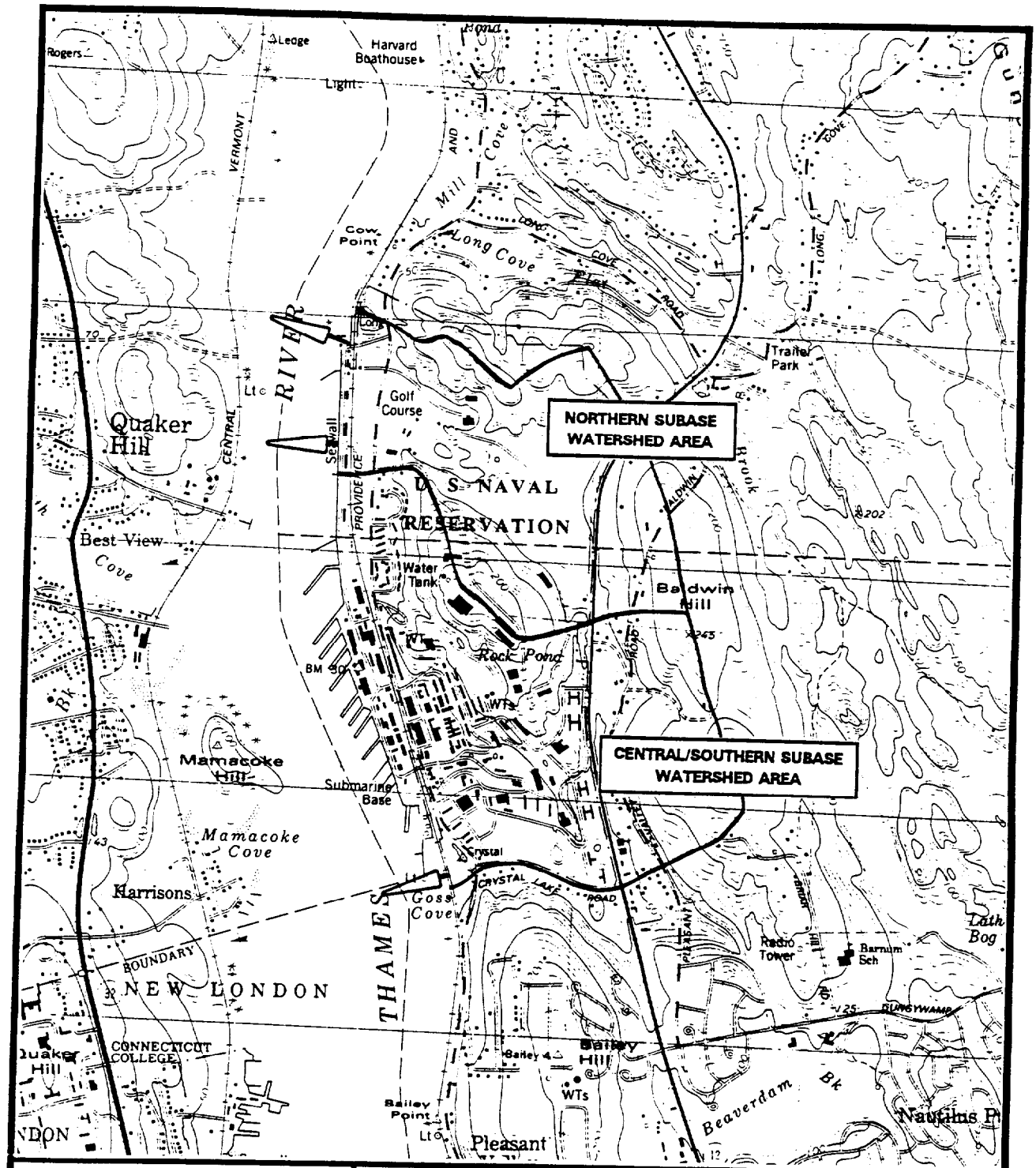
One occurrence of the Westerly Granite has been mapped on the northwest portion of the site. The Westerly Granite occurs in dikes of gray fine- to medium-grained, equigranular granite that is composed of primarily calcic oligoclase with equal amounts of quartz and microcline, about 3% biotite, 1% muscovite and accessory minerals.

Surface Water Hydrology. NSB-NLON is located on the east bank of the Thames River within the Thames River Watershed. The Thames River and its tributaries drain approximately 1,400 square miles of eastern Connecticut, western Rhode Island, and south central Massachusetts. The Thames River originates at the City of Norwich Harbor, at the confluence of the Shetucket and Yantic Rivers, and discharges into Long Island Sound approximately six miles south of NSB-NLON. The Thames River estuary extends from Long Island Sound north 16 miles to Norwich. Widths of the river vary from 1.5 miles at New London Harbor to approximately 500 feet at Norwich Harbor.

Surface water from the site drains west toward the Thames River via streams and storm sewers. Figure 1-10 shows site drainage basins. The off site portion of these watersheds includes a sparsely developed residential area located to the east along Route 12 and an area with limited commercial development located north of the intersection of Crystal Lake Road and Route 12.

On-site drainage includes several streams and ponds located in the north central section of NSB-NLON. These water courses discharge to the Thames River through discharge points located at the DRMO, on the Lower Subase north of Pier 33, and at the Goss Cove Landfill.

Groundwater Hydrology. Information on area aquifers was obtained from the Connecticut Water Resource Bulletin Numbers 15 and 16 (USGS/CWRC, 1968).



INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CT

LEGEND

SOURCE: U.S.G.S. Topographic Map, 1984
Uncasville, Ct.

N

Major Surface Water Discharge Points

FIGURE 1-10
WATERSHED AREAS IN THE VICINITY OF NSB-NLON

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In the site vicinity, groundwater is present in stratified drift, bedrock and to a lesser extent, till. General aquifer characteristics for each type encountered on site are described below.

A fine-grained stratified drift aquifer is mapped on the western and southwestern portions of the site. Mapped thickness of stratified drift ranges from ten feet along the banks of the Thames River to a maximum depth of 80 feet at the former location of Crystal Lake in the southwestern portion of the site. Average estimated permeabilities of wells in stratified drift in the area range from 250 to 1,400 gallons per day per square foot (gpd/ft^2). Well yields in the area range from 40 to 200 gallons per minute (gpm).

The bedrock in the site area consists of fractured metamorphic rock covered by glacial material that is thick in the lowlands and thinner in the uplands. In bedrock aquifers, groundwater movement is along joint planes rather than through intergranular openings. Well records indicate that bedrock wells in the site vicinity yield from between one and 65 gpm. Potential well yields in bedrock wells are dependent on degree of fracturing, topography, and type and thickness of overburden. In general, the greatest well yields occur in valleys where bedrock is highly fractured and is overlain by over 50 feet of stratified drift.

Till covers bedrock at locations previously discussed in this section. Till generally has low permeability and low water yield.

1.5.2 Area A Landfill Site Characteristics

The specific geology and hydrogeology data are provided for the Area A Landfill. Information discussed includes topography, soils classification, surficial geology, bedrock geology, surface-water hydrology, and groundwater hydrogeology. Test boring logs, monitoring well details, and aquifer property data are provided in the Phase I RI report.

Due to the close proximity of the sites, the Area A Landfill, Wetland and Downstream and the Over Bank Disposal Area were characterized in some discussions as a single unit for clarity. A total of 49 soil borings which included 20 test borings, 12 overburden monitoring wells and 17 bedrock monitoring wells were installed at these sites. Most test borings were generally extended to auger refusal. Borings for overburden monitoring wells were extended to bedrock or auger refusal, and borings for bedrock monitoring wells were extended through the overburden and into bedrock until sufficient water was encountered. Soils were not sampled in the latter, but information on the elevation of the bedrock surface was obtained from them. Several generalized geologic cross-sections were prepared from boring data; Plate 1 depicts the locations of cross-sections referred to in the text, as well as locations of all monitoring wells and test borings.

Topography. The topography of the site has been altered by landfilling. A review of topographic maps from 1893, 1938, 1939, and 1952 and other historical information provided the following information.

As discussed above, the low lying area that is now the Area A Wetland was filled in the late 1950s with dredged sediments from the Thames River. Refuse material generated at NSB-

NLON was disposed on top of dredge spoil in the Area A Landfill. Boring information from this investigation indicates that the thickness of dredge spoil is approximately 10 to 15 feet on the north section of the wetland and approximately 35 feet on the south portion of the wetland adjacent to the Area A Landfill. Thickness of refuse material in the landfill is estimated to be from ten to 20 feet. Landfill and dredge disposal activities substantially altered the topography of this area.

Soils. The 1983 SCS Soils Map (Figure 1-6) shows the majority of the Area A Landfill as Udorthents-Urban Land. The southwestern slope of the Landfill is classified as Hollis-Charlton Rock, 15-45% slopes. Both classifications are generally consistent with the soils and topography observed at the Area A Landfill.

Surficial Geology. The 1960 USGS Surficial Geology Map (Figure 1-7) shows nonstratified drift in the Area A Landfill. This classification is consistent with soils observed below fill material and dredge spoil in the eastern portion of the landfill and soils at the surface in the western portion of the landfill, the CBU Drum Storage Area and the Rubble Fill at Bunker A-86.

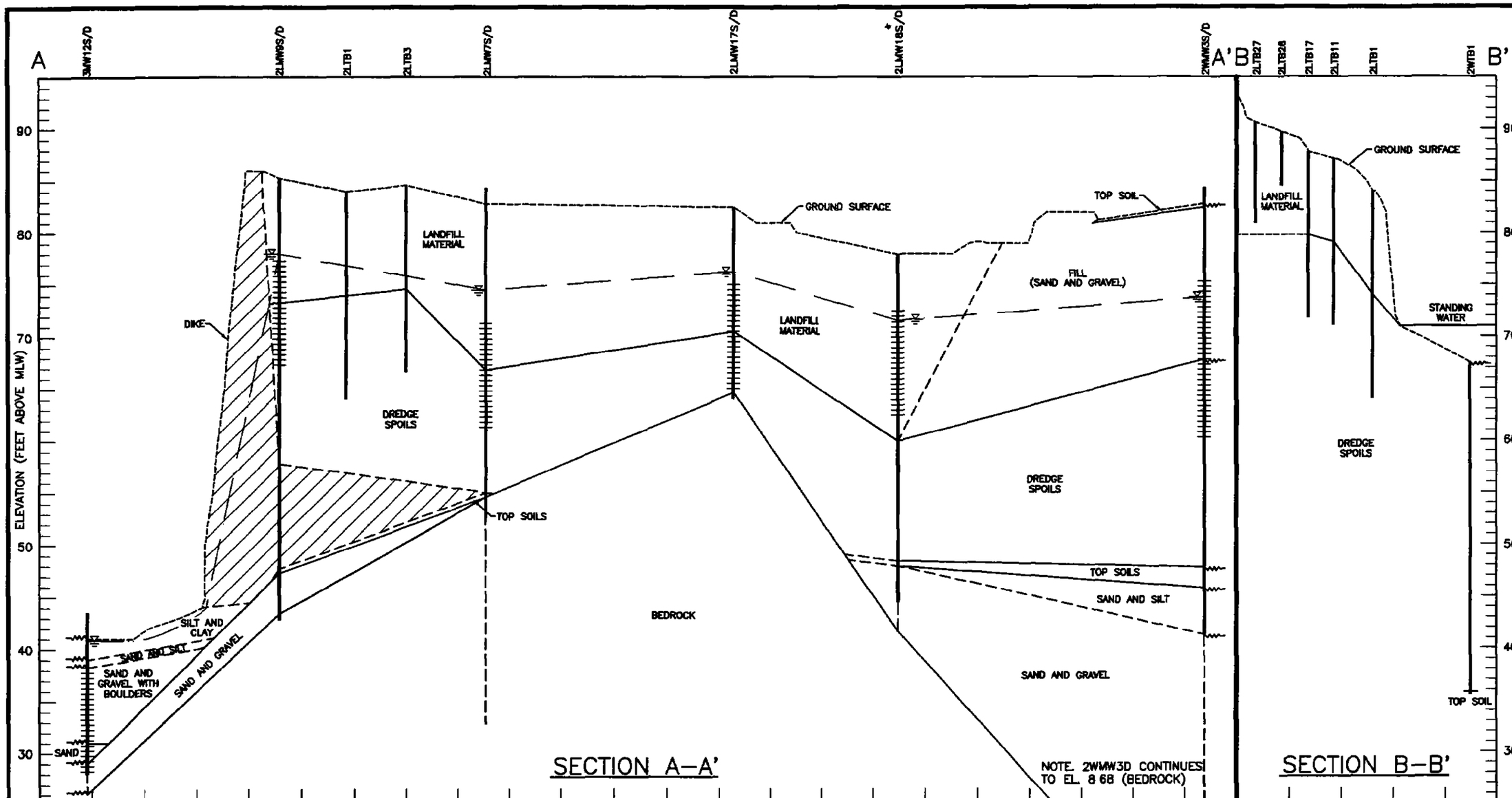
The Area A Landfill is underlain by 10 to 20 feet of miscellaneous fill material which comprises fine-to-coarse grained sand and gravel and refuse including ash, wood fragments, paper, brick fragments, and asphalt. The fill is generally underlain by 10 to 20 feet of dredge spoil. On the southeastern side, fill material is underlain by compact sand, silt and gravel which extends down to bedrock. Geologic cross-section A-A' (Figure 1-11) shows the subsurface conditions along the east-west axis of the landfill while cross section B-B' shows the subsurface conditions along the north-south axis.

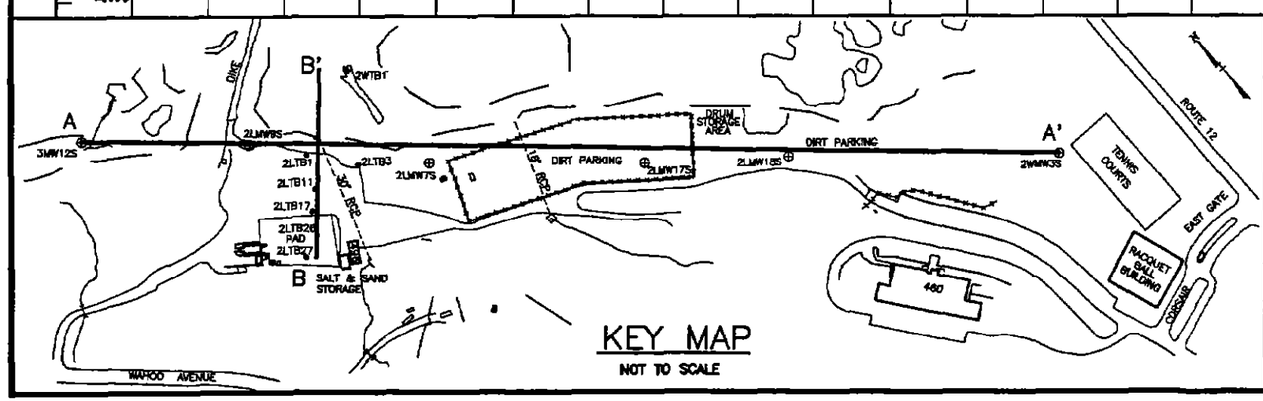
Bedrock Geology. The 1967 USGS Bedrock Geology Map (Figure 1-8) indicates that the bedrock underlying the majority of Area A is biotite-quartz-feldspar gneiss of the Mamacoke Formation. The northernmost portion of the wetland is underlain by a gneissic biotite granite that is mapped as the Granite Gneiss Member of the Sterling Plutonic Group. The southwestern portion of the Area A Downstream Watercourses is mapped as an equigranular gneissic granite known as the Alaskite Gneiss Member of the Sterling Plutonic Group.

During the Phase I RI, bedrock cores were drilled and collected at four monitoring well locations in Area A shown in Figure 1-12. Bedrock was cored until the rock quality designation (RQD) was greater than 75 percent or a minimum of 20 feet. In all cores, an RQD of 75 percent or greater was reached within 25 feet of the bedrock surface.

The bedrock at all four coring locations is mapped as the Mamacoke Formation. The mineralogy and texture of the bedrock cores is generally consistent with that of the biotite-quartz-feldspar gneiss of the Mamacoke Formation.

In addition to logging the mineralogy and texture of bedrock cores, Atlantic personnel noted such features as the degree of fracturing, weathering on fracture surfaces, and whether the fractures were dominantly horizontal or vertical. This information was used to determine hydrogeologic characteristics of the bedrock aquifer. In general, fracture orientations in the





KEY MAP
NOT TO SCALE

200 100 0 200 400
HORIZONTAL SCALE IN FEET

10 5 0 10 20
VERTICAL SCALE IN FEET

LEGEND

- INFERRED CONTACT
- GROUNDWATER TABLE (OBSERVED 3/21/91)
- BORING LOCATION
- GROUNDWATER LEVEL INDICATOR
- SCREENED INTERVAL

FIGURE 1–11
GEOLOGIC CROSS SECTIONS
AREA A LANDFILL

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NAVAL SUBMARINE BASE–NEW LONDON
GROTON, CONN.

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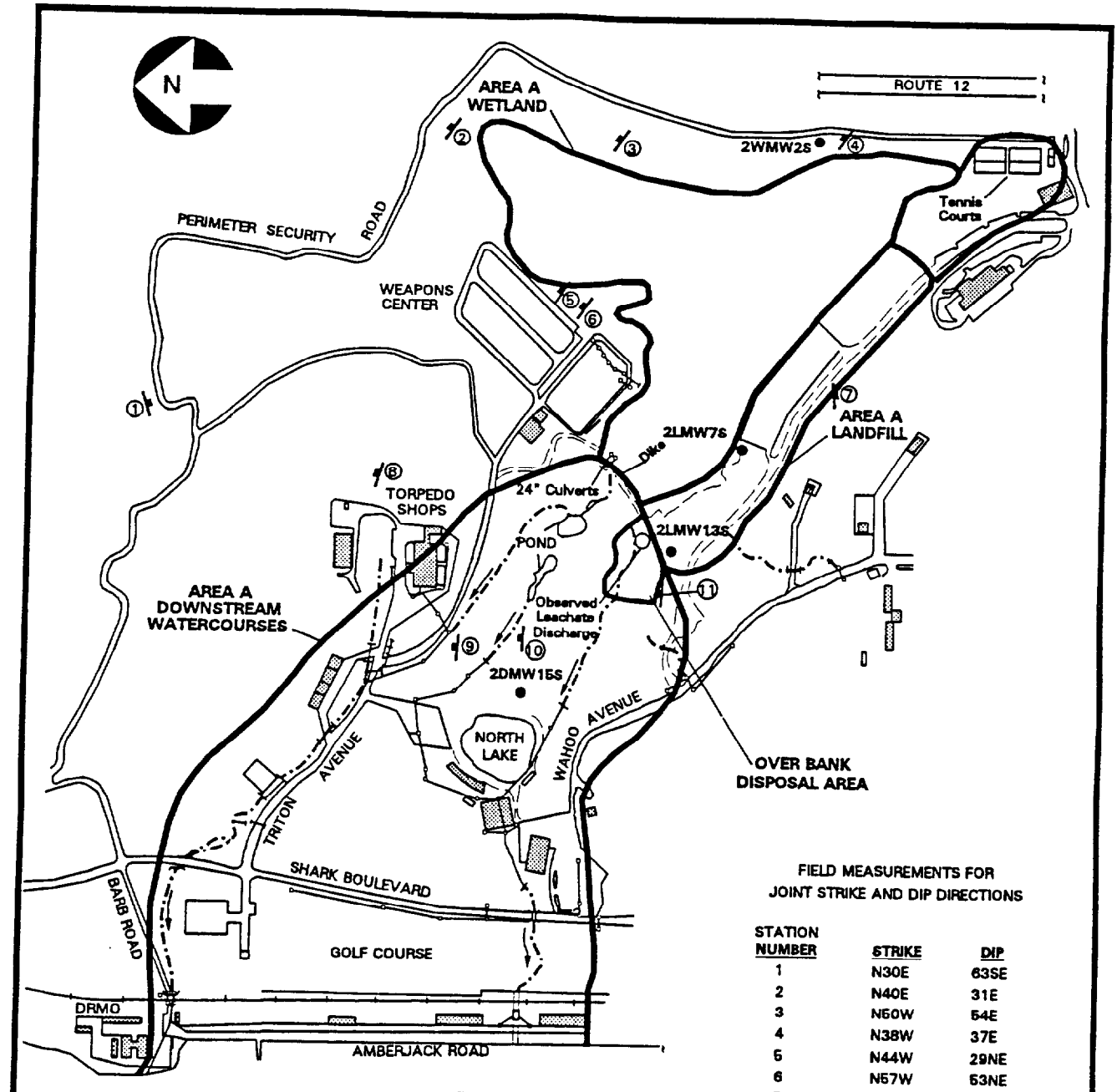

FIELD MEASUREMENTS FOR JOINT STRIKE AND DIP DIRECTIONS

STATION NUMBER	STRIKE	DIP
1	N30E	63SE
2	N40E	31E
3	N50W	54E
4	N38W	37E
5	N44W	29NE
6	N57W	53NE
7	N84W	61SW
8	N47W	51E
9	S68E	45SW
10	S77E	21SW
11	N59W	70NW

NOTE:
1. Underground utility locations are approximate.
2. Base map and utility information from maps of NSB-NLON prepared by Loureiro Engineering Associates, Dec 1980. Elevations are based on NSB-NLON datum which is 1.41 feet below NGVD.

INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CT

LEGEND
- Storm Culvert
- Strike and dip direction of joints with station location number.
- Coring Location
- Building
- Watercourse
Approximate Scale 0 200 400'

FIGURE 1-12
BEDROCK STRUCTURES AND CORING LOCATIONS

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bedrock cores parallel compositional banding in the gneiss. Biotite-rich bands with parallel alignment of micas tend to be both highly fractured and highly weathered; the fractures are parallel to banding and are oriented 45-60° from horizontal. More massive, quartz- and feldspar-rich bands tend to be less fractured, and fractures are generally horizontal.

In the bedrock cores logged for this investigation, orientation of fractures ranges from predominantly horizontal (2WMW2D), to 45° from horizontal (2DMW15D), to combinations and gradations of the two. The core from 2LMW7D shows primarily horizontal fractures with little weathering, but includes a two foot thick zone of highly weathered, fractured biotite-rich rock with fractures that are inclined approximately 60° from the horizontal. The core from 2LMW13D graded from horizontal, somewhat weathered fractures in the first ten feet to highly weathered fractures oriented 45° from horizontal in the last ten feet.

Subsurface bedrock elevation data was obtained for several points in Area A. From this data it appears that the bedrock surface is at its highest elevation at the northeast corner of Area A in the vicinity of well 2WMW1D. The lowest bedrock elevations were measured at 2WMW3D (near the tennis courts) and 2DMW16D (near North Lake). The bedrock surface elevation is greater in the Area A landfill than in the surrounding Wetland or Downstream. Between the landfill and the northeast corner of the wetland is a bedrock valley. This valley dips to the southeast (toward 2WMW3D) on the south side of the dike and dips to the northwest (toward 2DMW16D) on the north side of the dike.

To better predict groundwater flow in the bedrock aquifer, Atlantic personnel examined bedrock outcrops in the northern portion of NSB-NLON and measured the orientations of prominent joints and fractures. Figure 1-12 shows the orientation of joint sets. The most prominent joints are those that strike east-southeast to west-northwest and dip to the north. Vertical fractures that were measured strike generally north-south. Most of the measurements were taken from bedrock outcrops that are mapped as Mamacoke Formation.

Surface-Water Hydrology. The Area A Landfill site is located in the northern subase watershed area (Figure 1-10) and receives run-on primarily from the steep ridge located generally south of the landfill. This run-on is collected primarily by two catch basins, piped under the landfill, and discharged to the Area A Wetlands as shown in Figure 1-5. The remainder of run-on and direct precipitation flows as sheet flow across the landfill in a northerly direction and also discharges to the Area A Wetland. As shown in Figure 1-5, surface water flows from the Area A wetland through conduits in the dike to the Area A Downstream and ultimately to the Thames River.

Groundwater Hydrogeology. The Area A Downstream and Over Bank Disposal Area (OBDA) are physically separated from the Area A Wetland by an earthen dike and from the Area A Landfill by a steep slope. Cross-section A-A' and B-B' (Figure 1-11) shows the relative elevations of the Landfill, wetland and OBDA. It should be noted that the landfill cap proposed is intended to provide an interim source control measure that should improve groundwater quality by preventing the migration of contaminants from unsaturated materials to the groundwater.

Twelve overburden monitoring wells and 17 bedrock monitoring wells were installed in the Area A Landfill, Wetland, and Downstream and the Over Bank Disposal Area. A groundwater elevation contour map for the overburden aquifer at Area A is shown as Figure 1-13. As this map shows, the highest groundwater elevation was measured in the middle of the Area A Landfill at 2LMW8S. It appears that groundwater in the central/eastern portion of Area A flows north toward the Area A Wetland and groundwater in the northwestern portion of the Area A Landfill flows northwest toward the Area A Downstream and eventually to the Thames River.

Slug displacement test data from six overburden wells were analyzed in order to estimate the *in situ* hydraulic conductivity of the overburden materials throughout Area A. The slug tests were specified in the Phase I RI Work Plan and are a common method used to estimate hydraulic conductivity. The tests involve removing a slug of water from, or adding a slug of solid mass material to, the monitoring well. The recovery of the water level to its original elevation is thus measured in relation to time. This data is then used to determine the hydraulic conductivity of the aquifer materials. The mean hydraulic conductivity of the fill material and the dredge spoil combined was calculated to be 3.2 feet/day. The hydraulic conductivity of the dredge spoil was calculated to be 1.0 feet/day. The hydraulic conductivity of the material surrounding well 2DMW16S (Downstream Area) was calculated to be 6.8 feet/day.

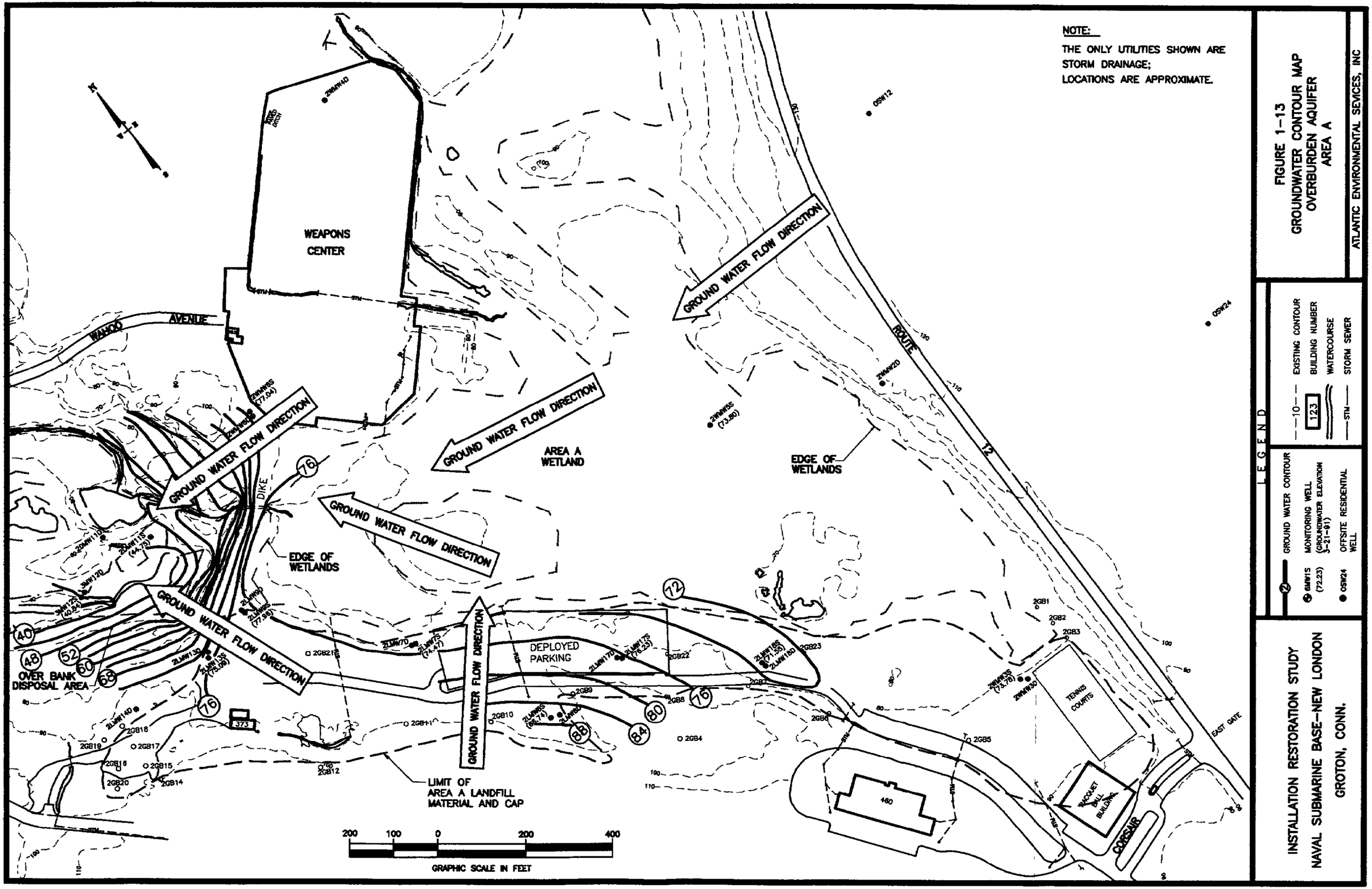
The velocity of groundwater flow through sediments in the landfill and wetland portions of Area A was estimated to be 0.04 feet/day, using a hydraulic conductivity of 3.2 feet/day, a porosity of 0.30 (Freeze and Cherry, 1979) and a hydraulic gradient of approximately 0.004 (from Figure 1-13). The groundwater flow velocity through the soils in the Area A downstream, using a hydraulic conductivity of 6.8 feet/day, 0.30 for the porosity, and 0.01 for the hydraulic gradient (from Figure 1-13), was calculated to be 0.02 feet/day.

To characterize the bedrock aquifer in the study area, 17 monitoring wells were installed in Area A, one well was installed at the Torpedo Shops and one was installed upgradient at the DRMO. To further characterize groundwater flow in the bedrock aquifer at the boundaries of the site, groundwater elevations were measured in five off site wells located to the north, east and southeast of Area A. Well data and elevation estimates are listed in Table 1-1. The accuracy of well water elevations derived from Town of Ledyard maps is estimated to be ± 5 feet. The accuracy of elevation from NSB-NLON maps is estimated to be ± 1 foot.

TABLE 1-1
SUMMARY OF OFF-SITE RESIDENTIAL WELL ELEVATION DATA

Well Number	Address	Ground Elevation (Source)	Approximate Water Elevation (feet)
OSW-8*	1292 Route 12	82 (NSB-NLON)	74.8*
O8W-12	1444 Route 12	138 (Ledyard)	123.4
OSW-24	1298 N. Pleasant Valley Road	171 (Ledyard)	161.5
OSW-28	1469 Route 12	119.6 (NSB-NLON)	98.7
OSW-29*	1323 Route 12	115 (NSB-NLON)	80.1*

* Indicates static water level, no pumping conducted.


NOTE:
THE ONLY UTILITIES SHOWN ARE STORM DRAINAGE;
LOCATIONS ARE APPROXIMATE.
WEAPONS CENTER
WAHOO AVENUE
GROUND WATER FLOW DIRECTION
AREA A WETLAND
EDGE OF WETLANDS
DIKE
ROUTE 12
OVER BANK DISPOSAL AREA
DEPLOYED PARKING
TENNIS COURTS
RACQUET BALL BUILDING
460
373
EAST GATE
CORSAIR
LIMIT OF AREA A LANDFILL MATERIAL AND CAP
GRAPHIC SCALE IN FEET
200 100 0 200 400
LEGEND
GROUND WATER CONTOUR
MONITORING WELL (GROUNDWATER ELEVATION 3-21-91)
OFFSITE RESIDENTIAL WELL
EXISTING CONTOUR
BUILDING NUMBER
WATERCOURSE
STORM SEWER
FIGURE 1-13
GROUNDWATER CONTOUR MAP
OVERBURDEN AQUIFER
AREA A
ATLANTIC ENVIRONMENTAL SEVICES, INC
INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE-NEW LONDON
GROTON, CONN.

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On-site and off-site data were compiled to make a potentiometric map for the bedrock aquifer, which is presented as Figure 1-14.

Slug displacement tests were conducted in bedrock wells 2LMW7D and 2LMW18D in the Area A Landfill. The open bedrock interval in well 7D is eight feet, and in well 18D it is ten feet. The calculated transmissivity from well 7D slug test data is 69 ft^2/day, and from well 18D it is 216 ft^2/day, assuming a porous aquifer thickness of 150 feet.

1.6 Nature and Extent of Contamination at the Area A Landfill Site

The nature and extent of soil and groundwater contamination detected at the Area A Landfill are summarized in subsections 1.6.1 through 1.6.4.

1.6.1 Screening Investigations at the Area A Landfill Site

Included in this subsection are the results of several non-intensive or screening technologies including a radiation survey, a geophysical survey, soil gas survey, and a methane gas survey.

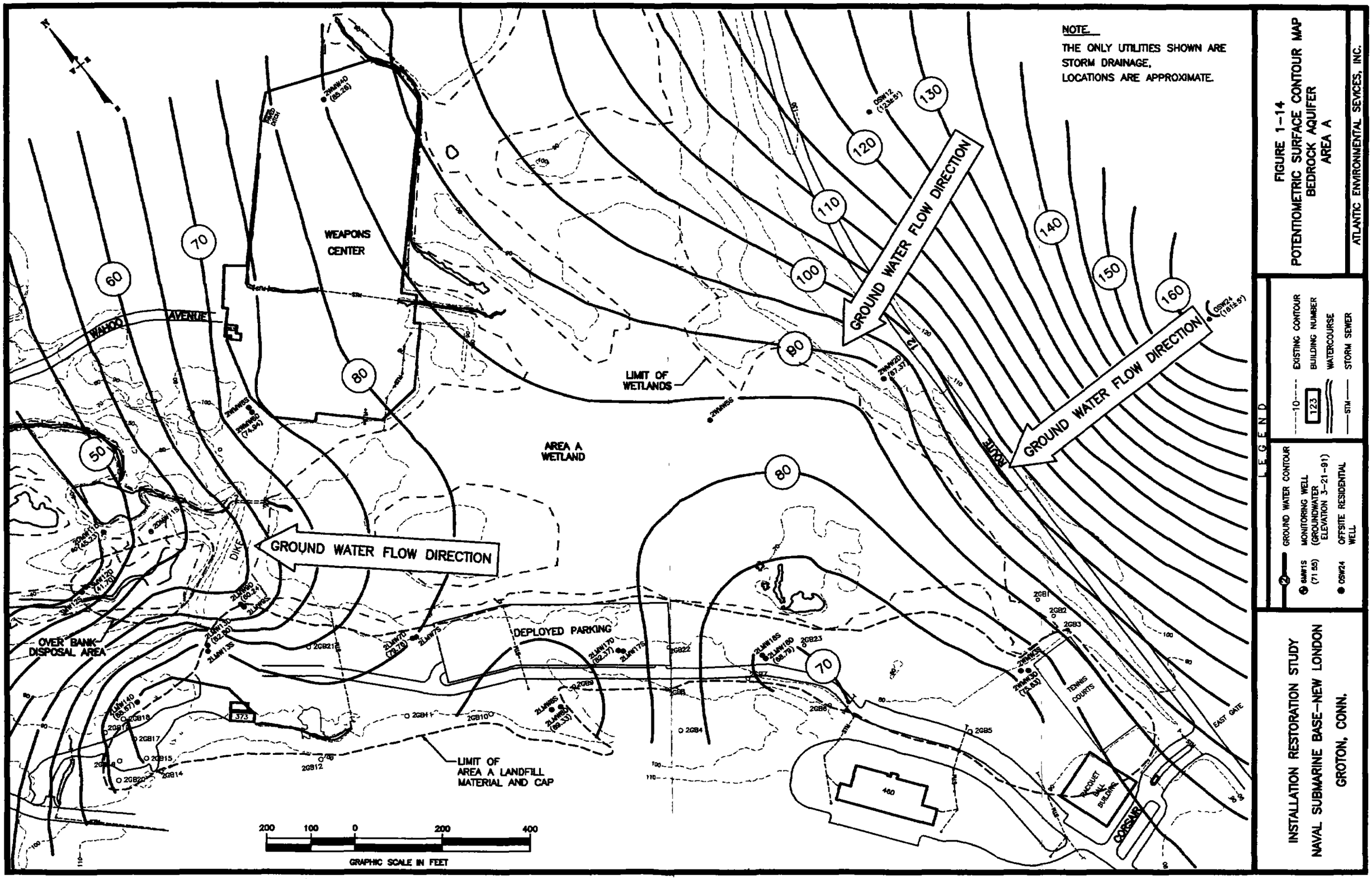
Radiation. A radiation survey of the Area A Landfill was performed as part of the Phase I RI. Results of this survey indicate that out of 1,272 measurements taken in the Area A Landfill, fifteen survey points were found to have gamma readings equal to or greater than 20 micro Roentgens per hour (μR/hr.). Several of the fifteen points were determined to be due to naturally occurring radiation from nearby rock outcrops. The remaining points were located in a section of the landfill used to store sand bags piled on wooden pallets; it was determined that the sand was the source of the elevated readings (sand, like rock, may contain trace amounts of naturally occurring radioactive materials). This survey did not detect any man-made contamination or buried radioactive materials in the landfill. This survey is not conclusive regarding detection of all radioactive materials potentially disposed in the Area A Landfill; therefore, the Navy has agreed to perform further investigations of radioactive waste disposal.

Geophysics. A combination of ground-penetrating radar (GPR), magnetometry, and EM terrain conductivity methods were performed at the Area A Landfill. Grid survey points are shown in Figure 1-15.

GPR Results. GPR data collection at Area A was limited to locations where the GPR antenna could access the ground surface. Regions excluded from the GPR survey include the sandbag storage piles and locations cluttered with surface metal objects. Most GPR data from Area A is characterized by numerous mottled reflectors commonly indicative of fill materials.

Continuous GPR reflectors noted near Lines 40 through 46 may represent the bottom of relatively clean fill which appears to be underlain by landfill materials. The thickest sections of the inferred "clean" fill is near Line C.5, Station 46.5 and Line 45.5, Station D.5. Note that C.5 indicates one-half distance between C and D, and similarly for 46.5.

Numerous individual objects were noted on the GPR recordings. Two objects are


NOTE.
THE ONLY UTILITIES SHOWN ARE STORM DRAINAGE.
LOCATIONS ARE APPROXIMATE.
FIGURE 1-14
POTENTIOMETRIC SURFACE CONTOUR MAP
BEDROCK AQUIFER
AREA A
ATLANTIC ENVIRONMENTAL SEVICES, INC.
LEGEND
GROUND WATER CONTOUR
MONITORING WELL (GROUNDWATER ELEVATION 3-21-91)
OFFSITE RESIDENTIAL WELL
EXISTING CONTOUR
BUILDING NUMBER
WATERCOURSE
STORM SEWER
INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE-NEW LONDON
GROTON, CONN.
WEAPONS CENTER
WAHOO AVENUE
GROUND WATER FLOW DIRECTION
LIMIT OF WETLANDS
AREA A WETLAND
DIKE
OVER BANK DISPOSAL AREA
DEPLOYED PARKING
LIMIT OF AREA A LANDFILL MATERIAL AND CAP
TENNIS COURTS
EAST GATE
CORSAIR
TACQUET BALL BUILDING
373
460
GRAPHIC SCALE IN FEET

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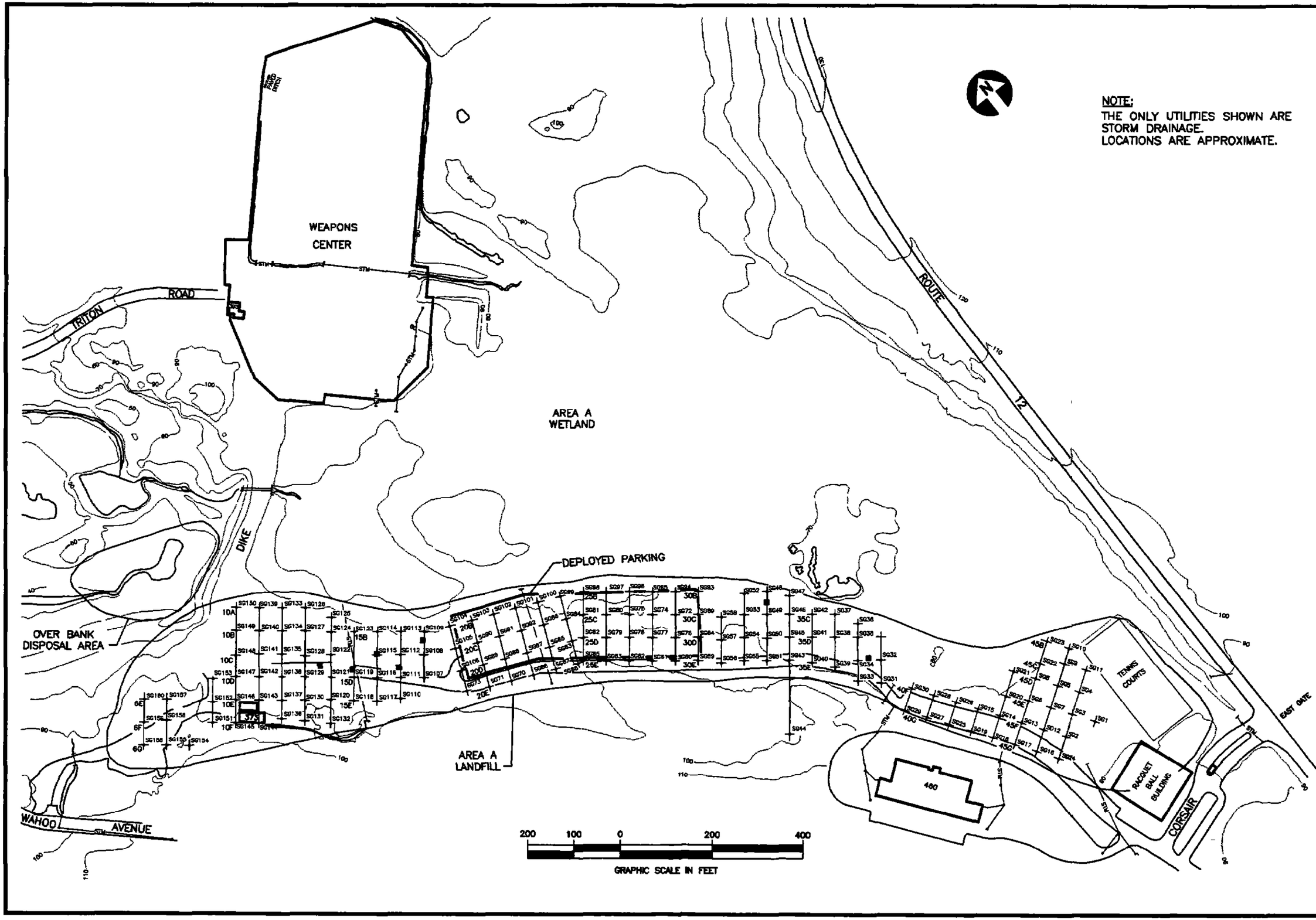

FIGURE 1-15
GRID SURVEY POINTS
AREA A LANDFILL

ATLANTIC ENVIRONMENTAL SERVICES, INC.

LEGEND

10	EXISTING CONTOUR
123	BUILDING NUMBER
	WATERCOURSE
STM	STORM SEWER
	GRID LINE
10A	GRID POINT
SG26	SOIL GAS SAMPLE NO.
■	POTENTIAL BURIED METAL OBJECTS

INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE-NEW LONDON
GROTON, CONN.

0072404Z

particularly large and located near Line E, Station 25.9 (approximately five feet deep) and Line 33, Station B.8 (approximately seven to eight feet deep).

Magnetic and EM Conductivity Results. The region west of Line 13.5 exhibits little magnetic variation, indicating that no significant ferrous objects are buried there. This region is therefore likely to be outside the disposal limits.

Buried metal objects may be located east of Line 13.5, as indicated by numerous magnetic variations. The most significant magnetic anomalies are listed below in decreasing order of priority: 1) 20 feet south of survey point 17C, 2) 5 feet north of survey point 15D, 3) at Line 13.5, 10 feet south of Station C, and 4) 25 feet south of survey point 18B. These buried metal objects are significant as they could affect settlement or contain sources of contamination. The objects will not affect settlement unless they contain large voids or liquids. Any liquids contained also represent a source of contamination.

A lack of EM conductivity anomalies were recorded at the northwest corner of the survey area, similar to the magnetic data discussed above. High conductivity values (up to approximately 300 mmhos/m) in the eastern portion of the survey area may be due to either salt or landfilled materials. EM data indicates anomalies located at Line 13.5, 10 feet south of Station C and at survey point 16 C.

Both magnetic and EM conductivity data show a northwest anomaly trend located east of the deployed parking area (15 feet east of survey point 37E).

EM conductivity values throughout the easternmost portion of Area A Landfill (adjacent to Racquetball Center) are not as high as observed in other portions of Area A (up to 80 mmhos/m), but could still represent limited landfilling.

Soil Gas. A total of 160 soil gas points were analyzed as shown in Figure 1-16. Soil gas results were primarily used as a screening tool to aid in the selection of final locations for wells and borings.

Trace to low levels of 1,1-dichloroethene, trichloroethene, and tetrachloroethene were noted in scattered soil gas points across the site.

Thirty-two moderate-to-high soil gas results were recorded, containing many unknowns with occasional associated benzene, toluene, and xylenes. All of these chromatograms were similar and suggest a petroleum product. The fact that most of these points were located within the deployed parking area makes it reasonable to assume that the contamination is the result of leaks from the many parked cars in this unpaved area.

Methane Gas Survey. A methane survey of the landfill was performed to determine if significant methane levels are being generated by the decomposition of landfill materials. The quantitation of high levels of methane could create the potential for an explosion if not properly addressed by venting before a cap is installed over the landfill, or excess pressure buildup due to accumulation of methane gas could cause damage to the cap by uplifting. Analytical results

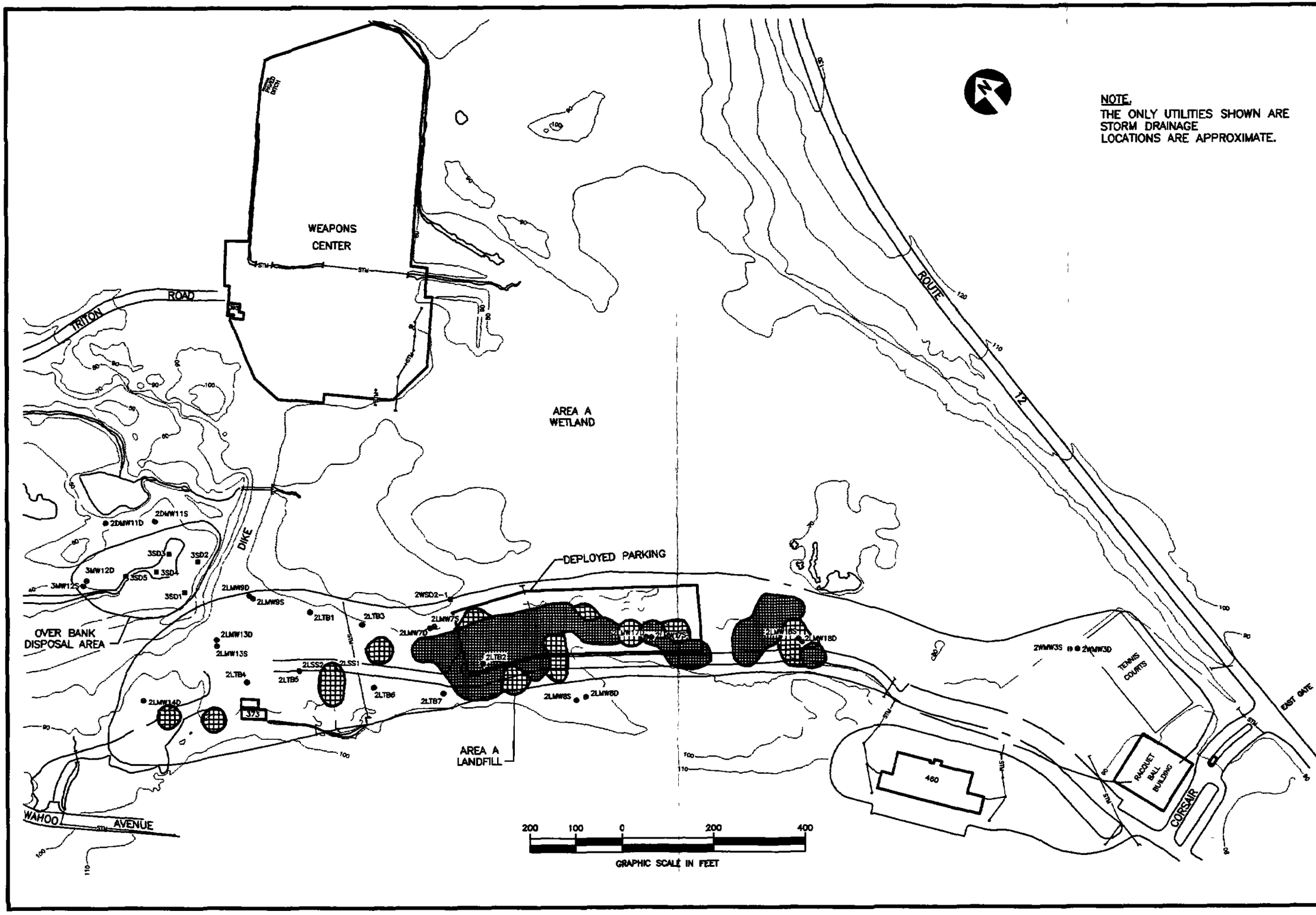

FIGURE 1-16
SOIL GAS CONCENTRATIONS
AREA A LANDFILL

ATLANTIC ENVIRONMENTAL SERVICES, INC

LEGEND

SOIL GAS CONCENTRATIONS
HIGH
MODERATE

10 EXISTING CONTOUR
123 BUILDING NUMBER
WATERCOURSE
STM STORM SEWER

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GROTON, CONN.

00724052

and sampling locations are presented in Figure 1-17. Thirty-seven sampling locations were sampled and analyzed using an organic vapor analyzer with a flame ionization detector equipped with a gas-chromatograph. Only surficial materials were tested for methane as the site cross-section consists of 10 to 20 feet of fill over dredge spoils. These deposits (fill and dredge spoils) decrease in thickness until they are no longer present to the south of the landfill alongside the bottom of the hillside, which rises steeply in the south. Because the hill consists of a shallow till layer over bedrock, deeper horizontal migration of methane in sand or other pervious layers was not identified as a potential pathway for gas migration. Results ranged from nondetected (29 locations) to 90,000 ppm. Four sampling points located were determined to contain methane at levels greater than 25% of the Lower Explosive Limit (LEL) or 1,250 ppm (the LEL for methane is 5,000 ppm). The LEL is defined as the lowest concentration of gas or vapor (% by volume in air) that will burn or explode if an ignition source is present at ambient temperatures. Three of these locations contained methane above the actual LEL value.

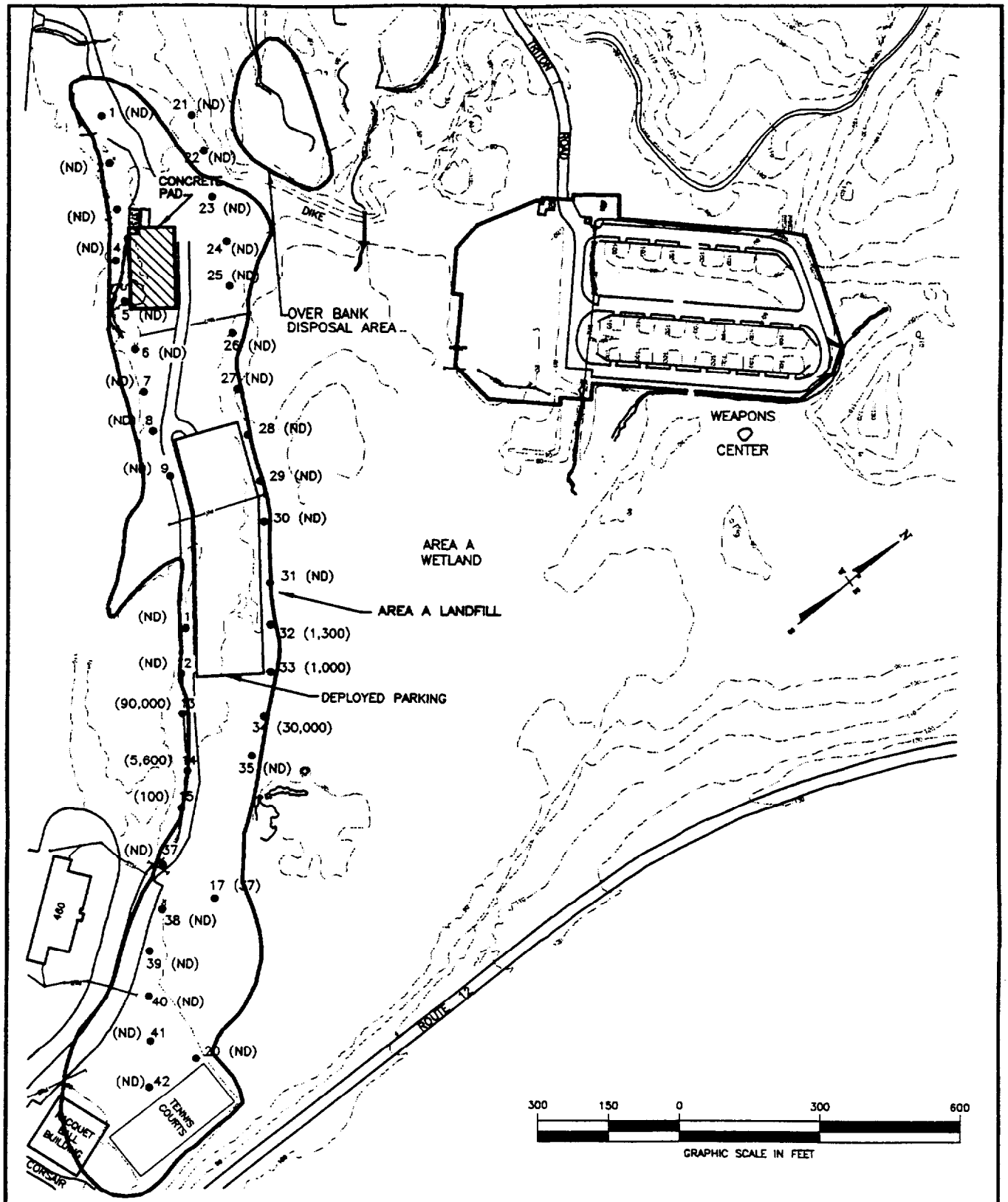
1.6.2 Subsurface and Surface Soils at the Area A Landfill Site

Two surface soil samples and twelve subsurface soil samples were collected from eight test boring/monitoring well locations during the Phase I RI investigation at the Area A Landfill site. Summary data tables showing the analytical results from this investigation are included in Appendix A. Figure 1-18 shows sample locations and a summary of results for key parameters. Supplemental investigations comprised select sections of the Phase II RI Work Plan at the Area A Landfill were focused on defining the extent of PCB contamination near the bituminous concrete pad. The results of these field investigations which consisted of field-screening all samples with a gas chromatograph for PCB content, off-site laboratory analysis of 13 subsurface soil samples collected from 24 test borings, and four samples of the bituminous concrete pad, are included as Appendix B. The results of this investigation are summarized in Figure 1-19. In addition, the Area A Landfill/Wetland interface was sampled in November 1994 by Halliburton NUS. Sample results are included as Appendix C. The sampling was performed to determine if disturbance at the wetlands would be necessary to implement remedial actions at the Area A Landfill. If the wetlands at the interface contained contamination above levels of concern, either the proposed landfill cover would have to be extended into the wetland to cover these contaminated materials or, alternatively, the contaminated materials in the wetlands would be required to be removed. Based on these test results, the wetlands do not have to be disturbed to implement remedial actions at the Area A Landfill.

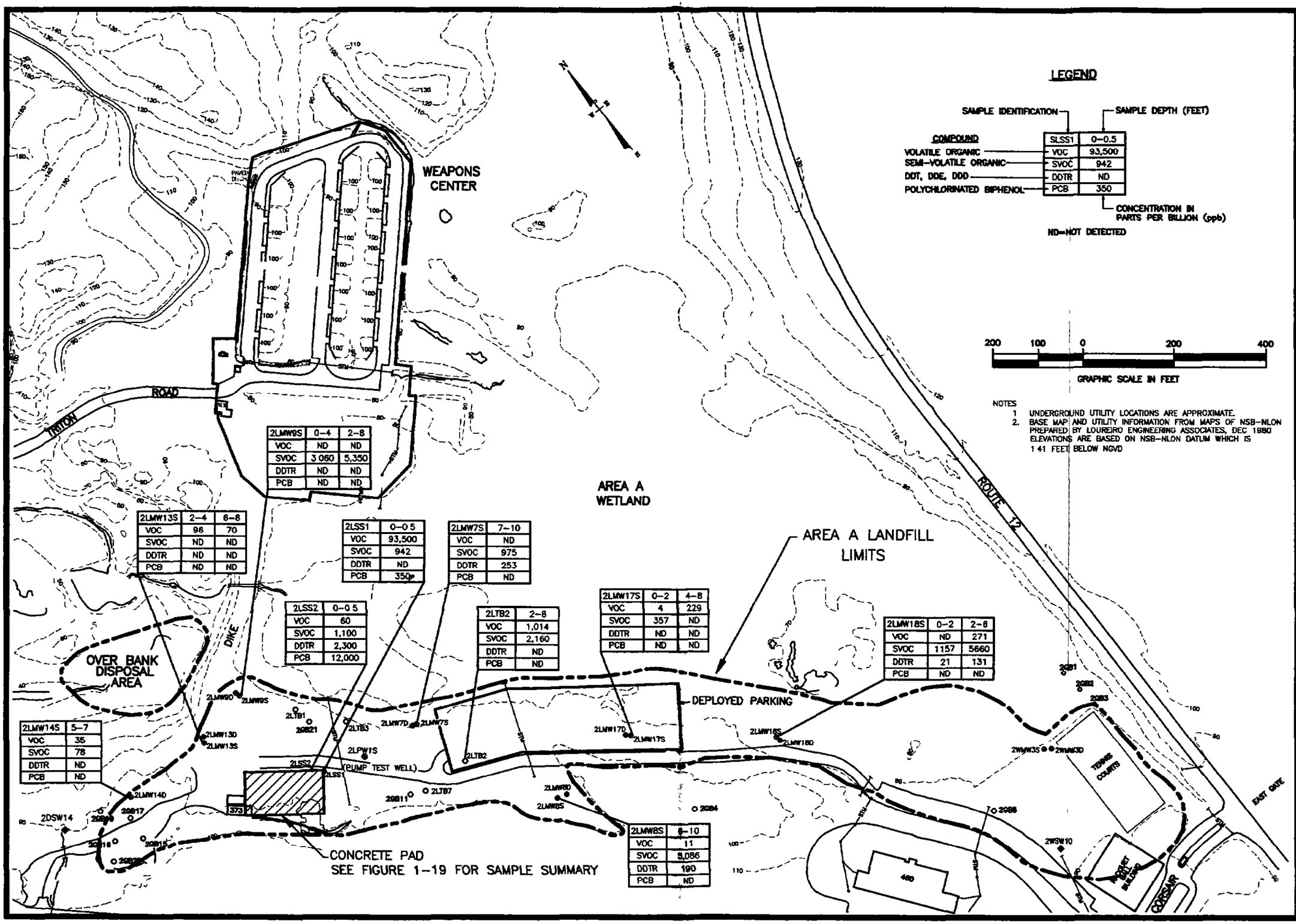
The sources of contamination detected at the Area A Landfill are, according to best available knowledge, the materials discarded at the landfill. Documented soil contaminants detected, based on testing performed to date, are described separately for surface soils and subsurface soils below. Surface soils include surface soil samples collected from a depth of 0 to 6 inches and samples collected from a depth of 0 to 2 feet. Subsurface soil samples include all samples collected from a depth below 2 feet.

Surface Soils

- Volatile organic compounds (VOCs), predominantly xylene, toluene, and ethylbenzene, ranging in concentration from non-detected to 75 ppm for



INSTALLATION RESTORATION STUDY NAVAL SUBMARINE BASE–NEW LONDON GROTON, CONN.	LEGEND (100) 1 SAMPLE RESULTS IN PPM METHANE GAS SURVEY SAMPLE LOCATION ND MEANS NOT DETECTED 10 EXIST CONTOUR 123 BUILDING No. WATERCOURSE STM STORM SEWER CATCH BASIN	FIGURE 1–17 AREA A LANDFILL METHANE GAS SURVEY SAMPLE LOCATIONS AND RESULTS ATLANTIC ENVIRONMENTAL SERVICES, INC.



SLSS1	0-0.5
VOC	93,500
SVOC	942
DDTR	ND
PCB	350

2LMW9S	0-4	2-8
VOC	ND	ND
SVOC	3 060	5,350
DDTR	ND	ND
PCB	ND	ND

2LMW13S	2-4	6-8
VOC	96	70
SVOC	ND	ND
DDTR	ND	ND
PCB	ND	ND

2LSS1	0-0 5
VOC	93,500
SVOC	942
DDTR	ND
PCB	350

2LMW7S	7-10
VOC	ND
SVOC	975
DDTR	253
PCB	ND

2LSS2	0-0 5
VOC	60
SVOC	1,100
DDTR	2,300
PCB	12,000

2LTB2	2-8
VOC	1,014
SVOC	2,160
DDTR	ND
PCB	ND

2LMW17S	0-2	4-8
VOC	4	229
SVOC	357	ND
DDTR	ND	ND
PCB	ND	ND

2LMW18S	0-2	2-8
VOC	ND	271
SVOC	1157	5660
DDTR	21	131
PCB	ND	ND

2LMW14S	5-7
VOC	35
SVOC	78
DDTR	ND
PCB	ND

2LMW8S	8-10
VOC	11
SVOC	3,086
DDTR	190
PCB	ND

FIGURE 1-18
PHASE I SOIL ANALYTICAL RESULT SUMMARY
AREA A LANDFILL

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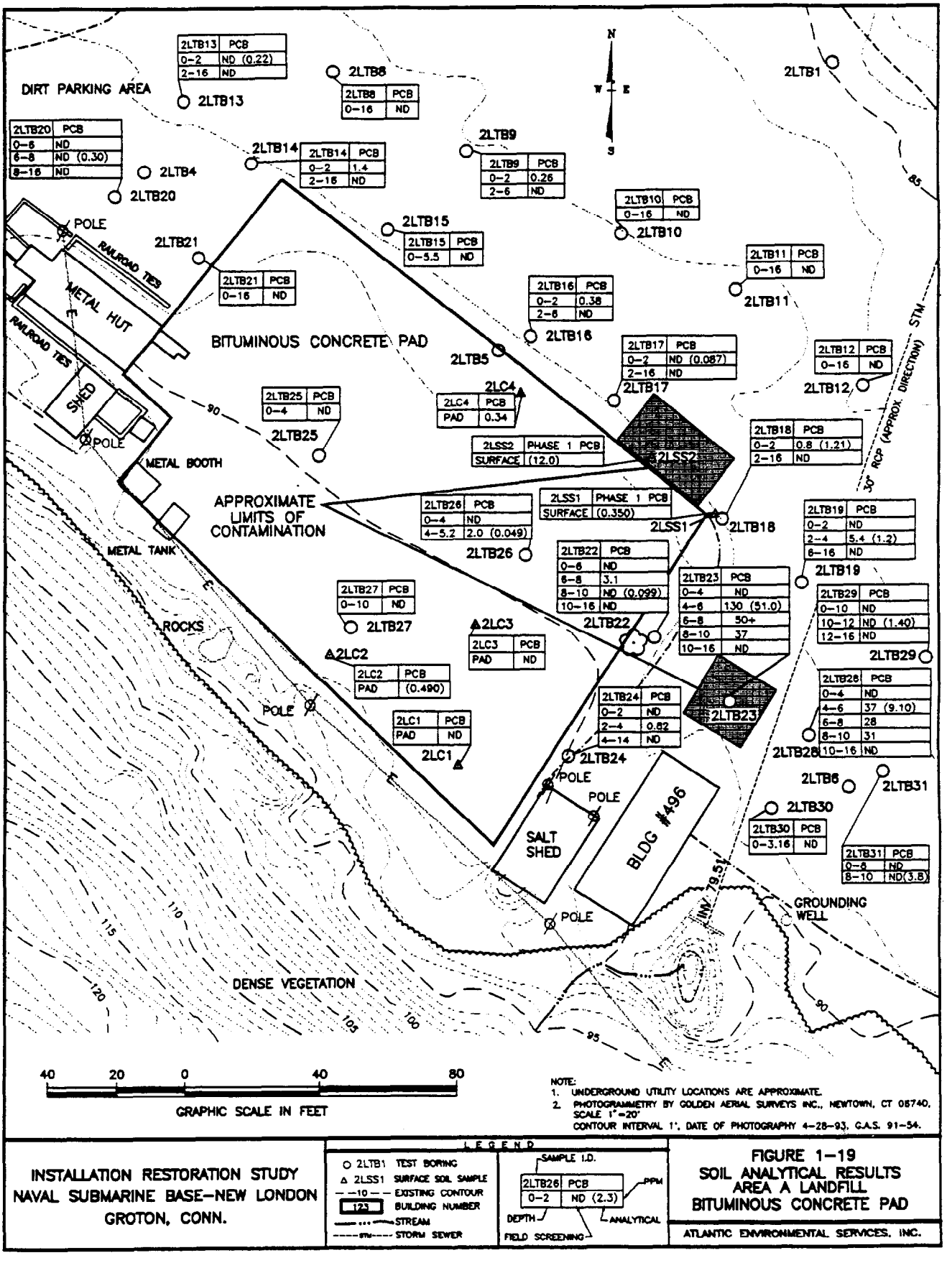

DIRT PARKING AREA
2LTB13 PCB
0-2 ND (0.22)
2-16 ND
2LTB13
2LTB8
2LTB8 PCB
0-16 ND
N
W E
S
2LTB1
2LTB20 PCB
0-6 ND
6-8 ND (0.30)
8-16 ND
2LTB20
2LTB4
2LTB14
2LTB14 PCB
0-2 1.4
2-16 ND
2LTB9
2LTB9 PCB
0-2 0.26
2-6 ND
2LTB10 PCB
0-16 ND
2LTB10
85
POLE
2LTB21
RAILROAD TIES
METAL HUT
2LTB21 PCB
0-16 ND
2LTB15
2LTB15 PCB
0-5.5 ND
2LTB11 PCB
0-16 ND
2LTB11
2LTB16 PCB
0-2 0.38
2-6 ND
2LTB16
BITUMINOUS CONCRETE PAD
2LTB5
2LTB17 PCB
0-2 ND (0.087)
2-16 ND
2LTB17
2LTB12 PCB
0-16 ND
2LTB12
STM
30" RCP (APPROX. DIRECTION)
2LC4
2LC4 PCB
PAD 0.34
2LTB25 PCB
0-4 ND
2LTB25
90
SHED
POLE
METAL BOOTH
2LSS2 PHASE 1 PCB
SURFACE (12.0)
2LSS2
2LTB18 PCB
0-2 0.8 (1.21)
2-16 ND
APPROXIMATE LIMITS OF CONTAMINATION
2LTB26 PCB
0-4 ND
4-5.2 2.0 (0.049)
2LTB26
2LSS1 PHASE 1 PCB
SURFACE (0.350)
2LSS1
2LTB18
2LTB19 PCB
0-2 ND
2-4 5.4 (1.2)
6-16 ND
2LTB19
METAL TANK
2LTB22 PCB
0-6 ND
6-8 3.1
8-10 ND (0.099)
10-16 ND
2LTB22
2LTB23 PCB
0-4 ND
4-6 130 (51.0)
6-8 50+
8-10 37
10-16 ND
2LTB29 PCB
0-10 ND
10-12 ND (1.40)
12-16 ND
2LTB29
2LTB27 PCB
0-10 ND
2LTB27
ROCKS
2LC3
2LC3 PCB
PAD ND
2LC2
2LC2 PCB
PAD (0.490)
2LTB23
2LTB28 PCB
0-4 ND
4-6 37 (9.10)
6-8 28
8-10 31
10-16 ND
2LTB28
POLE
2LC1 PCB
PAD ND
2LC1
2LTB24 PCB
0-2 ND
2-4 0.82
4-14 ND
2LTB24
POLE
POLE
2LTB6
2LTB31
2LTB30
2LTB30 PCB
0-3.16 ND
SALT SHED
BLDG #496
2LTB31 PCB
0-8 ND
8-10 ND(3.8)
INV. 79.51
GROUNDING WELL
POLE
115
110
120
105
100
95
90
DENSE VEGETATION
40 20 0 40 80
GRAPHIC SCALE IN FEET
NOTE:
1. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE.
2. PHOTOGRAMMETRY BY GOLDEN AERIAL SURVEYS INC., NEWTOWN, CT 06740, SCALE 1"=20'
CONTOUR INTERVAL 1', DATE OF PHOTOGRAPHY 4-28-93, G.A.S. 91-54.
INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE-NEW LONDON
GROTON, CONN.
LEGEND
2LTB1 TEST BORING
2LSS1 SURFACE SOIL SAMPLE
10 EXISTING CONTOUR
123 BUILDING NUMBER
STREAM
STM STORM SEWER
SAMPLE I.D.
2LTB26 PCB
0-2 ND (2.3)
PPM
DEPTH
ANALYTICAL
FIELD SCREENING
FIGURE 1-19
SOIL ANALYTICAL RESULTS
AREA A LANDFILL
BITUMINOUS CONCRETE PAD
ATLANTIC ENVIRONMENTAL SERVICES, INC.

individual constituents, and from non-detected to 93.5 ppm for total VOCs. Benzene was not detected in any surface soil samples.

- Semi-volatile organic compounds (SVOCs), predominantly polycyclic aromatic hydrocarbons (PAHs), ranging in concentration from non-detected to 0.39 ppm for individual constituents, and from non-detected to 1.58 ppm for total SVOCs.

- Pesticides, predominantly DDT, DDD, and DDE, ranging in concentration from non-detected to 2.3 ppm for individual constituents, and from non-detected to 2.87 ppm for total constituents. The TBC value for DDT is 0.50 ppm.

- Polychlorinated biphenyls (PCBs), ranging in concentration from not detected to 12.0 ppm for total PCBs (concentrations ranged from non-detected to 1.4 ppm using field screening techniques). The TBC values for PCB are 10 ppm (EPA) and 2 ppm (CTDEP).

- Inorganic constituents of concern (heavy metals) on a mass basis were detected consistently and significantly above background levels, including beryllium, cadmium, barium, copper, lead, nickel, and zinc.

- Several inorganic constituents were detected above TBC values in a TCLP extract, including barium, cadmium, arsenic, and lead.

Subsurface Soils

- Volatile organic compounds (VOCs), predominantly toluene, ethylbenzene and xylene, ranging in concentration from not detected to 75 ppm for individual constituents and 90.8 ppm for total VOCs. Benzene was not detected.

- Semivolatile organic compounds (SVOCs), predominantly polycyclic aromatic hydrocarbons (PAHs), ranging in concentration from not detected to 61 ppm for individual constituents and 321.2 ppm for total PAHs.

- Pesticides, predominantly DDT, DDD, and DDE, ranging in concentration from not detected to 1.7 ppm for individual constituents and 2.89 ppm for total constituents. The TBC value for DDT is 0.50 ppm.

- Polychlorinated biphenyls (PCBs), ranging in concentration from not detected to 51 ppm for total PCBs (concentrations ranged from non-detected to 130 ppm using field screening techniques). The TBC values for PCB are 10 ppm (EPA) and 2 ppm (CTDEP).

- Inorganic constituents of concern (heavy metals) on a mass basis were detected consistently and significantly above background levels, including arsenic, barium, cadmium, copper, chromium, lead, nickel, and zinc.

- Several inorganic constituents were detected above TBC values in a TCLP extract including: arsenic, cadmium, lead, selenium, and silver; with the exception of selenium, all were detected in soils above background.

A summary of values detected above ARAR or TBC values are summarized in the following table. A further definition of ARAR and TBC sources is provided in subsection 2.2.2.

CONSTITUENTS EXCEEDING TBC VALUES IN SOILS				
Constituent	**Concentration Range Detected (ppb)**	**Number of Values Above TBC**	**TBC (ppb)**	**Source of TBC**
TCL Volatile Organics				
1,1,2-Trichloroethane	ND -11	1 of 27	10	CTDEP Pollutant Mobility Criteria for Soil (GA)
1,1,2,2-Tetrachloroethane	ND - 22	1 of 27	10	CTDEP Pollutant Mobility Criteria for Soil (GA)
Chlorobenzene	ND - 4,500	1 of 27	2000	CTDEP Pollutant Mobility Criteria for Soil (GA)
Ethylbenzene	ND - 14,000	3 of 27	2600	CTDEP Pollutant Mobility Criteria for Soil (GA)
Xylene (total)	ND - 75,000	3 of 27	1400	CTDEP Pollutant Mobility Criteria for Soil (GA)
TCL Semi-Volatile Organics				
Naphthalene	ND - 20,000	1 of 27	5600	CTDEP Pollutant Mobility Criteria for Soil (GA)
Fluorene	ND - 17,000	1 of 27	5600	CTDEP Pollutant Mobility Criteria for Soil (GA)
Phenanthrene	ND - 61,000	2 of 27	4000	CTDEP Pollutant Mobility Criteria for Soil (GA)
Fluoranthene	ND - 47,000	1 of 27	5600	CTDEP Pollutant Mobility Criteria for Soil (GA)
Pyrene	ND - 40,000	3 of 27	4000	CTDEP Pollutant Mobility Criteria for Soil (GA)
Benzo(a)anthracene	ND - 23,000	4 of 27	660	CTDEP Pollutant Mobility Criteria for Soil (GA)
Benzo(b)fluoranthene	ND - 15,000	5 of 27	660	CTDEP Pollutant Mobility Criteria for Soil (GA)
Benzo(k)fluoranthene	ND - 14,000	3 of 27	660	CTDEP Pollutant Mobility Criteria for Soil (GA)
Benzo(a)pyrene	ND - 15,000	4 of 27	660	CTDEP Pollutant Mobility Criteria for Soil (GA)
bis(2-ethylhexyl)phthalate	ND - 1,900	3 of 27	660	CTDEP Pollutant Mobility Criteria for Soil (GA)
TCL Pesticides and Polychlorinated Biphenyls (PCBs)				
Heptachlor	ND - 79	1 of 27	2	CTDEP Pollutant Mobility Criteria for Soil (GA)
Heptachlor Epoxide	ND - 300	4 of 27	2	CTDEP Pollutant Mobility Criteria for Soil (GA)
Dieldrin	ND - 160	6 of 27	0.4	CTDEP Pollutant Mobility Criteria for Soil (GA)
Alpha Chlordane	ND - 86	5 of 27	12	CTDEP Pollutant Mobility Criteria for Soil (GA)
Gamma Chlordane	ND - 84	4 of 27	12	CTDEP Pollutant Mobility Criteria for Soil (GA)
4,4'-DDT	ND - 2,300	3 of 27	500	FFDC Action Tolerance Level
DDTR	ND - 2,470	5 of 27	500	FFDC Action Tolerance Level
TAL Inorganics (ppm)				
Arsenic	ND - 10.6	10 of 27	3.3	CTDEP DEC for Soil, Ind./Com. Criteria Draft, 12/94
Beryllium	0.25 - 3.9	8 of 27	1.3	CTDEP DEC for Soil, Ind./Com. Criteria Draft, 12/94
Chromium	8.3 - 289	2 of 27 0 of 27	100 (hexavalent) 51,000 (trivalent)	CTDEP DEC for Soil, Ind./Com. Criteria Draft, 12/94
Lead	5.5 - 1,780	2 of 27	1000	CTDEP DEC for Soil, Ind./Com. Criteria Draft, 12/94
TCLP Metals (ppm)				
Arsenic	ND - 0.3	8 of 16	0.05	Draft Pollutant Mobility Criteria for Soil, CTDEP, 12/94
Barium	0.14 - 1.06	1 of 16	1	Draft Pollutant Mobility Criteria for Soil, CTDEP, 12/94
Cadmium	ND - 0.065	11 of 16	0.005	Draft Pollutant Mobility Criteria for Soil, CTDEP, 12/94
Lead	ND - 2.19	7 of 16	0.015	Draft Pollutant Mobility Criteria for Soil, CTDEP, 12/94
Selenium	ND - 0.23	5 of 16	0.036	Draft Pollutant Mobility Criteria for Soil, CTDEP, 12/94
Silver	ND - 0.042	1 of 16	0.036	Draft Pollutant Mobility Criteria for Soil, CTDEP, 12/94

Chemical-specific action objectives for this site are presented in subsection 2.2. As subsection 2.2 indicates, there are two remedial action objectives. One is to reduce the exposure of workers to PCBs located near the bituminous concrete pad. This objective was developed due to the PCBs detected near the concrete pad. As indicated in the summary of analyses above, PCBs were detected above TBC concentrations up to 51 ppm. All of these locations were adjacent to the bituminous concrete pad. The other remedial action objective is to control, minimize, or eliminate, to the extent necessary to protect human health or the environment, post-closure escapes of hazardous substances to the environment. This objective was developed to address the wide variety of lower levels of contaminants detected throughout the landfill. As is evident from a review of the above table and the summary of analytical results, a variety of hazardous constituents have been detected at the landfill. Several of these constituents (PAHs, DDTR, PCBs, and metals) are present in concentrations above TBC values. In particular, surficial materials could migrate to the adjacent wetlands and adversely impact ecological receptors; or persons working in this area could be exposed to these surficial materials.

1.6.3 Groundwater at the Area A Landfill Site

Twenty-eight groundwater monitoring wells were installed and sampled within Area A, which includes the landfill, wetland, and downstream areas during the Phase I RI. Summary data tables showing the analytical results from this investigation are included in Appendix A. Plate 2 provides a summary of groundwater quality data for Area A. It should be noted that the landfill cap is intended to provide an interim source control measure that should prevent contamination in the groundwater (as summarized in this section) from worsening. Groundwater contamination at the site will be addressed in the final remedy.

The monitoring well sample analytical results did not indicate any significant ongoing release of contaminants to the groundwater.

VOCs were detected in groundwater at four (of twelve) monitoring well locations in Area A Landfill. The VOCs included:

- benzene at 0.010 ppm 2LMW18S;
- chlorobenzene at 0.220 ppm 2LMW18S;
- ethylbenzene at 0.002 and 0.120 ppm 2LMW8S, 2LMW18S;
- xylene at 0.002 and 0.840 ppm 2LMW8S, 2LMW18S;
- dichloroethene at 0.001 ppm 2LMW13D;
- tetrachloroethane at 0.140 ppm and 0.001 ppm 2LMW13D, 2LMW17D; and
- trichloroethene at 0.010 ppm 2LMW13D.

Ethylbenzene, xylene, and tetrachloroethane were detected at two (out of twelve) monitoring well locations within the Area A Landfill site. The other VOCs detected were found only at one monitoring well. Drinking-water standards were exceeded at two Area A Landfill monitoring well locations. Trichloroethene (0.010 ppm) exceeded drinking-water standards (0.005 ppm) at a location in the west end of the landfill. Benzene (0.010 ppm) exceeded drinking-water standards (0.005 ppm) in a monitoring well in the central portion of the landfill, just east of the deployed parking area. The CTDEP proposed groundwater protection criteria

(GWPC) of 100 ppb for chlorobenzene was exceeded at one location (220 ppb at 2LMW-18S) and the GWPC for 1,1,2,2 tetrachloroethane was exceeded at two locations in the Area A Landfill site and one location in the Area A Downstream.

Total SVOC concentrations ranged from nondetected to 279 ppb in groundwater samples collected from the landfill monitoring wells. SVOCs were detected in four of the twelve monitoring wells sampled at relatively low concentrations. With the exception of Bis-2 ethyl hexyl phthalate (a commonly recognized lab contaminant), 1,4-dichlorobenzene at 99 ppb in 2LMW18S was the only SVOC compound with a concentration which exceeded the associated regulatory level of 75 ppb in groundwater which is the MCL.

Cadmium was the only inorganic analyte found in Area A Landfill monitoring wells in excess of primary drinking-water standards (0.005 ppm). Exceedances (up to 0.016 ppm) were detected in five (out of twelve) monitoring wells. Lead was detected in one well in the Area A Wetland (2WMW2D) at 22.4 ppb slightly above the EPA action level of 15 ppb. Aluminum was detected above the EPA secondary MCL of 200 ppb at one location (2WMW6S) in the Area A Wetland. Iron and manganese were detected at several locations above EPA secondary MCL values of 300 and 50 ppb, respectively. Sodium was detected at several locations above the CTDOHS notification level of 28,000 ppb.

1.6.4 Limits of Landfill

The limits of the landfill were defined based on the results of the Phase I RI, and further refined based on the results of subsequent investigations at the site. Additional information from geotechnical borings, supplemental surface soil sampling, and reviews of historic USGS topographic maps and aerial photographs have facilitated in the proper delineation of the landfill materials. The limits of the landfill are indicated in Figure 1-20; this figure also depicts the thickness of landfill materials based on the boring logs.

The northern and southern limits were easily identified based on Phase I borings, topography, aerial photographs, and USGS maps. Supplemental geotechnical borings were performed to better identify the limits of the landfill, in particular the eastern and western boundaries. In addition, soil samples were collected at the eastern limits of the landfill to determine if certain fill materials were contaminated.

Phase I RI. All borings in the presumed limits of the landfill indicated the presence of contaminated materials, except for boring 2WMW3S located near the tennis courts at the eastern limit of the site. The lithology observed in boring 2WMW3S indicates that fill material above dredge spoils in this area is a "clean sand and gravel." There were no detections of VOCs, SVOCs, pesticides, or PCBs in soil located above the dredge spoils in this boring. Inorganics detected were all below the site background levels for the soil sample collected above the dredge spoils. The only compound detected above a TBC limit is Arsenic, which was detected in a TCLP extract. Because the level of arsenic (total mass analysis) detected in the soil was below the site specific background value, it is not considered an element of concern.

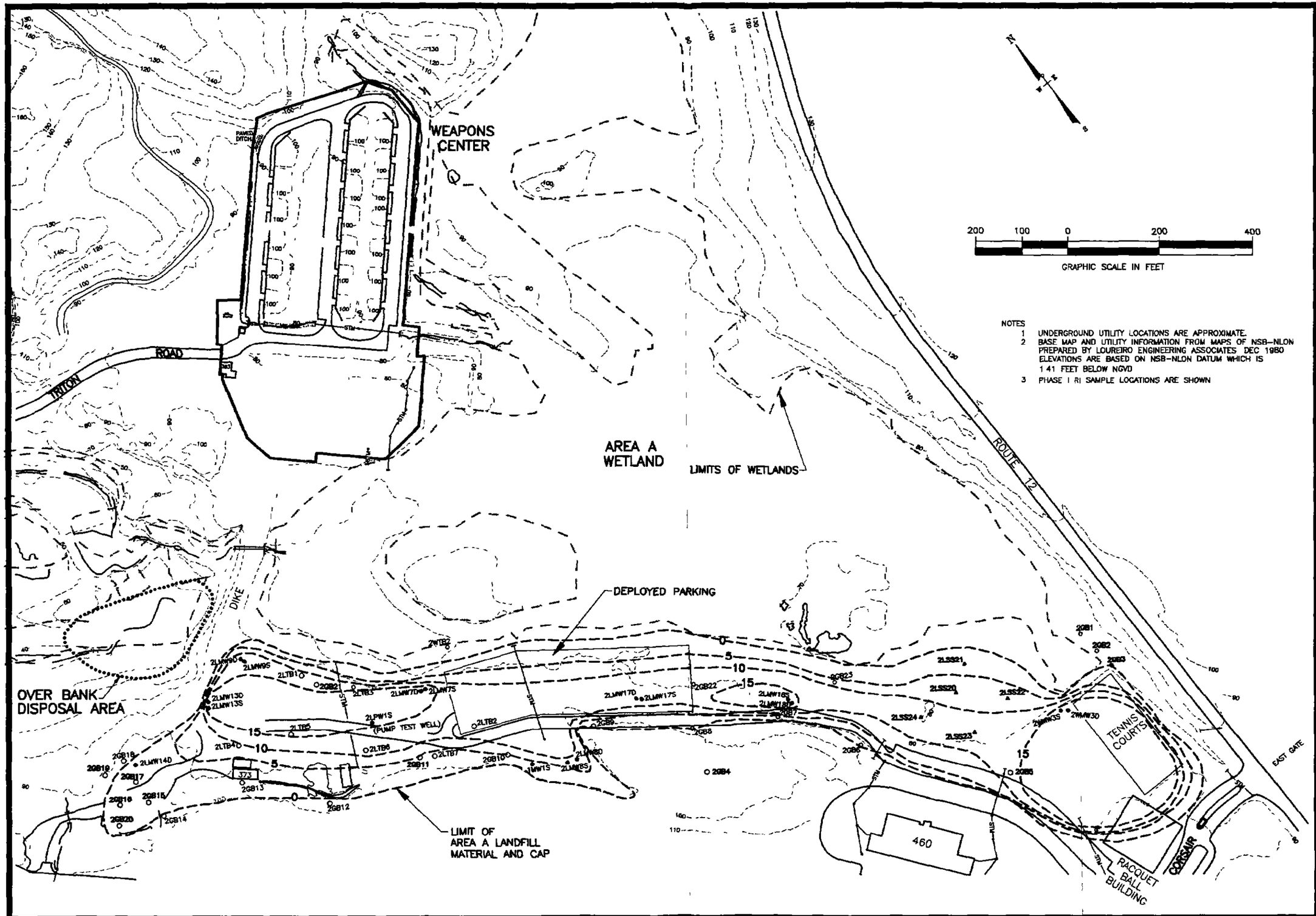


FIGURE 1-20
LANDFILL THICKNESS ISOPLETHS
AREA A LANDFILL

ATLANTIC ENVIRONMENTAL SERVICES, INC

INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE-NEW LONDON
GROTON, CONN.

0072407Z

Geotechnical Borings. Twenty-three geotechnical borings (2GB1 through 2GB23) were installed to better determine the extent of the landfill. These borings confirmed the northern and southern limits of the landfill and determined the western limits of the landfill. The locations of these borings are shown in Figure 1-20, and the logs are included as Appendix D.

Supplemental Sample Results. The eastern limit of the landfill near the racquet ball building and tennis courts was sampled to determine if fill materials in this area were contaminated. Five surface samples were collected and analyzed for TCL VOCs, SVOCs, pesticides, and PCBs, as well as the TAL inorganics, cyanide, and boron. Sample locations are indicated in Figure 1-20, and sample results are summarized in Table 1-2.

Very low levels of the VOCs methylene chloride, acetone, and 2-butanone were detected.

Two samples contained low levels of SVOCs; where total SVOC concentrations ranged from 300 ppb (2LSS22 (0-1)) to 1,289 ppb (2LSS23 (0-1)). The concentration for all of these compounds were estimated as they were all below the typical detection limit for the particular compound detected. The pesticide 4,4' DDT was detected in one sample at 6.8 ppb (2LSS23 (0-1)). The detection of this pesticide is expected based on the past use of pesticides at the site. It is not expected that its presence is due to disposal in the area.

The PCB compound Aroclor 1254 was detected at very low levels in two surface soil samples 2LSS22 (0-1) and 2LSS23 (0-1) at 15 and 20 ppb, respectively. The source of these two detections is unclear; however, the levels detected are very low and below values that could have an adverse impact to either human health and the environment, and, therefore, are not of concern.

There were three inorganics detected above the established site-specific background values for inorganics at the site; they include: calcium, manganese, and potassium. The concentrations were all very close to the background value with no exceedances greater than an order of magnitude. Cyanide was also detected at a very low concentration 0.09 ppm at 2LSS22 (0-1).

The concentrations observed in these five surface soils indicate that there does not appear to be contamination in this area. Materials appear to be unsuitable fill and rock generated by construction activity elsewhere. As the materials are not clean fill, they have been included within the limits of the cap shown in this FFS; however, the Navy is planning a more accurate assessment of materials in this section of the landfill prior to final design. Any areas determined by this assessment to only contain clean fill will not be capped or otherwise remediated.

Historic USGS Maps and Aerial Photographs. A review of historic USGS maps and aerial photographs of the site appear to indicate that the landfilling at the eastern side at the landfill was a separate landfilling operation. This area appears to have received nonhazardous "clean" fill not related to the refuse type of fill located further to the northwest, based on the sequence of filling operations and results of chemical analyses of soils in this area. The Area A Landfill was opened sometime before 1957, and in 1963 unburned wastes from local operations became the primary fill material. Prior to 1963, fill came from the base incinerator

TABLE 1-2
NAVAL SUBMARINE BASE - NEW LONDON
AREA A LANDFILL
SUMMARY OF SOIL ANALYTICAL DATA (VOLATILE ORGANICS)

PARAMETER	2LSS20 (0.5-1.0)	2LSS21 (0.5-1.0)	2LSS22 (0.5-1.0)	2LSS23 (0.5-1.0)	2LSS24 (0.5-1.0)	DUPLICATE (0.5-1.0)	EQUIPMENT RINSATE	TRIP BLANK
VOLATILE ORGANIC COMPOUNDS (ppb)								
Chloromethane	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Bromomethane	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Vinyl Chloride	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Chloroethane	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Methylene Chloride	5 BJ	6 BJ	5 BJ	6 BJ	5 BJ	6 BJ	2 BJ	4 BJ
Acetone	9 J	14	12	15	11 U	13	55	10 U
Carbon Disulfide	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
1,1-Dichloroethene	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
1,1-Dichloroethane	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
1,2-Dichloroethene (total)	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Chloroform	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
1,2-Dichloroethane	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
2-Butanone	11 U	12 U	11 U	11 U	11 U	12 U	11	10 U
1,1,1-Trichloroethane	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Carbon Tetrachloride	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Bromodichloromethane	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
1,2-Dichloropropane	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
cis-1,3-Dichloropropene	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Trichloroethene	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Dibromochloromethane	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
1,1,2-Trichloroethane	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Benzene	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
trans-1,3-Dichloropropene	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Bromoform	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
4-Methyl-2-pentanone	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
2-Hexanone	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Tetrachloroethene	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
1,1,2,2-Tetrachloroethane	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Toluene	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Chlorobenzene	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Ethylbenzene	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Styrene	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U
Xylene (total)	11 U	12 U	11 U	11 U	11 U	12 U	10 U	10 U

Notes:

B (Organics) - Indicates the anlayte was found in the associated blank as well as the sample.

J - Indicates estimated value.

U - Indicates not detected, value shown is the detection limit.

Shading indicates detected compound.

TABLE 1-2 (continued)
NAVAL SUBMARINE BASE - NEW LONDON
AREA A LANDFILL
SUMMARY OF SOIL ANALYTICAL DATA (SEMI-VOLATILES)

PARAMETER	2LSS20 (0-1)	2LSS21 (0-1)	2LSS22 (0-1)	2LSS23 (0-1)	2LSS24 (0-1)	DUPLICATE (0-1)	EQUIPMENT RINSATE
SEMI-VOLATILE ORGANIC COMPOUNDS (ppb)							
Phenol	380 U	400 U	380 U	380 U	360 U	380 U	11 U
bis(2-Chloroethyl)ether	380 U	400 U	380 U	380 U	360 U	380 U	11 U
2-Chlorophenol	380 U	400 U	380 U	380 U	360 U	380 U	11 U
1,3-Dichlorobenzene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
1,4-Dichlorobenzene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
1,2-Dichlorobenzene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
2-Methylphenol	380 U	400 U	380 U	380 U	360 U	380 U	11 U
2,2'-oxybis(1-Chloropropane)	380 U	400 U	380 U	380 U	360 U	380 U	11 U
4-Methylphenol	380 U	400 U	380 U	380 U	360 U	380 U	11 U
N-Nitroso-di-n-propylamine	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Hexachloroethane	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Nitrobenzene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Isophorone	380 U	400 U	380 U	380 U	360 U	380 U	11 U
2-Nitrophenol	380 U	400 U	380 U	380 U	360 U	380 U	11 U
2,4-Dimethylphenol	380 U	400 U	380 U	380 U	360 U	380 U	11 U
bis(2-Chloroethoxy)methane	380 U	400 U	380 U	380 U	360 U	380 U	11 U
2,4-Dichlorophenol	380 U	400 U	380 U	380 U	360 U	380 U	11 U
1,2,4-Trichlorobenzene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Naphthalene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
4-Chloroaniline	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Hexachlorobutadiene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
4-Chloro-3-methylphenol	380 U	400 U	380 U	380 U	360 U	380 U	11 U
2-Methylnaphthalene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Hexachlorocyclopentadiene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
2,4,6-Trichlorophenol	380 U	400 U	380 U	380 U	360 U	380 U	11 U
2,4,5-Trichlorophenol	930 U	970 U	920 U	930 U	880 U	930 U	26 U
2-Chloronaphthalene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
2-Nitroaniline	930 U	970 U	920 U	930 U	880 U	930 U	26 U
Dimethylphthalate	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Acenaphthylene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
2,6-Dinitrotoluene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
3-Nitroaniline	930 U	970 U	920 U	930 U	880 U	930 U	26 U
Acenaphthene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
2,4-Dinitrophenol	930 U	970 U	920 U	930 U	880 U	930 U	26 U
4-Nitrophenol	930 U	970 U	920 U	930 U	880 U	930 U	26 U
Dibenzofuran	380 U	400 U	380 U	380 U	360 U	380 U	11 U
2,4-Dinitrotoluene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Diethylphthalate	380 U	400 U	380 U	380 U	360 U	380 U	11 U
4-Chlorophenyl-phenylether	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Fluorene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
4-Nitroaniline	930 U	970 U	920 U	930 U	880 U	930 U	26 U
4,6-Dinitro-2-methylphenol	930 U	970 U	920 U	930 U	880 U	930 U	26 U
N-Nitrosodiphenylamine (1)	380 U	400 U	380 U	380 U	360 U	380 U	11 U
4-Bromophenyl-phenylether	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Hexachlorobenzene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Pentachlorophenol	930 U	970 U	920 U	930 U	880 U	930 U	26 U
Phenanthrene	380 U	400 U	380 U	150 J	360 U	380 U	11 U
Anthracene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Carbazole	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Di-n-butylphthalate	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Fluoranthene	380 U	400 U	140 J	230 J	360 U	380 U	11 U
Pyrene	380 U	400 U	160 J	270 J	360 U	380 U	11 U
Butylbenzylphthalate	380 U	400 U	380 U	380 U	360 U	380 U	11 U
3,3'-Dichlorobenzidine	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Benzo(a)anthracene	380 U	400 U	380 U	120 J	360 U	380 U	11 U
Chrysene	380 U	400 U	380 U	120 J	360 U	380 U	11 U
bis(2-Ethylhexyl)phthalate	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Di-n-octylphthalate	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Benzo(b)fluoranthene	380 U	400 U	380 U	170 J	360 U	380 U	11 U
Benzo(k)fluoranthene	380 U	400 U	380 U	89 J	360 U	380 U	11 U
Benzo(a)pyrene	380 U	400 U	380 U	140 J	360 U	380 U	11 U
Indeno(1,2,3-cd)pyrene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Dibenz(a,h)anthracene	380 U	400 U	380 U	380 U	360 U	380 U	11 U
Benzo(g,h,i)perylene	380 U	400 U	380 U	380 U	360 U	380 U	11 U

Notes:
J - Indicates estimated value.
U - Indicates not detected, value shown is the detection limit.
Shading indicates detected compound.

TABLE 1-2 (continued)
NAVAL SUBMARINE BASE - NEW LONDON
AREA A LANDFILL
SUMMARY OF SOIL ANALYTICAL DATA (INORGANICS)

PARAMETER	2LSS20 (0-1)	2LSS21 (0-1)	2LSS22 (0-1)	2LSS23 (0-1)	2LSS24 (0-1)	DUPLICATE (0-1)	EQUIPMENT RINSATE
INORGANICS (ppm)							
Aluminum	7150	12200	6180	8220	8580	5680	0.0179 U
Antimony	2.6 UN	3.2 UN	2.9 UN	3 UN	2.4 UN	2.3 UN	0.0156 U
Arsenic	0.5 B	2.2	1.2 B	1.9 B	1.1 B	0.59 B	0.0029 U
Barium	54.5	36.6 B	38.8	48.1	42.5	49.1	0.0024 U
Beryllium	0.31 B	0.5 B	0.36 B	0.34 B	0.37 B	0.24 B	0.0004 U
Cadmium	0.35 U	0.43 U	0.39 U	0.41 U	0.33 U	0.31 U	0.0021 U
Calcium	1300	794 B	1500	6090	989	1100	0.0618 B
Chromium	8.2	12.7	9.2	10.7	9.7	6.5	0.0023 U
Cobalt	5.7 B	5.2 B	4.5 B	5.4 B	5.3 B	4.6 B	0.0032 U
Copper	4.3	7.3	15.5	9.4	6.2	3.1 B	0.0026 U
Iron	10100	11700	7660	10100	10200	7960	0.0184 B
Lead	5	7.4	13.6	15.9	5	4.9	0.0007 U
Magnesium	3960 *	2610 *	2320 *	2990 *	3120 *	3070 *	0.022 U
Manganese	247 N	145 N	177 N	179 N	254 N	213 N	0.001 U
Mercury	0.02 U	0.04 U	0.04 U	0.03 B	0.03 U	0.02 U	0.0001 U
Nickel	5.6 B	7.6 B	7.4 B	7.2 B	5.9 B	4.9 B	0.0104 U
Potassium	3110	1270	1470	1830	1930	2370	0.649 U
Selenium	0.28 U	0.35 U	0.32 U	0.33 U	0.26 U	0.25 U	0.0017 U
Silver	0.59 UN	0.74 UN	0.68 UN	0.7 UN	0.56 UN	0.53 UN	0.0036 U
Sodium	37.4 B	34.3 B	42.5 B	113 B	38.6 B	33.6 B	0.0224 U
Thallium	0.46 U	0.57 U	0.53 U	0.55 U	0.44 U	0.41 U	0.0028 U
Vanadium	17.9	24.5	15.6	19.7	18	15	0.0033 U
Zinc	34	24.5	74.4	46.6	28.7	29.6	0.0024 B
Boron	2.9 U	3.6 U	3.3 U	3.4 U	2.7 U	2.6 U	0.0175 U
Cyanide	0.11 U	0.11 U	0.09 B	0.11 U	0.09 U	0.1 U	0.001 U

Notes:

B (Inorganics) - Indicates the result was less than the Contract Required Detection Limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL).

J - Indicates estimated value.

N - Indicates spiked sample recovery not within control limits.

U - Indicates not detected, value shown is the detection limit.

* - Indicates duplicate analysis is not within control limits.

Shading indicates detected compound.

TABLE 1-2 (continued)

NAVAL SUBMARINE BASE - NEW LONDON

AREA A LANDFILL

SUMMARY OF SOIL ANALYTICAL DATA (PESTICIDES/PCBs)

PARAMETER	2LSS20 (0-1)	2LSS21 (0-1)	2LSS22 (0-1)	2LSS23 (0-1)	2LSS24 (0-1)	DUPLICATE (0-1)	EQUIPMENT RINSATE
PESTICIDES/PCBs (ppb)							
alpha-BHC	2 U	2.1 U	2 U	2 U	1.9 U	2 U	0.052 U
beta-BHC	2 U	2.1 U	2 U	2 U	1.9 U	2 U	0.052 U
delta-BHC	2 U	2.1 U	2 U	2 U	1.9 U	2 U	0.052 U
gamma-BHC (Lindane)	2 U	2.1 U	2 U	2 U	1.9 U	2 U	0.052 U
Heptachlor	2 U	2.1 U	2 U	2 U	1.9 U	2 U	0.052 U
Aldrin	2 U	2.1 U	2 U	2 U	1.9 U	2 U	0.052 U
Heptachlor epoxide	2 U	2.1 U	2 U	2 U	1.9 U	2 U	0.052 U
Endosulfan I	2 U	2.1 U	2 U	2 U	1.9 U	2 U	0.052 U
Dieldrin	3.9 U	4 U	3.8 U	3.9 U	3.7 U	3.9 U	0.1 U
4,4'-DDE	3.9 U	4 U	3.8 U	3.9 U	3.7 U	3.9 U	0.1 U
Endrin	3.9 U	4 U	3.8 U	3.9 U	3.7 U	3.9 U	0.1 U
Endosulfan II	3.9 U	4 U	3.8 U	3.9 U	3.7 U	3.9 U	0.1 U
4,4'-DDD	3.9 U	4 U	3.8 U	3.9 U	3.7 U	3.9 U	0.1 U
Endosulfan sulfate	3.9 U	4 U	3.8 U	3.9 U	3.7 U	3.9 U	0.1 U
4,4'-DDT	3.9 U	4 U	3.8 U	6.8	3.7 U	3.9 U	0.1 U
Methoxychlor	20 U	21 U	20 U	20 U	19 U	20 U	0.52 U
Endrin ketone	3.9 U	4 U	3.8 U	3.9 U	3.7 U	3.9 U	0.1 U
Endrin aldehyde	3.9 U	4 U	3.8 U	3.9 U	3.7 U	3.9 U	0.1 U
alpha-Chlordane	2 U	2.1 U	2 U	2 U	1.9 U	2 U	0.052 U
gamma-Chlordane	2 U	2.1 U	2 U	2 U	1.9 U	2 U	0.052 U
Toxaphene	200 U	210 U	200 U	200 U	190 U	200 U	5.2 U
Aroclor-1016	39 U	40 U	38 U	39 U	37 U	39 U	1 U
Aroclor-1221	78 U	81 U	78 U	79 U	74 U	79 U	2.1 U
Aroclor-1232	39 U	40 U	38 U	39 U	37 U	39 U	1 U
Aroclor-1242	39 U	40 U	38 U	39 U	37 U	39 U	1 U
Aroclor-1248	39 U	40 U	38 U	39 U	37 U	39 U	1 U
Aroclor-1254	39 U	40 U	15 JP	20 JP	37 U	39 U	1 U
Aroclor-1260	39 U	40 U	38 U	39 U	37 U	39 U	1 U

Notes:

J - Indicates estimated value.

P - Indicates there is greater than a 25% concentration difference between quantitation on the primary and confirmatory GC columns. The lower value was reported.

U - Indicates not detected, value shown is the detection limit.

Shading indicates detected compound.

as ash material. The September 2, 1963 aerial photograph indicates the beginning stages of the landfilling operations at the Area A landfill. This photograph shows access to the landfill off of Wahoo Avenue. At this time, the eastern end of this site in the location of the tennis courts was filled. However, access to this area appears to be from Route 12, indicating that the fill was from a different source. This indication is supported by the soil sample results from this area, which indicate that soils are not contaminated in this area. The June 1, 1969 aerial photograph shows a baseball field and tennis courts in the location of the fill material located southeast of the proposed cap, suggesting that the fill indicated in the 1963 photograph was used to level the area prior to construction. Refuse type fill material would not have been a likely source for such fill. As this area has been filled it has been included within the limits of the cap shown in this FFS; however, the Navy is planning a more accurate assessment of materials in this section of the landfill prior to final design. Any areas determined by this assessment to only contain clean fill will not be capped or otherwise remediated. The February 24, 1974 aerial photograph indicates that light toned mounded material had been deposited in the area just northwest of the tennis courts. This material, likely the large boulder fill which was observed during field activities at the site, is representative of the supplemental surface soil samples collected. The supplemental soil analytical results indicate that this material is not contaminated. Subsequent aerial photographs do not indicate further landfilling activities in this area.

1.7 Contaminant Fate and Transport at the Area A Landfill Site

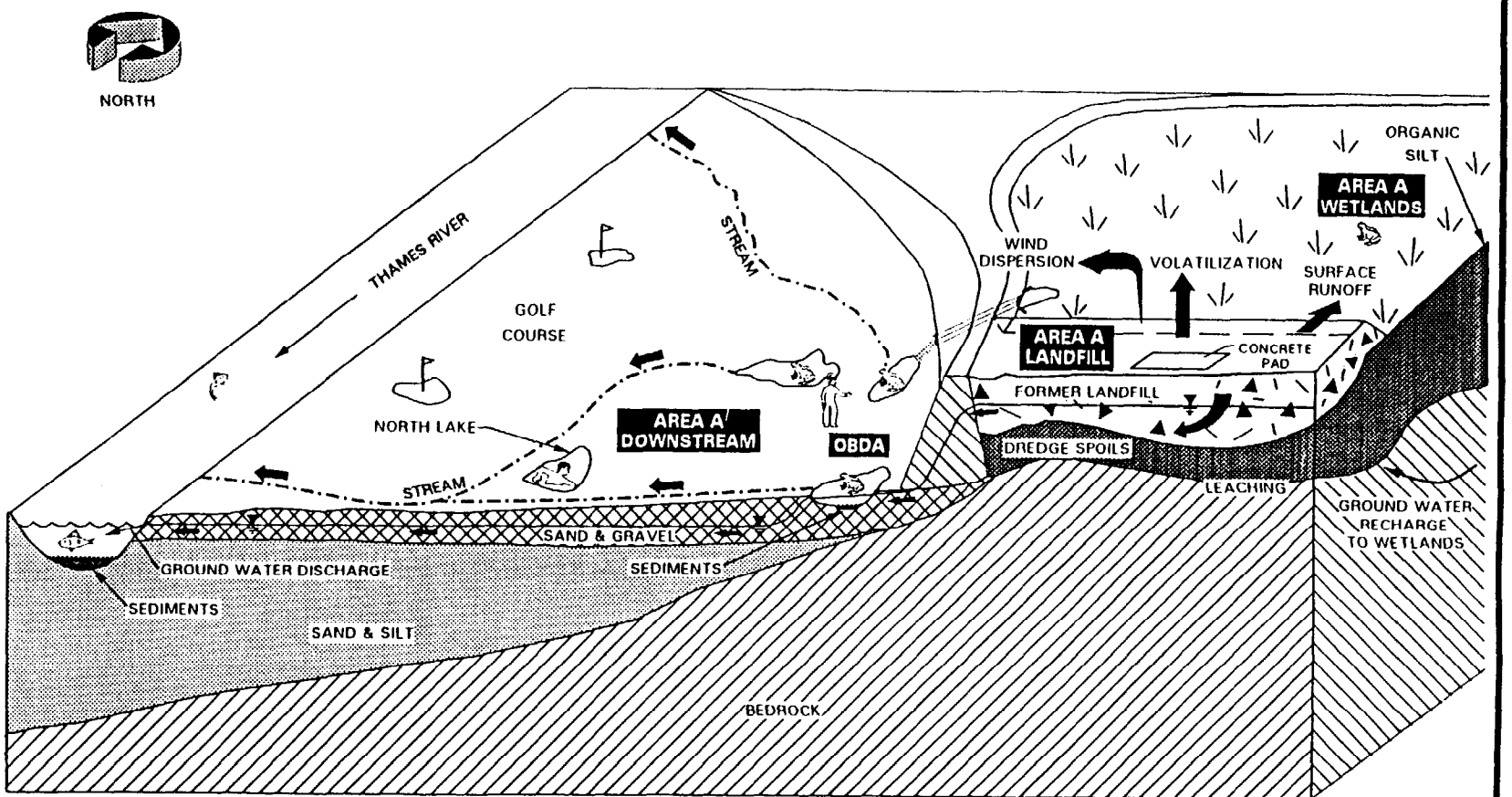
This subsection and subsections 1.7.1 through 1.7.3 provide an analysis and discussion of the data presented in previous sections to provide an interpretation of the interaction between physical and chemical processes which characterize areas of contamination at the Area A Landfill. An understanding of these processes allowed for the proper development of effective remedial actions that protect human health and the environment.

Figure 1-21 presents a conceptual site model which has been developed to illustrate transport mechanisms in a more simplified format. The following transport mechanisms for the Area A Landfill site are identified: wind dispersion, volatilization, infiltration (leaching), groundwater discharge, and overland flow (surface runoff and soil erosion). The fate of contaminants detected at the Area A Landfill will in part be determined by the aforementioned transport mechanisms combined with the attributes of the individual chemicals, the mechanism through which the chemical has been released into the environment, and the quantity of the chemical released.

1.7.1 Area A Landfill Site: Fate and Transport Data

Contaminants

There are a number of documented contaminants in Area A soils. These include low levels of VOCs, SVOCs, and pesticides and moderate levels of PCBs. Many inorganics were also detected above background concentrations in soil. The following metals were detected above to be considered (TBC) regulatory levels in TCLP leachate of soils collected from the landfill: arsenic, barium, cadmium, lead, and selenium.



NOTE: THIS IS A SCHEMATIC REPRESENTATION OF THE SITE AND GEOLOGIC CONDITIONS. TRANSPORT MECHANISMS SHOWN ARE POTENTIAL, AND DO NOT NECESSARILY INDICATE CONTAMINANT TRANSPORT IS OCCURING IN ALL CASES.

INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CT

LEGEND

- Potential Transport Mechanism
- Ground Water

FIGURE 1-21
AREA A
CONCEPTUAL SITE MODEL

ATLANTIC ENVIRONMENTAL SERVICES, INC.

The groundwater at Area A was found to contain low levels of VOCs, one occurrence of PCB, and 1,4-dichlorobenzene. Area A groundwater also contained the following inorganics above ARAR or TBC values: iron, manganese, sodium, aluminum, cadmium, and lead. It should be noted that the landfill cap is intended as an interim source control measure which will prevent the migration of contaminants in unsaturated soils from migrating to groundwater. The groundwater contamination that presently exists at the site will be addressed as necessary in the final remedy for this site.

Factors Affecting Fate and Transport Processes

A number of physical, chemical, and biological processes are known to impact upon the fate and transport of environmental contaminants. In addition to the individual effects of each such process, there is much interaction between them. Interaction of one process may limit the impacts of another on that same target compound. The salient factors affecting environmental fate and transport of chemical contaminants are: solubility, volatilization, sorption (adsorption/desorption), transformation (hydrolysis, photolysis, oxidation/reduction, biotransformation/biodegradation), and bioaccumulation.

1.7.2 Behavior of VOCs in Environmental Media at the Area A Landfill Site

VOCs were present in soils at the site. Generally, two classes of volatiles were detected they include chlorinated compounds, and non-chlorinated compounds. A total of seven chlorinated compounds were detected, while eight non-chlorinated compounds were reported. In general, chlorinated volatile organics are widely used as solvents, degreasers, dry-cleaning agents, refrigerants, and chemical intermediates. The non-chlorinated compounds detected are primarily constituents of petroleum products or solvents with the exception of 2-butanone, and acetone which are typical laboratory contaminants.

- **Solubility.** In general, all of these compounds exhibit high solubilities in water. Considering their highly-soluble nature, surface runoff and the infiltration to and eventual migration as a dissolved constituent in groundwater are expected to be the principle fate/transport processes.

- **Volatilization.** These compounds are highly-volatile and are therefore readily transported into the atmosphere from surficial soils and water matrices. As a result, volatilization of these compounds from near-surface sources is expected to be a significant environmental fate process at this site. However, sources in more deeply-buried soils will not be as readily impacted by this mechanism.

- **Sorption.** Adsorption to soils or organic matter is not expected to greatly affect these organic compounds. In general, with the exception of ethylbenzene, these compounds do not exhibit a strong affinity for organic matter. This coupled with their high water solubility and volatility, make adsorption a relatively minor environmental fate process.

- **Transformation.** The natural degradation of volatile compounds can occur through several mechanisms including biodegradation/biotransformation and photolysis. Biodegradation and biotransformation via microbial activity or biologic processes in higher organisms can occur and be effective on this group of compounds; however, the process is generally slow. Photolysis or direct photo-disassociation is not expected to impact this site due to the inaccessibility of radiant energy to the subsurface. Although it is likely that these processes are occurring, they are not considered significant fate processes.

- **Bioaccumulation.** In general, these compounds do not bioaccumulate appreciably therefore, bioaccumulation is not expected to provide a significant fate process for these identified compounds.

1.7.3 Behavior of SVOCs in Environmental Media at the Area A Landfill Site

SVOCs were identified in soils and groundwater across the site. There were primarily two classes of these compounds, acid extractable organics, and base neutral extractable organics. The latter of the two groups being the most prevalent.

Acid Extractables

Several acid extractable semivolatile compounds were detected in Area A Landfill soils and groundwater; they include: 4-methylphenol, 2-chlorophenol, 2,4-dimethylphenol, and benzoic acid. Acid extractables consist primarily of phenolic compounds. Phenols are a diverse group of chemicals whose structure is comprised of a basic benzene ring, and one or more hydroxyl (OH) groups. Phenols are commonly associated with coal tar and its by-products.

- **Solubility.** Acid extractable SVOCs exhibit relatively high aqueous matrices. Considering the soluble nature of these compounds in water, transport via surface water and groundwater is likely. The aqueous solubility of these compounds range from 5.9×10^2 mg/l (2,4 dimethyl phenol)(Superfund Public Health Evaluation Model 1986) to 2.85×10^4 mg/l (2-chlorophenol) (Merck).

- **Volatilization.** Semivolatile acid extractable organic compounds are capable of volatilizing; however, this process generally proceeds at a much slower rate than for the lighter molecular weight volatile organic compounds discussed earlier. Volatilization is expected to play a minor role in the environmental fate of these compounds.

- **Transformation.** There are four primary transformation processes, photolysis, oxidation, hydrolysis, and biodegradation/ biotransformation; oxidation, and biodegradation are the only noteworthy fate mechanisms for this group of compounds. Oxidation may occur by a metal-catalyzed reaction in some environments. Biodegradation of some of the acid extractable compounds detected at the site by microbial populations is considered

a significant environmental fate process. These compounds may biodegrade relatively rapidly under most conditions.

- **Sorption.** The acid extractable phenolic compounds associated with the site exhibit varying degrees of binding affinity to organic matter. The organic carbon-water partition coefficient for compounds at the site ranged from 55.7 ml/g (benzoic acid) to 96 ml/g (2,4-dimethylphenol). These data suggest that sorption to clay and organic matter may be significant for some of the phenolic compounds.

- **Bioaccumulation.** The acid extractable SVOC compounds detected at the Area A Landfill do not tend to bioaccumulate. Due to primarily low concentrations of these chemicals, and a relative absence of target species at the landfill, bioaccumulation is not considered a significant fate mechanism.

The majority of semivolatile acid extractable organic compounds associated with the site are not expected to be persistent. Although the phenolic compounds detected on site have some binding affinity for days and are highly water-soluble and, therefore, readily mobilized into surface and groundwaters, they are not likely to be extremely persistent in these environments due to their moderate volatility and susceptibility to microbial degradation.

Base-Neutral Extractables

A number of other semivolatile organic compounds, the base neutral extractable compounds, were identified during the investigation. The three primary subgroups of base-neutrals detected on site are polynuclear aromatic hydrocarbons (PAHs), chlorinated benzenes, and phthalate esters. The majority of base-neutral compounds detected belong to the PAH subgroup.

Polynuclear Aromatic Hydrocarbons (PAHs)

A total of 17 PAH compounds were detected they include; naphthalene, 2-methylnaphthalene, acenaphthalene, acenaphthene, dibenzofuran, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene. PAHs are fused-ring compounds in which at least two carbon atoms in each ring are shared by adjacent rings. Typically, the rings are fully aromatic but some may be saturated and have fewer carbon atoms, such as the compound fluorene. Major sources of PAHs include coal tars, crude oils, and products from the incomplete combustion of organic matter.

- **Solubility.** Solubilities of polynuclear aromatic hydrocarbons (PAHs) vary a great deal in aqueous matrices, depending upon the molecular structure and degree of aromaticity of the compounds molecular structure. As a general rule, a decrease in the degree of aromaticity in the parent molecule results in a higher degree of water solubility. Although there are some exceptions, most PAHs are not very soluble in aqueous matrices. Water solubilities for the PAHs detected on

site range from 31.7 ppm for naphthalene to 7.00 x 10^{-4} ppm for benzo(g,h,i)perylene (EPA, 1986). PAHs exhibiting the lowest water solubility have a high degree of aromaticity (i.e., greater than four or five aromatic rings). For PAHs with relatively high water solubilities (such as naphthalene), runoff and groundwater transport of these compounds may be a significant fate/transport mechanism. For the less soluble compounds, this transport mechanism will be less significant.

- **Volatilization.** PAHs are capable of volatilizing; the process proceeds at a much slower rate than for the lighter volatile organic compounds. However, concentrations of PAHs detected on site make volatilization likely when source areas are exposed. The more-volatile PAHs (i.e., naphthalene, acenaphthylene, and acenaphthene) have vapor pressures greater than 2.0 x 10^{-3} mm mercury, whereas the other compounds have vapor pressures ranging from 1.03 x 10^{-10} to 7.10 x 10^{-4} mm mercury. Probable carcinogenic PAHs associated with the site (benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, and indeno(1,2,3-cd)pyrene) are less likely to volatilize due to their greater molecular weight and more complex structures. Based upon their low vapor pressures (i.e., less than 1.0 x 10^{-8}) and high affinity for adsorption to particles, these PAHs would be expected to be associated more with airborne particulates (Eisenreich et al., 1981).

- **Transformation.** Of the four transformation processes, photolysis, oxidation, hydrolysis, and biodegradation/biotransformation; biodegradation is the only significant long-term environmental fate process for the PAHs associated with the site. PAHs are degraded under most conditions by microbial populations and/or metabolized by higher organisms relatively rapidly (EPA, 1979). Microbial degradation rates are particularly high if the PAHs are utilized as a sole carbon source (U.S. EPA, 1979).

- **Sorption.** The PAHs associated with the site exhibit varying degrees of binding affinity to organic matter and soil particles; this affinity is dependent upon their individual molecular structures. In general, the higher molecular weight PAHs are strongly adsorbed whereas the lighter PAHs (e.g., naphthalene) are less strongly sorbed (U.S. EPA, 1979; U.S. EPA, 1986). Therefore, adsorption to organic matter and/or soil particles will be an important environmental fate process, particularly for the higher molecular weight PAHs at the site.

- **Bioaccumulation.** Although polycyclic aromatic hydrocarbons are rapidly bioaccumulated, they are also quickly metabolized and eliminated from most organisms with the exception of shellfish (Clement Associates, 1985). Bioaccumulation is considered an important fate process for PAHs which, through other transport mechanisms make their way to the Thames River where shellfish may be impacted.

With few exceptions, the PAHs associated with the site will be relatively persistent in on-site soil matrices. This is primarily due to their generally low water solubility, resistance to photolytic, oxidative and hydrolytic degradation, and their high affinity for organic matter and soil particles.

Chlorinated Benzenes

Three chlorinated benzene compounds were detected in landfill groundwater. These three compounds include 1,2-dichlorobenzene, 1,3-dichlorobenzene, and 1,4-dichlorobenzene. Typical uses of these compounds are as solvents for degreasing and as an insecticide for moths, and termites.

- **Solubility.** The aqueous solubilities for these compounds range from 80 ppm (1,4-dichlorobenzene) to 145 ppm (1,2-dichlorobenzene), which is considered slightly soluble. As these compounds were detected in groundwater and not soils, it appears that this is a viable transport mechanism at the site.

- **Volatilization.** These compounds are expected to volatilize readily based on their Henry's Law constant value of 1.99×10^{-3} atm m^3/mole. Volatilization is a likely transport mechanism for these compounds.

- **Transformation.** Of the four transformation processes, photolysis, oxidation, hydrolysis, and biodegradation/biotransformation, biotransformation and possibly oxidation are the only significant fate processes. It is thought that these compounds can be broken down to some degree by pollutant-acclimatized microorganisms (Clement Associates, 1985). If volatilization occurs, it is likely that atmospheric oxidation will be the eventual fate process to take place.

- **Sorption.** Sorption is considered an important environmental fate mechanism for these compounds. The high log octanol/water partition coefficient (3.38) indicates a high affinity for adsorption to soil or organic matter.

- **Bioaccumulation.** "Indirect evidence suggests that bioaccumulation may also be an important fate process" (Clement Associates, 1985).

With respect to the chlorinated benzene subgroup of the base-neutral semivolatiles, sorption bioaccumulation, and volatilization with subsequent atmospheric oxidation are the recognized fate/transport mechanisms. The chlorinated benzenes detected at the site are expected to be persistent in the environment if volatilization does not occur.

Phthalate Esters

Phthalate esters are dispersed throughout the environment due to their common use as plasticizers. Di-n-butylphthalate and bis(2-ethylhexyl)phthalate were detected in environmental media at NSB-NLON. Phthalate esters have relatively low Henry's Law constants (10^{-5} to 10^{-7} atm-m^3/mole) and high K_{OW} values indicating that, although they may volatilize, it is at a slow

rate and they will tend to partition to organic soils and sediments. The water solubilities of di-n-butylphthalate and bis(2-ethylhexyl)phthalate are 13.0 mg/l and 0.3 mg/l, respectively, indicating that the compounds have relatively low water solubilities. Phthalate esters will undergo biodegradation in soil and sediment. Photolysis and oxidation do not appear to be important processes in governing the fate of these compounds (Clement Associates, 1985). Phthalate esters are commonly used as a plasticizing agent in plastics, leachability from those materials, and presence as a microcontaminant in laboratory chemicals (Verschueren, 1983) makes them common laboratory contaminants. As a result, it is not believed that phthalates are significant contaminants at the site. However, for phthalate compounds that are present in the environment, their affinity for organic matter and soils, low water solubility, resistance to transformation processes, and low volatility would make them relatively persistent chemical compounds.

1.7.4 Pesticides at the Area A Landfill Site

Pesticides were detected in numerous samples collected from the Area A Landfill. A total of 15 such compounds were detected; these include alpha BHC, heptachlor, aldrin, heptachlor epoxide, endosulfan I, dieldrin, endrin, endosulfan II, endrin ketone, endrin aldehyde, alpha chlordane, gamma chlordane, 4,4' DDE, 4,4' DDD, and 4,4' DDT.

- **Solubility.** A review of data regarding these compounds indicate that their aqueous solubilities are generally low ranging from 10 mg/l (alpha BHC) to 0.0055 mg/l (4,4' DDT). This is further evidenced by the lack of any detections in site groundwater samples.

- **Volatilization.** The pesticides detected at the Area A Landfill are all capable of volatilizing to some degree. For the following compounds, volatilization is an important transport mechanism; alpha BHC, aldrin, dieldrin, endrin, DDT, DDE, and DDD.

- **Transformation.** The pesticides detected at the Area A Landfill were determined to be affected by the transformation processes in varying degrees. Some compounds are very resistant to transformation. They included: heptachlor, heptachlor epoxide, alpha chlordane, and gamma chlordane. The majority of the other compounds are very susceptible to biotransformation, biodegradation, and photolysis. However, for some of these compounds their breakdown products can be as toxic as the original compound. For example, DDT can break down to DDE and DDD.

- **Sorption.** The pesticides detected at the site are generally thought to have a strong affinity for soils and organic matter. Sorption is probably one of the primary fate mechanisms for this group of contaminants at the site.

- **Bioaccumulation.** The pesticides detected at the site are all generally considered to be highly bioaccumulated compounds. bioaccumulation is therefore an important fate and transport mechanism for this group of contaminants.

A review of the chemical and physical properties of the pesticides detected at the site indicates that their behavior in the environment are similar. In general, these contaminants are highly susceptible to bioaccumulation; they tend to adsorb to soils and sediments; they have low aqueous solubilities; and are volatile to some degree. A review of the transformation processes for these compounds reveals the greatest variability between compounds. Heptachlor, heptachlor epoxide, alpha and gamma chlordane are all extremely persistent in the environment and are not highly susceptible to the transformation processes, while the remaining compounds all tend to undergo transformation via one or more of the processes.

1.7.5 Polychlorinated Biphenyls (PCBs) at the Area A Landfill Site

Three PCB isomers were detected in samples collected from the site. They include Arochlor 1242, Arochlor 1254, and Arochlor 1260. These Arochlor formulations are composed of complex mixtures of chlorinated biphenyls. Arochlor 1242, Arochlor 1254, and Arochlor 1260 contain 42%, 54%, and 60% chlorine (by weight), respectively. Up until the 1970s, PCBs were used widely as dielectric fluids in electrical capacitors and transformers because of their resistance to thermal degradation. Although the manufacture and use of PCBs for this purpose was discontinued in the United States in the 1970s, older equipment may still contain PCBs.

- **Solubility.** PCBs represent some of the least water soluble compounds detected at the site. Thus, runoff and groundwater transport of dissolved PCBs are not considered important transport mechanisms.

- **Volatilization.** Volatilization of dissolved PCBs is thought to be an important fate/transport mechanism. However, since PCBs are only slightly soluble in water, their rate of partitioning to the atmosphere is controlled by their low solubility.

- **Transformation.** Of the four transformation processes, photolysis, and to a lesser degree, biodegradation are the primary mechanisms. Less heavily chlorinated PCBs can be biodegraded by some soil microorganisms; however, PCBs with five or more chlorines are not measurably biodegraded. These heavier PCBs can be photolyzed by ultraviolet light.

- **Bioaccumulation.** PCBs have been shown to bioaccumulate in the adipose tissues of animal species. This is considered an important fate mechanism for this class of contaminants.

- **Sorption.** Adsorption to soils or organic matter is a major process controlling the environmental fate of PCBs. Like chlorinated pesticides, high affinity for adsorption to organic matter is evident from their high partition coefficients. Water solubility and partition coefficients among different PCBs are correlated by the number of chlorine atoms on the molecule. Consequently, PCB congeners with lower numbers of chlorine atoms (i.e., Arochlor 1242) tend to sorb less strongly than the more heavily chlorinated molecules such as Arochlor 1254 and Arochlor 1260. This is the primary environmental fate mechanism regarding this group of contaminants.

PCBs exhibit high persistence in the environment. This high persistence results from: (1) low solubility in water and air; (2) strong adsorption to soils, sediments, and organic matter; (3) the recycling of volatilized PCBs between the atmosphere, surface soils, and water; (4) high tendencies to bioaccumulate; and (5) relative resistance to biodegradation. PCBs were detected only in a relatively small area of soils located near the concrete pad. On the basis of the characteristics described above, it is apparent that existing PCB concentrations will remain associated with site soils due to their adsorbent properties. Significant migration is therefore not likely, other than for contaminants attached to soil particles that migrate via water or wind erosion.

1.7.6 Inorganics at the Area A Landfill Site

Inorganic contaminants detected in environmental media NSB-NLON include metals and cyanide.

Metals

Unlike most of the other contaminants detected in environmental media at NSB-NLON, metals occur naturally in the environment in addition to resulting from anthropogenic sources. The Phase I RI and Supplemental Site Investigation (Appendices A and B) discussed the distribution of metals in the environment and assessed whether the metals detected at NSB-NLON occur at concentrations in excess of their naturally occurring levels.

The fate and transport of metals in the environment depends on chemical properties of the metal as well as chemical and physical characteristics of the environment. The solubility of metals and metal salts controls the amount of metal available to groundwater or surface water, although other physical and chemical processes control the observed concentrations of those metals in water. Environmental factors influencing the mobility of metals in the environment include pH, Eh, the presence or lack of oxygen, the presence of other metal compounds such as iron oxides, and the presence of anions and complexing agents.

In general, metals are more soluble and more mobile in the environment at lower pH values. Higher pH values tend to cause metals to precipitate from solution.

The oxidation/reduction potential of the aquatic system being assessed (surface water, groundwater, or interstitial pore water in sediments) determines the equilibrium valence state of the metal. The more oxidized form of the metal will be favored under aerobic conditions; the reduced form is favored under anaerobic conditions. Many metals, including lead and cadmium, are less mobile in anoxic environments because they form nearly insoluble sulfide salts. However, some metals such as iron are more soluble in their reduced (Fe II or ferrous) form. When dissolved iron moves from a reducing to an oxidizing environment, the iron is oxidized to its ferric (Fe III) form and precipitates out of solution forming orange floc generally observed downgradient of landfills.

The presence of dissolved salts and gases (e.g., carbon dioxide and hydrogen sulfide) and the system pH determine the mineral form controlling the metal's solubility. For example, the

presence of sulfur in the form of sulfide in a reducing environment will cause precipitation with many metals cations (e.g., cadmium and lead) to form the metal sulfide. In addition, metals solubility can be enhanced in the presence of complexing agents such as humic acids formed from organic materials such as rotting leaves.

Metals have a high affinity to adsorb to soils and sediments. The degree to which metals adsorb to soils depends on the environmental factors discussed above and on characteristics of the soil or sediment including organic content, cation exchange capacity, clay content, and the presence of iron oxides in the soil.

Cyanide

The behavior of cyanide in the environment depends on the form of cyanide present. Factors influencing cyanide include pH, the presence or lack of oxygen, and the presence of iron which forms complexes with cyanide. Hydrogen cyanide is a weak acid with a pK_a of 9.21. At most environmental pH values, hydrogen cyanide is in its associated form (HCN). In this form, cyanide is very mobile in the groundwater and volatilizes as cyanide gas. However, cyanide forms hexacyanoferrate complexes with the ferrous (Fe II) and ferric (Fe III) forms of iron which are abundant in soil. Cyanide in these forms is much less toxic than free cyanide. The hexacyanoferrate complexes can bind to ferrous or ferric ions to form ferroferro- or ferriferrocyanide compounds that are much less soluble than free cyanide and have a much greater tendency to bind to soil or sediment.

1.7.7 Contaminant Migration at the Area A Landfill Site

The following sections summarize the areas of identified site contamination, the nature of that contamination, and the identified or postulated means for migration or exposure pathways. Potential receptors that may be impacted by site contaminants are identified in the sections that follow regarding human health and ecological risks.

1.7.7.1 Contaminant Sources at the Area A Landfill Site

Subsection 1.6 presents the available information pertaining to the nature and extent of contamination at the Area A Landfill. From that information the following conclusions regarding contaminant sources are made.

- As the site is a landfill, contaminants are not distributed homogeneously. No specific point sources or hot spots of contamination were detected. However, the soils surrounding the concrete pad have been determined to contain PCBs in several locations at concentrations which present a hazard to human health. This area of contamination is depicted in Figure 1-19.

- Of the twelve monitoring wells installed and sampled in the landfill there is no contamination hot spot which appears to be the source of groundwater contamination detected. However, groundwater in the vicinity of 2LMW18S was found to contain some of the highest incidences and concentrations of

contaminants from each of the classes of chemicals detected at the landfill. Samples of landfill contents/soils at this location did not indicate the presence of a contaminant hot spot.

1.7.7.2 Exposure Pathways

Chemicals will migrate within a specific media, and will also undergo interphase transport between media such as evaporation of chemicals from water to air. Plants and animals can also take up chemicals from soils and water which can cause transport of contaminants in the food chain. This pathway is of particular concern for chemicals that bioaccumulate as described in the previous section. The following sections will discuss potential migration routes for each media. For purposes of this section, the media, or primary migration routes, are air, groundwater and soils, and surface water and sediments.

Air

Airborne transport of chemicals occurs via two primary routes. These are volatilization and adsorption to small soil particles that become airborne as fugitive dust. Volatile chemicals were not detected at the Area A Landfill in high enough concentrations to have a measurable effect on ambient air quality. One pathway of concern for VOCs is the possible migration to air in subsurface utility trenches from contaminated subsurface soils and groundwater. Transport of fugitive dusts is a concern due primarily to PCB and DDTR compounds which tightly adsorb to these particles. The rate and extent of contaminant migration of airborne materials will be primarily determined by modelling air transport. Subsurface migration of volatiles is governed primarily by preferential flow pathways such as sand lenses, or gravel bedding for subsurface utilities. Dispersion for VOCs and particle size for fugitive dusts are physical parameters that will affect the rate and extent of migration. Airborne contaminants from this site will migrate in the direction of wind currents. The prevailing winds are southwesterly in the summer and northwesterly in the winter. The average wind speed is around ten miles per hour. Transport in any direction is possible at certain times. The chemicals once airborne will either degrade, settle on land or the Thames River. Possible effects on water quality in the Thames River are currently being investigated. Fugitive dusts could have measurable impacts on soils within a short distance of a contaminated site and could have temporary adverse impacts on ambient air quality.

Groundwater and Soils

Contaminated soils can release contaminants to both air and groundwater. The release to air by evaporation or fugitive dust is discussed above. Water percolating through soils will mobilize chemicals from soils to infiltrating water by dissolution and desorption. Chemicals are also leached from soils below the water table by the same mechanism. Due to the shallow depth to groundwater and relatively permeable overburden at NSB-NLON, this infiltrating water will migrate to and mix with the groundwater. The mobility of a chemical is its rate of transport relative to groundwater velocity. Contaminants will not migrate faster than groundwater. Groundwater at the Area A Landfill eventually discharges in some instances to wetlands and several small streams which all eventually discharge to the Thames River. In such discharge

areas, groundwater could be close enough to the ground surface whereby direct uptake by biota is possible. In other instances, groundwater flows at a greater depth and does not discharge to surface water until it reaches the Thames River.

Contaminants are present above and below the water table, therefore, contaminants will be leached from soils by both infiltrating precipitation and flowing groundwater. In the overburden, the highest groundwater elevation is in the middle of the Area A Landfill. It appears that groundwater in the central/eastern portion of Area A flows north toward the Area A wetland, and groundwater in the northwestern portion of the Area A Landfill flows northwest toward the Area A Downstream and eventually to the Thames River. The velocity of groundwater flow through soils in the landfill and adjacent wetland portions of Area A was estimated to be 0.04 feet per day.

Groundwater flow in the bedrock is generally to the west. Transmissivity values in the bedrock range from 4.7 to 250 ft^2/day, indicating a high variability of transmissive properties within the fractured bedrock.

VOCs which were detected in soils in low to moderate concentrations are highly mobile and were detected in low concentrations in groundwater. The SVOs, PCBs and pesticides detected in site soils have low mobilities. There was only one occurrence of PCB in groundwater. If this result is correct, the presence of PCBs in groundwater suggests a concentrated source of PCBs in soil near the location where it was observed (2LMW18S). Metals are generally immobile and partition strongly to soils except for some metal compounds. Of all the metals detected above background in soils, only cadmium was detected in groundwater above MCL. Cadmium is substantially more soluble in natural waters than many metals; therefore, its existence in groundwater is not surprising. All other metals are apparently in forms that are relatively immobile. Other inorganics were detected in groundwaters above TBC values. These inorganics were also present above background in soils. These include: iron, manganese and sodium. These inorganics are more soluble in reduced environments. Therefore, it appears that the landfill has caused leaching of these materials from soils into groundwater at elevated levels.

The final cap proposed for the Area A Landfill will prevent the migration of contaminants from unsaturated landfill contents/soils to the groundwater. By preventing such migration, the cap will improve groundwater quality; however, the cap by itself may not improve groundwater sufficiently to achieve all remedial action objectives for groundwater. Any groundwater remediation, beyond a cap, that may be required to meet remedial action objectives will be addressed in the final remedy for this site.

Surface Water and Sediments

Contaminants enter surface water primarily by runoff and groundwater discharge. Runoff becomes contaminated by contact with surficial soils and atmospheric chemicals. Runoff and groundwater can contain dissolved chemicals and contaminated suspended particles. Once introduced to the stream, contaminants will migrate with the surface water or be incorporated into river sediments by partitioning or sedimentation. The more volatile compounds can also

evaporate to the air. The sediment bedload will also migrate downstream, although at a much slower rate than surface water. Sediments accumulate at dams, obstructions, or where flow velocity decreases. Contaminants can also enter surface water via air releases, however, this is not considered a significant pathway at this site due to the relatively low surface soil contaminant concentrations and limited amount of erodible surfaces. The exchange of surface water to groundwater is also considered negligible in that the small streams tributary to the Thames River are normally recharged by groundwater. The Thames River during high tide does recharge small areas of groundwater up to 200 feet inland, however, the Thames River is the ultimate discharge point for contaminants from NSB-NLON. Due to the large flow of the Thames River, contaminant concentrations are only potentially a concern in the mixing zone within the Thames River adjacent to NSB-NLON and adjacent sediments. The section of the Thames River near NSB-NLON is an estuary. Within an estuary, the changing of the river from fresh to salt water conditions has substantial effects on suspended and dissolved material in the river. Destabilization of colloids, alternation of adsorption equilibrium and precipitation of cationic species are among the commonly observed changes. There is a general tendency for trace metals, and potentially hydrophobic organic compounds, to be trapped in estuarine sediments as a result of these processes. Contaminants once in the surface water/sediment system are available for uptake by biota. The Thames River does support a significant sport fish population. An ecological assessment of the Thames River will be provided as an appendix to the forthcoming Phase II Remedial Investigation Report.

Surface water from this site originates from runoff within the northern Subase watershed area (refer to Figures 1-5 and 1-10), and eventually discharge to the Area A Wetlands and Downstream surface waters. The primary discharge point from the Area A Wetland is through four 24-inch metal culverts through the dike. This discharge forms a small stream which flows west for approximately 200 feet and into a small pond. Wetlands sediments accumulate upstream of the dike. Under normal flow conditions, this pond discharges to a small stream which flows north and then west toward Triton Avenue (past OBDANE site). The stream continues flowing west under Triton Avenue and Shark Boulevard and eventually discharges to the Thames River at the DRMO outfall. This pond also has a discharge structure on the south side. During periods of high flow and high water at the pond, water also flows out through this structure to a stream which flows south from the Over Bank Disposal Area site. A second pond to the west of the pond referenced above is formed by groundwater inflow, and flows to the west around North Lake.

Groundwater also discharges from the Area A Landfill to a small wetland at the base of the dike and the Over Bank Disposal Area site. A stream flows from this wetland west toward North Lake, a recreational swimming area for Navy personnel. Under normal flow conditions the stream enters a culvert which bypasses the pond and discharges to a stream below the outfall of the pond. This stream flows west under Shark Boulevard and through the golf course to the Thames River. There is a manhole adjacent to North Lake that connects to another pipe which was designed to discharge overflow water from North Lake; however, this pipe has been plugged. The invert elevation of this pipe is several inches higher than the main culvert, so that under normal flow conditions no water would have flowed to the pond. Under substantial runoff conditions, however, it is possible that some water may have discharged to the pond from this

stream. At the time of Atlantic's site inspection, the pond had been drained, yet some water remained in the pond, indicating that it receives groundwater recharge.

1.8 Human Health Risks

In subsections 1.8.1 through 1.8.5, risks to human health are assessed in terms of current and future land use; the conditions evaluated; the selection of chemicals of concern for evaluation; the receptors and exposure pathways evaluated; and conduct of the human health risk assessment and quantification of exposure. Results of the human health risk assessment are presented in subsection 1.8.6, while a summary of human health risks is presented in subsection 1.8.7. All of the information presented herein is a summary of the risk assessment in the Phase I RI.

1.8.1 Current and Future Land Use at the Area A Landfill Site

The region referred to as Area A Landfill is approximately nine acres in size, most (97%) of which is unpaved. The area is used primarily for storage, and Naval authorities refer to this site as "Alpha Area Storage and Deployed Parking". Various materials are stored on wooden palettes in the landfill area, and a concrete pad in the southwest portion of the site was used as an above ground storage area for transformers, removed underground storage tanks, and crane weights. Military servicemen use a section of the landfill area as parking while on sea duty.

Current on-site activities include daily movement of stored items on the wooden palettes, preparation of sandbags during summer months, and occasional storm sewer repair. The site is also periodically visited by the public during auctions of abandoned cars in the parking area. Because of existing uncovered dirt piles and current on-site activities, fugitive dust generation is likely.

The nearest Groton/Ledyard residence along Route 12 is only 425 meters from the site. Residential housing for junior officers and their families is approximately 490 meters from the landfill. Recreational activities in close proximity to the Area A Landfill include military servicemen jogging along Wahoo Avenue and playing tennis at nearby tennis courts. A standing watch exists when Alpha Area storage is closed, but access is possible from the road and a wooded hillside to the west.

Based on discussions with Navy personnel, future uses of these areas are expected to remain the same as current use.

1.8.2 Conditions Evaluated

Inorganic and organic compounds were detected at elevated levels (i.e., above background) in the surface soils, subsurface soils, and groundwater at the Area A Landfill during the Phase I investigation. The media indicated were the focus of the investigation.

1.8.3 Selection of Chemicals of Concern for Evaluation

The Area A Landfill is one of a number of sites under evaluation at the Navy Base. Because of the potential for cumulative risks associated with this site, a single base-wide list of chemicals of concern was developed. This ensured that chemicals were consistently evaluated from location to location even though some of the chemicals included on the list may not have been detected at a particular location. The chemicals evaluated for this area and the Navy Base in general are listed below.

Non-carcinogenic PAHs (All HSL Compounds Included)	**Carcinogenic PAHs** (All HSL Compounds Included)	**PCBs** (Aroclors 1260 & 1254)
Other Semi-Volatiles (12 compounds: primarily phthalates and phenols)	**Pesticides** (7 compounds: DDT residues, endrin, methoxychlor)	**Metals** (14 compounds: Al, Sb, As, Be, B, Cd, Cu, Fe, Pb, Mn, Hg, Ni, Se, Zn)
BTEX Compounds (All BTEX compounds)	**Chlorinated Volatiles** (13 compounds)	**Other Volatiles** (4 compounds)

1.8.4 Receptors and Exposure Pathways Evaluated

Based on information obtained through site visits, inspections, and discussions with personnel at the Area A Landfill or involved in future plans for the area, the following potential receptors were identified:

- Utility workers repairing storm sewers in landfill;
- Weapons center personnel exposed to fugitive dust from landfill;
- Military servicemen moving palettes in Alpha A Storage;
- Military servicemen exposed to fugitive dust while engaging in nearby recreational activities;
- Groton/Ledyard residents exposed to fugitive dust;
- Citizens attending car auctions in Deployed Parking Area.
- Subase children playing in adjacent areas and exposed to fugitive dusts from DRMO and Area A Landfill.

1.8.5 Conduct of the Human Health Risk Assessment and Quantification of Exposure

Risk calculations were made for chemicals with regard to their potential carcinogenic health risks and other (non-carcinogenic) health risks. These calculations were carried out in

accordance with standard U.S. EPA guidance and also reflect specific guidance provided by U.S. EPA Region I in their guidance documents and discussions.

In estimating the risk, the maximum values reported for each chemical detected in subsurface soils were used in each scenario. In addition, the most recent U.S. EPA guidance concerning exposure factors and toxicity values was used in making the risk estimates.

Non-carcinogenic health risks were evaluated using the Hazard Index. Risks are presumed to exist for a particular receptor when the Hazard Index exceeds "1" for all the compounds and pathways combined. When the Hazard Index is less than "1" , non-carcinogenic health risks are considered to be negligible. If the Hazard Index exceeds "1", the compounds contributing to the risk and target organs are reviewed to evaluate whether different non-carcinogenic effects are being assessed.

Carcinogenic health risks were evaluated with respect to incremental lifetime risk of cancer for an exposed individual. These risk estimates were compared to the one in one million (10^{-6}) to one in ten thousand (10^{-4}) range identified by the U.S. EPA. Risks less than 10^{-6} are generally considered negligible, while risks greater than 10^{-4} are generally considered indicative of requirements for remedial action. Within these two ranges requires risk management decisions that involve a variety of factors.

Lead exposure for workers was evaluated by comparison to the 500 to 1,000 mg/kg range used by EPA in the past for assessing adult exposure to lead at commercial/industrial sites. Currently, the EPA only has guidance for assessing children's exposure to lead in soil (OSWER Directive #9355.4-12). EPA established a screening level of 400 ppm lead in soils for protection of children in a residential setting using the Integrated Exposure Uptake Biokinetic (IUBK) model. Various methods for assessing adult exposure are under review by EPA.

Groundwater within Area A contains VOCs and cadmium at levels above drinking water standard/guidance values, indicating a potential health risk if the water were to be consumed. The landfill cap is intended to provide an interim source control measure that will prevent the migration of contaminants in unsaturated soils from migrating to the groundwater. By preventing such migration, groundwater quality should improve. Any remaining groundwater contamination at the site will be addressed in the final remedy.

Dust concentrations for the fugitive dust scenarios were either modeled or an ambient particulate concentration was selected. In the storm sewer scenario, the soil samples collected to a depth of eight feet were used to calculate exposure point concentrations based on the depth to sewers in this area. Depth to groundwater in the Area A Landfill ranges from approximately 6 to 16 feet below the surface. Therefore, exposure to groundwater in this area is considered unlikely, but possible if storm sewers are located where the water table is eight feet.

1.8.6 Results of the Human Health Risk Assessment

The results of the Risk Assessment for each scenario are as follows:

RISK SUMMARY TABLE NAVAL SUBMARINE BASE, GROTON				
Scenario	Total Cancer Risk		Total Hazard Indices	
	Average	Max	Average	Max
Utility Worker Repairing Storm Sewers in Area A Landfill	1.80E-07	1.10E-06	2.40E-02	8.50E-02
Weapons Center Personnel Exposed to Fugitive Dust From Area A Landfill	8.20E-08	2.60E-07	6.30E-04	1.50E-03
Military Servicemen Moving Palettes Within Area A Landfill	9.20E-06	4.20E-05	1.30E-01	3.30E-01
Military Servicemen Exposed to Fugitive Dust While Engaging in Nearby Recreational Activities	7.90E-10	1.60E-09	3.60E-05	5.40E-05
Groton/Ledyard Residents Exposed to Fugitive Dust	1.50E-08	2.90E-08	3.10E-04	5.80E-04
Citizens Attending Car Auctions in Deployed Parking	3.30E-07	5.80E-07	6.50E-03	1.0E-02
Subase Children Exploring the Area A Landfill and Surrounding Woodlands	3.0E-06	1.7E-05	7.0E-02	1.8E-01
Subase Children Exposed to Fugitive Dust From DRMO and Area A Landfill	6.40E-11	1.40E-10	4.4E-06	1.0E-05

Utility Worker Repairing Storm Sewers in Area A Landfill

The Hazard Indices do not exceed "1" for this scenario, and the carcinogenic incremental lifetime risk associated with soil contaminant exposure fell between 10^{-6} and 10^{-5}. The risks were primarily due to the presence of PCBs in the subsurface soils, and to a lesser extent, the presence of carcinogenic PAHs. Combined, the carcinogenic PAHs contributed a maximum of approximately 10^{-6} risk. The distribution of the PCB and PAH contamination in the soil was patchy, therefore, the average risk is expected to be lower than that estimated using the maximum values. Based on the results of the analysis, the risks to the workers in this scenario are judged to be low.

Weapons Center Personnel Exposed to Fugitive Dust from Area A Landfill

The non-carcinogenic health risks and the incremental carcinogenic risks are within levels considered to be acceptable.

Military Servicemen moving Palettes within Area A Landfill

Non-carcinogenic health risks were negligible for these workers. Incremental lifetime cancer risks of 8.5×10^{-6} are within the U.S. EPA acceptable range. The risk is primarily due to the presence of PCBs in the landfill surface soils.

Military Servicemen Exposed to Fugitive Dust While Engaged in Recreational Activities Near Area A Landfill

The non-carcinogenic health risks and the incremental carcinogenic risks are negligible for potential receptors in this scenario.

Groton/Ledyard Residents Exposed to Fugitive Dust from Area A Landfill

The non-carcinogenic health risks and the incremental carcinogenic risks are negligible for potential off-site receptors in this scenario.

Citizens Attending Car Auctions in Deployed Parking Area

The non-carcinogenic health risks and the incremental carcinogenic risks are negligible for auction participants in this scenario.

Subase Children Exploring the Area A Landfill and Surrounding Woodlands

Systemic (noncarcinogenic) health risks are estimated to be negligible for this exposure group. However, nominal lifetime cancer risk exceeded one in one million (1E-6) and the upper bound estimate exceeded one in one hundred thousand (1E-5). The carcinogenic risk is due to the presence of PCB Arochlor 1260 through oral or dermal contact with surface soils.

Subase Children Exposed to Fugitive Dust from DRMO and Area A Landfill

Systemic (noncarcinogenic) and cancer risks are estimated to be negligible via exposure to fugitive dusts.

1.8.7 Summary of Human Health Risks

The human health risk assessment for the Area A Landfill indicates that for the scenarios considered, the risks to human health from the landfill are minimal. These minimal risks are due primarily to the presence of PCBs in the landfill soils.

1.9 Risks to Ecological Receptors at the Area A Landfill Site

The Area A Landfill site is a developed section of the Subase that has no natural habitats. However, surface water runoff and leachate from the landfill could impact the areas directly to the north. Therefore, the Area A Ecological Risk Assessment focuses on biota in the adjacent Area A Wetlands. The biota that reside in these areas include plants, invertebrates, amphibians, birds, and mammals. Non-resident biota include migrating birds that visit the area seasonally, and mammals and birds that visit Area A occasionally. These receptors may be exposed to contaminant in the surficial soils, contaminants in the groundwater where it may seasonally discharge to the ground surface, and the contaminants in the surface water and sediments of ponds and streams. Higher trophic organisms in the food web may be exposed to contaminants

via bioaccumulation in lower level organisms such as soil invertebrates in the wetland and benthic invertebrates in the ponds and streams. All of the information presented herein is a summary of the risk assessment in the Phase I RI.

1.9.1 Current and Future Land Use

The Area A Wetland consists of approximately 30 acres of land to the north of Area A Landfill. A small pond is located in the eastern portion of the wetland, adjacent to the landfill. The wetlands are separated from the Downstream watercourses and the Overbank Disposal Area (OBDA) by a dike.

1.9.2 Conditions Evaluated

As previously discussed, inorganic and organic compounds were detected at elevated levels in the surface soils, subsurface soils, and groundwater at the Area A Landfill. Surface runoff and groundwater leachate from the landfill could impact the soils, sediments, surface waters, and groundwaters of the adjacent Area A Wetlands. Most of the ecological risks in Area A wetland are due to DDTR. The DDTR does not originate from the landfill. The ecological risks associated with DDTR in Area A Wetland will also not be discussed further, as they do not relate to the Area A Landfill.

1.9.3 Selection of Chemicals of Concern for Evaluation

The data evaluation and selection of compounds of interest for the ecological risk assessment were the same as for the human health risk assessment described above. Compounds of concern were detected in soils, sediments, surface water, and ground water. Based on the different physical and biological characteristics of wetland soil/sediments and stream, pond, and river sediments (i.e., carbon content, moisture content, invertebrate communities), wetland soil/sediments are referred to only as "soils" in this section of the assessment. Contamination of these media were also detected in Area A Wetland.

1.9.4 Receptors and Exposure Pathways Evaluated

Based on site visits and inspections, the following potential aquatic and terrestrial ecological receptors were identified:

- Vegetation,
- Benthic and Soil Invertebrates,
- Fish and Amphibians, and
- Birds and Mammals.

1.9.5 Quantification of Exposures

This section summarizes the various methods used to quantify exposures to the terrestrial and aquatic organisms previously described.

Terrestrial Exposures

Plants: The evaluation for plants focused on metals, since organic contaminants are much less likely to be taken up by plants. Measured surficial soil and sediment concentrations were compared with soil concentrations that produce toxic responses in plants available in contaminant literature.

Soil Invertebrates: Exposures to soil invertebrates were estimated using two different approaches. The first approach used the Equilibrium Partitioning (EqP) Method to estimate soil moisture concentrations of organic contaminants from measured soil concentrations. This method assumes complete and constant exposure to pore water. The second approach assumes wetland soils are constantly exposed to groundwater discharges, and uses the measured groundwater concentrations of contaminants as exposure concentrations. Both methods compare these exposure concentrations to U.S.EPA Water Quality Criteria and No Observed Adverse Effect Levels (NOAELs) to assess acute and chronic environmental risks. The exposure concentrations were then used to calculate predicted body burdens of invertebrates.

Fish and Amphibians: Fish were to be captured and analyzed for potential contaminants in tissue. No fish were observed on the day of sampling, however, numerous frogs were observed. Several frogs were collected from the wetland area and streams in the downstream area. These frogs were analyzed for pesticides, PCBs, metals, and body lipids. Control frogs were obtained from the Manomet Bird Sanctuary in Massachusetts, a presumably uncontaminated site. Pesticides and PCBs were not detected in frog tissues above the sample quantitation limit.

Birds and Mammals: The predicted body burden of soil invertebrates were used to estimate dietary exposure point concentrations for birds and mammals. These concentrations were used to estimate daily doses, which can be used to predict possible effects and risks through comparison with dose/response thresholds for various biological endpoints (lethality, reproductive/developmental, other chronic effects). Bioaccumulation models were also used to predict body burdens of DDTR and PAHs, which were then compared to concentrations in birds collected at the site. Gray Catbirds were collected from the site, but were only evaluated for DDTR body burdens.

Aquatic Exposures

Fish and Aquatic Invertebrates: Exposures for these organisms were evaluated by comparison of concentrations to Ambient Water Quality Criteria and effect levels reported in the literature.

Benthic Invertebrates: Exposure concentrations for these organisms were estimated using the EP Method previously discussed.

1.9.6 Conduct of the Risk Assessment

The ecological risk characterization relies upon the Toxicity Quotient approach and on direct observation of condition in the field. These approaches provide an overall "weight of

evidence" for the assessment, and are similar to the Hazard Index used in the Human Health Risk Assessment. The Toxicity Quotient approach involves comparing an exposure concentration to a NOAEL. Values that exceed "1" (exposure/effect level) are considered to be indicative of potential risk. Such values do not necessarily indicate that an effect will occur, but only that a lower threshold has been exceeded. Because the NOAEL value typically have uncertainty factors of 10 built into them, it is useful to evaluate the significance of the Toxicity Quotients as follows:

Toxicity Quotient >"1":	Some small potential for environmental effects;
Toxicity Quotient > "10":	based on experimental evidence, good potential that greater exposure could result in environmental effects;
Toxicity Quotient >"100":	effects may be expected based on the fact that this represents an exposure level at which effects have been observed in other species.

The Toxicity Quotient approach assumes that risks within a class of compounds (e.g., VOCs) are additive. This does not take into account possible synergistic or antagonistic effects among the compounds. In some cases, exposure point concentrations were compared to known toxicity data or developed criteria.

1.9.7 Summary of Ecological Risks

The ecological risk assessment addressed risks to a variety of trophic levels in the terrestrial and aquatic food chain in Area A Landfill and adjacent wetland. In general, the estimated ecological risks due to impacts of the Area A Landfill were low. On the lower levels of the food chain, risks to plants were low. Plants are unlikely to accumulate organic compounds to a great degree.

Metals concentrations in soil and sediment were, in general, below levels that may adversely affect plants or a higher trophic level that feeds on plants.

The results of estimating contaminant concentrations in soil moisture by the equilibrium partitioning method indicated that risks to soil invertebrates in the wetland area due to contaminants were low. Small risks due to exposure to PAHs were indicated in wetland soil samples 2WMW5S and 2WSD9. Soil invertebrates also may occasionally be exposed to ground water when it discharges to the ground surface in sections of Area A, particularly the wetland. However, risks to these organisms from this source appear to be low due to the low contaminant concentrations detected in the ground waters in this area.

Higher level organisms in the food chain may be exposed to a small extent to PAHs bioaccumulated in soil invertebrates. The greatest potential risks are to small mammals such as the shrew that consume a diet consisting primarily of soil invertebrates at a rate equivalent to their body weight per day. However, the elevated average dose calculated for theses animals was the result of one sample with a high concentration of PAHs. Calculations without this sample greatly reduced the dose and the associated risk. Risks to larger mammals, aquatic birds, birds of prey, and herbivores in general have minimal risks from the site.

Erosion of contaminated surface soils from the Area A Landfill to the adjacent wetlands present a continuing source of contamination which could increase risks to biota and plants in the wetland.

2.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

2.1 Overview of Process

This section addresses the first phase of the FFS process, which involves the identification and screening of remedial technologies. The steps of this process are as follows:

- **Step 1: Development of Remedial Action Objectives**. Remedial action objectives are initially established. These objectives consist of media-specific environmental goals to facilitate the development of remedial alternatives that will be protective of human health and the environment. Remedial action objectives consider the constituents of concern and potential exposure routes and receptors; the objectives also establish acceptable constituent levels or ranges of levels for each potential exposure route, based on potentially applicable, relevant and appropriate requirements (ARARs) and/or risk calculations.

- **Step 2: Development of General Response Actions**. Appropriate general response actions are developed during this step. This step involves the identification of general categories of remedial actions, each of which could provide a remedy or be incorporated into a coordinated remedy for the site. General response actions are selected so that, either by themselves or in combination with other general response actions, they will satisfy the remedial action objectives.

- **Step 3: Identification of Volumes or Areas of Site Media**. This step takes into account the characteristics of the site and the requirements for protectiveness to identify the volumes and areas to which the general response actions apply.

- **Step 4: Identification and Screening of Technologies**. Based on the general response actions for the media of concern, a master list of feasible technologies and technology process options are identified and screened. Technology types are general categories of technologies. Technology process options are defined as specific processes within a technology type. The objective of this screening step is to eliminate technologies that are not technically appropriate for the site.

- **Step 5: Evaluation of Technology Process Options**. In this step, the feasible technologies and technology process options that passed the initial screening are further evaluated on the basis of effectiveness, implementability, and relative cost.

Each of these steps are discussed separately in detail in subsections 2.2 through 2.6.

2.2 Step 1: Remedial Action Objectives

This subsection and subservient subsections establish remedial action objectives which consider contaminants and media of concern, potential exposure pathways, and remediation goals. In the following subsections, remedial action objectives will be established for contaminated soils/landfill contents at the Area A Landfill. These objectives are preliminary, since final remediation goals will not be determined until the final remedy is selected. The remedial action objectives were selected, at a minimum, to comply with the statutory requirements for CERCLA remedies as promulgated in the NCP (40 CFR Part 300). To that extent, the remedial action objectives satisfy the following criteria:

- meet applicable, relevant, and appropriate requirements (ARARs) developed in consideration of 40 CFR 300.430(e)(2)(i)A-E or proposed alternative concentration limits (ACLs) where appropriate;
- consider "to be considered" (TBC) requirements;
- reduce exposure to known or suspected carcinogens to represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6};
- reduce exposure to systemic toxicants to represent a lifetime toxicity quotient less than one; and
- reduce ecological risks to acceptable exposure levels.

The following subsections describe the development of remedial action objectives, based on: (1) human health or ecological risk-based levels (subsection 2.2.1), and (2) ARAR/TBC values and criteria (subsection 2.2.2). Subsection 2.2.3 presents the preliminary remedial action objectives to be used in this FFS for purposes of evaluating the capability of a remedial alternative to protect human health and the environment and comply with ARARs. TBC values were considered in the development of these remedial action objectives.

2.2.1 Risk-Based Remediation Goals

This section presents the risk-based remedial action objectives and evaluation of general response action alternatives for the Area A Landfill based on the Phase I Remedial Investigation Report, as well as subsequent data from the fall of 1993. Remediation goals are also necessary because hazardous wastes are present. These goals, which are the primary goals for the site, are discussed in subsection 2.2.2 regarding ARAR-based objectives. Baseline risk calculations were made for chemicals with respect to their potential systemic (noncarcinogenic) and carcinogenic health effects. These calculations were carried out in accordance with standard EPA guidance and also reflect specific guidance provided by EPA Region I in their guidance documents and discussions. A summary of the baseline risk assessment in the Phase I RI is provided in subsections 1.8 and 1.9.

There are no ecological receptors in the Area A Landfill site itself. However, contaminants migrating from the Area A Landfill site could impact the Area A Wetland via soil erosion, runoff, and groundwater discharge, as well as the OBDA wetland area via groundwater discharge. As summarized in subsection 1.9, ecological risks identified in the Area A wetland are low. Development of specific remedial action objectives to address groundwater discharges is outside the scope of this FFS. However, remedial action objectives to protect the Area A wetland environment from the escape of hazardous substances from the Area A Landfill by soil erosion and runoff, and contamination of groundwater due to migration of contaminants from unsaturated landfill materials, will be established in subsection 2.2.2 (ARAR-based RAO).

2.2.1.1 Risk-Based Remedial Action Objectives

Remedial action objectives are designed to be protective of human health and should reduce or eliminate potential health risks posed by the site. A summary of risks is as follows.

Receptors at Risk: Estimated cancer risks for all groups were less than one in ten thousand (1×10^{-4}) and most receptors were near or below the one in one million (1×10^{-6}) risk level. The two groups for which risk estimates exceeded one in one million were workers involved in moving pallets and workers involved in maintaining subsurface utility lines. These findings are consistent with the nature, frequency, and duration of these workers' activities. Risks to both groups were due to the presence of PCBs in either surface or subsurface soils. PAH compounds contributed to some of the risk to workers involved in excavation activities. Consistent with EPA guidance, the risk assessment assumed that workers involved in these activities did not use protective equipment such as gloves, dust masks, respirators, etc.

Exposure Routes and Media Contributing to Risk: Potential incidental ingestion of contaminants in surface soils or subsurface soils is the most important contributor to the estimated risks; dermal exposure for individuals involved in excavations is also important for PCBs.

Chemicals Contributing to Risk: PCBs are the primary group of chemicals contributing to the carcinogenic risk. PAH compounds make a small contribution to the risk for individuals involved in excavations. Lead concentrations slightly exceeded 1,000 mg/kg in one sample. Overall, metals, while elevated in some soil samples, do not pose an unacceptable health risk. Based on the information presented in the March 18, 1994 Risk Memo for Area A Landfill, which is included as Appendix E, and the results of the human health risk assessment, the following risk reduction and remedial action objectives were developed:

- reduce exposure of workers to PCBs in surface soils; and
- reduce exposure of workers to PCBs in subsurface soils.

These risk reduction objectives are established for the upper one foot of surface soils and the upper eight to ten feet of subsurface soils that are accessible under the anticipated exposure scenarios. The depth of accessible subsurface soils is established based on the depth of excavation for future maintenance of storm sewers.

Workers involved in loading and unloading wooden pallets and workers involved in excavations of storm sewers are the individuals most at risk at the site, and PCBs are the specific contaminants that contribute to the estimated risks. Remedial action objectives and associated target levels developed for these individuals and chemicals will ensure that risks to other receptors are at acceptable levels. Meeting these objectives will also reduce exposure of biota to PCBs.

The target levels suggested in subsections 2.2.1.2 and 2.2.1.3 are designed to ensure: (1) that there is little opportunity for individuals to encounter hot spots where patches of contaminants may be present at elevated levels, and (2) that overall risks associated with activities at the Area A Landfill are less than one in ten thousand (1×10^{-4}). Because contaminants have been observed to occur in patches within the Area A Landfill, remediation focused at addressing these patches will likely ensure that both risk reduction objectives are met. To ensure that overall risks are at or less than 1×10^{-4}, target levels for PCBs are developed for a target risk level of between one in one hundred thousand (1×10^{-5}) and one in one million (1×10^{-6}).

2.2.1.2 Target Levels for PCBs in Surface Soils

Workers involved with moving pallets may come into contact with surface soils over long periods of time and be exposed to PCBs present within these surface soils. A Risk Reduction Objective has been identified to "reduce exposure of workers to PCBs in surface soils of the Area A Landfill." The objective is based on the continued industrial use of the Area A Landfill site.

Workers moving pallets are the individuals most at risk due to PCB-contaminated surficial soils. Risk reduction objectives and associated target levels developed for these individuals and chemicals will ensure that risks to other receptors are at acceptable levels.

In brief, the major exposure factors used in the scenario involving movement of pallets are: frequency of exposure (260 days/year); duration of exposure (3 years for military personnel); soil ingestion rate (100 mg/day); absorption factor for ingestion (0.3); soil adherence on skin (0.5 mg/cm^2); fraction of skin area exposed (0.19); absorption of PCBs through skin (6%); body weight (70 kg); and lifetime (70 years).

A target level of 10 mg/kg (ppm) for PCBs in surface soils is suggested because it is consistent with federal levels that have been used to guide remediation efforts. A concentration of 10 mg/kg will ensure that there are no "hot spots" for exposure to soils within the Area A Landfill area. In addition, this concentration would yield an estimated risk of 7×10^{-6} for the workers moving pallets. Application of this target level as a site-wide average for the Area A Landfill site will ensure that the residual risk is within the 1×10^{-6} to 1×10^{-4} target range identified by EPA and that the average PCB concentration for remaining soils is less than 2 ppm. This level (2 ppm) is the target cleanup level recommended by CTDEP for GA groundwater classification areas. An average of 2 ppm for the Area A Landfill is achieved by remediating to 10 ppm because all higher level contamination is being removed and the areas of PCB contamination in the 2 ppm to 10 ppm range are small compared to the areas containing less than

2 ppm. Conservative assumptions have been incorporated into the estimate of risk and the derived target level should be protective of workers. The target level of 10 mg/kg will also ensure that risks to other receptors within or near Area A Landfill are low; however, this standard may not be protective of ecological receptors. As areas containing PCBs are to be capped there will not be any exposure of ecological receptors to PCBs.

2.2.1.3 Target Levels for PCBs in Subsurface Soils

Workers involved in excavation activities could periodically encounter PCBs in subsurface soils. A Risk Reduction Objective has been identified to "reduce exposure of workers to PCBs in subsurface soils of the Area A Landfill." The objective is based on the continued industrial use of the Area A Landfill. The depth of accessible subsurface soils is 10 feet. This depth was established based on the depth of excavation for future maintenance of storm sewers. Persons are not expected to be exposed to soils below this depth. Therefore, such soils (i.e., greater than 10 feet deep) do not present a hazard to human health.

Utility workers (involved in storm sewer repair) are the individuals most at risk due to PCB in subsurface soils. Risk reduction objectives and associated target levels developed for these individuals and chemicals will ensure that risk to other receptors are at acceptable levels.

The major exposure factors used in the exposure involving excavation are: frequency of exposure (1 day/year on average); duration of exposure (20 years for civilian personnel), soil ingestion rate (480 mg/day); absorption factor for ingestion (0.3); soil adherence on skin (0.5 mg/cm^2), fraction of skin area exposed (0.19); absorption of PCBs through skin (6%); body weight (70 kg); and lifetime (70 years).

A target level of 50 mg/kg (ppm) for PCBs in subsurface soils is suggested because it is consistent with levels that have been used to evaluate PCBs (under Toxic Substance Control Act [TSCA]), and to guide remediation efforts. Excavation of subsurface soils will occur infrequently as compared to the pallet-moving activities and, therefore, a concentration of 50 mg/kg (as compared to 10 mg/kg) should provide adequate protection. In addition, this concentration would yield an estimated risk of 2.5×10^{-6} for a utility worker involved in storm sewer repair. Application of this target level as a site-wide average for Area A Landfill will ensure that the residual risk is within the 1×10^{-6} to 1×10^{-4} target range identified by EPA. Conservative assumptions have been incorporated into the estimate of risk, and the derived target level should be protective of workers.

A summary of target levels for Area A Landfill is given below:

Scenario	Soil Depth (below ground surface)	PCBs Soils
Workers Moving Pallets	0 - 1 ft.	10 mg/kg
Excavation of Storm Sewers	1 ft. to 10 ft.	50 mg/kg

2.2.2 ARAR/TBC Remediation Goals

Federal and state chemical-specific, location-specific, and action-specific ARARs and TBCs are shown in Tables 2-1 through 2-3. These tables provide a synopsis of each ARAR or TBC, indicate its status (e.g., applicable, relevant, and appropriate, etc.), and provide a description of actions that may be required to be taken to comply with a specific ARAR.

Chemical-Specific ARARs

There are no chemical-specific ARAR values for soils; however, there are TBC values for soil. Based on the results of the Phase I RI and supplemental investigations to implement this remedial action, the following constituents were present in the Area A Landfill soils above TBC values:

CONSTITUENTS EXCEEDING TBC VALUES IN SOILS				
Constituent	**Concentration Range Detected (ppb)**	**Number of Values Above TBC**	**TBC (ppb)**	**Source of TBC**
TCL Volatile Organics				
1,1,2-Trichloroethane	ND -11	1 of 27	10	CTDEP Pollutant Mobility Criteria for Soil (GA)
1,1,2,2-Tetrachloroethane	ND - 22	1 of 27	10	CTDEP Pollutant Mobility Criteria for Soil (GA)
Chlorobenzene	ND - 4,500	1 of 27	2000	CTDEP Pollutant Mobility Criteria for Soil (GA)
Ethylbenzene	ND - 14,000	3 of 27	2600	CTDEP Pollutant Mobility Criteria for Soil (GA)
Xylene (total)	ND - 75,000	3 of 27	1400	CTDEP Pollutant Mobility Criteria for Soil (GA)
TCL Semi-Volatile Organics				
Naphthalene	ND - 20,000	1 of 27	5600	CTDEP Pollutant Mobility Criteria for Soil (GA)
Fluorene	ND - 17,000	1 of 27	5600	CTDEP Pollutant Mobility Criteria for Soil (GA)
Phenanthrene	ND - 61,000	2 of 27	4000	CTDEP Pollutant Mobility Criteria for Soil (GA)
Fluoranthene	ND - 47,000	1 of 27	5600	CTDEP Pollutant Mobility Criteria for Soil (GA)
Pyrene	ND - 40,000	3 of 27	4000	CTDEP Pollutant Mobility Criteria for Soil (GA)
Benzo(a)anthracene	ND - 23,000	4 of 27	660	CTDEP Pollutant Mobility Criteria for Soil (GA)
Benzo(b)fluoranthene	ND - 15,000	5 of 27	660	CTDEP Pollutant Mobility Criteria for Soil (GA)
Benzo(k)fluoranthene	ND - 14,000	3 of 27	660	CTDEP Pollutant Mobility Criteria for Soil (GA)
Benzo(a)pyrene	ND - 15,000	4 of 27	660	CTDEP Pollutant Mobility Criteria for Soil (GA)
bis(2-ethylhexyl)phthalate	ND - 1,900	3 of 27	660	CTDEP Pollutant Mobility Criteria for Soil (GA)
TCL Pesticides and Polychlorinated Biphenyls (PCBs)				
Heptachlor	ND - 79	1 of 27	2	CTDEP Pollutant Mobility Criteria for Soil (GA)
Heptachlor Epoxide	ND - 300	4 of 27	2	CTDEP Pollutant Mobility Criteria for Soil (GA)
Dieldrin	ND - 160	6 of 27	0.4	CTDEP Pollutant Mobility Criteria for Soil (GA)
Alpha Chlordane	ND - 86	5 of 27	12	CTDEP Pollutant Mobility Criteria for Soil (GA)
Gamma Chlordane	ND - 84	4 of 27	12	CTDEP Pollutant Mobility Criteria for Soil (GA)
4,4'-DDT	ND - 2,300	3 of 27	500	FFDC Action Tolerance Level
DDTR	ND - 2,470	5 of 27	500	FFDC Action Tolerance Level
TAL Inorganics (ppm)				
Arsenic	ND - 10.6	10 of 27	3.3	CTDEP DEC for Soil, Ind./Com. Criteria Draft, 12/94
Beryllium	0.25 - 3.9	8 of 27	1.3	CTDEP DEC for Soil, Ind./Com. Criteria Draft, 12/94
Chromium	8.3 - 289	2 of 27 0 of 27	100 (hexavalent) 51,000 (trivalent)	CTDEP DEC for Soil, Ind./Com. Criteria Draft, 12/94
Lead	5.5 - 1,780	2 of 27	1000	CTDEP DEC for Soil, Ind./Com. Criteria Draft, 12/94
TCLP Metals (ppm)				
Arsenic	ND - 0.3	8 of 16	0.05	Draft Pollutant Mobility Criteria for Soil, CTDEP, 12/94
Barium	0.14 - 1.06	1 of 16	1	Draft Pollutant Mobility Criteria for Soil, CTDEP, 12/94
Cadmium	ND - 0.065	11 of 16	0.005	Draft Pollutant Mobility Criteria for Soil, CTDEP, 12/94
Lead	ND - 2.19	7 of 16	0.015	Draft Pollutant Mobility Criteria for Soil, CTDEP, 12/94
Selenium	ND - 0.23	5 of 16	0.036	Draft Pollutant Mobility Criteria for Soil, CTDEP, 12/94
Silver	ND - 0.042	1 of 16	0.036	Draft Pollutant Mobility Criteria for Soil, CTDEP, 12/94

TABLE 2-1
NAVAL SUBMARINE BASE - NEW LONDON SUPERFUND SITE
AREA A LANDFILL
CHEMICAL-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
N/A	**Federal** EPA Human Health Assessment Cancer Slope Factors (CSFs)	TBC	CSFs are developed by EPA for health effects assessments or evaluation by the Human Health Assessment Group (HHAG).	These values present the most up to date cancer risk potency information. CSFs were used to compute the individual cancer risk resulting from exposure to contaminants.
N/A	**Federal** EPA Reference Doses (RfDs)	TBC	RfDs are dose levels developed by EPA for use in the characterization of risks due to non-carcinogens in various media.	RfDs are typically employed to characterize risks of groundwater contaminant exposure (for ingestion pathways).
STATE				
Soil	**State** Proposed Connecticut Cleanup Standard Regulations (CGS § 22a-133k)	TBC	These regulations are being adopted under the statutory authority provided by CGS § 22a-133k. They will provide specific numeric cleanup criteria for a wide variety of contaminants in soil. Separate criteria will be established for threats to human health and environmental receptors posed by direct contact with contaminants.	The Soil Cleanup Standards will be considered in the design of the proposed remedy.
Water	**State** Water Quality Standards (CGS § 22a-426)	Applicable	Connecticut's Water Quality Standards were adopted under this statute. They establish specific numeric criteria, and anti-degradation policies for groundwater and surface water.	Remedial activities will be undertaken in a manner that is consistent with the antidegradation policy in the Water Quality Standards. If any remedial activities occur that are regulated under these provisions, the use of engineering controls and best management practices may be required to prevent or minimize adverse impacts to the waters of the state.
Water	**State** Water Pollution Control (RCSA §§ 22a-430-1 to 8)	Applicable	These rules establish criteria for water and stormwater discharge to surface water, groundwater and POTWs.	Some of the proposed alternatives include collection and discharge of upgradient surface water and groundwater. Any discharges will meet the substantive requirements of these regulations, including treatment if necessary.

TABLE 2-2
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
Waste	**Federal** RCRA - General requirements (40 CFR Part 264 Subpart A)	Relevant and Appropriate	Establishes general requirements for owners and operators of hazardous waste treatment, storage, and disposal facilities.	A RCRA cap is required and the cap and associated systems will be designed to meet these requirements.
Waste	**Federal** RCRA - Preparedness and Prevention (40 CFR Part 264 Subpart C)	Relevant and Appropriate	Establishes requirements for minimizing the possibility of fire, explosion, or release of hazardous material.	The required RCRA cap and associated systems will be designed to meet these requirements.
Waste	**Federal** RCRA - Contingency Plan and Emergency Procedures (40 CFR Part 264 Subpart D)	Relevant and Appropriate	Establishes contingency plan requirements in the event of fire, explosion, or release from a facility.	The interim remedy will meet the substantive requirements specified in these regulations through the preparation and implementation of appropriate plans and procedures.
Waste	**Federal** RCRA - Releases from Solid Waste Management Units (40 CFR Part 264 Subpart F)	Relevant and Appropriate	Regulates releases from Solid Waste Management Units (SWMUs).	The interim remedy will meet the substantive requirements specified in these regulations.
Waste	**Federal** RCRA - Closure and Post-Closure Requirements (40 CFR Part 264 Subpart G)	Relevant and Appropriate	Details general requirements for closure and post-closure of hazardous waste facilities.	The required RCRA cap and associated systems will be designed to meet these requirements.
Waste	**Federal** EPA Technical Guidance - Final Covers on Hazardous Waste Landfills and Surface Impoundments, EPA/530-SW-89-047.	TBC	Presents technical specifications for the design of multi-layer covers at landfills where hazardous wastes were disposed.	The required RCRA cap and associated systems will be designed to meet these design specifications.
Waste	**Federal** PCB regulation under TSCA (40 Part CFR 761)	Applicable	These standards govern the storage of PCB items.	The management of PCB items during implementation of the remedy will be conducted in accordance with these standards.

TABLE 2-2 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Waste	State Hazardous Waste Management: Generator & Handler Requirements - General Standards, Listing, & Identification (RCSA §§ 22a-449(c)100-101)	Applicable	These sections establish standards for listing and identification of hazardous waste. The standards of 40 CFR Parts 260 to 261 are incorporated by reference. Chromium is not exempted from listing as a hazardous waste.	Hazardous waste determinations will be performed and the wastes will be managed in accordance with requirements of these regulations, if necessary.
Waste	State Hazardous Waste Management: Generator Standards (RCSA §§ 22a-449(c)102)	Applicable	This section establishes standards for various classes of generators. The standards of 40 CFR Part 262 are incorporated by reference. Storage requirements given at 40 CFR § 265.15 are also included. The selected remedy calls for off-site management of hazardous waste. However, these provisions would be applicable if hazardous waste is generated on the site as part of the remedy.	Any hazardous waste generated through excavation or other activities will be managed in accordance with the substantive requirements of these regulations.
Waste	State Hazardous Waste Management: TSDF Standards (RCSA § 22a-449(c)104)	Relevant and Appropriate	This section establishes standards for treatment, storage, and disposal of hazardous waste, and establishes standards for closure, post-closure, and groundwater monitoring. The standards of 40 CFR Part 264 are incorporated by reference. Underground injection of hazardous wastes, and placement of free liquids in landfills are prohibited.	A cap is required. The cap design will comply with the closure requirements of this regulation. The proposed remedial action includes groundwater monitoring. Any on-site treatment or storage would have to be conducted in accordance with the substantive requirements of these regulations.

TABLE 2-2 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
Waste	State Hazardous Waste Management: Interim Status Facilities and Groundwater Monitoring Requirements, Closure and Post-Closure Requirements (RCSA § 22a-449(c)105)	Relevant and Appropriate	This section establishes interim status standards for treatment, storage, and disposal of hazardous waste, and establishes standards for closure, post-closure, and groundwater monitoring. The standards of 40 CFR Part 265 are incorporated by reference. The Commissioner may require groundwater monitoring based on site-specific considerations.	A cap is required. The proposed cap design will comply with the closure requirements of this regulation. The proposed remedial action includes groundwater monitoring. Any on-site treatment or storage would have to be conducted in accordance with the substantive requirements of these regulations.
Waste	State Solid Waste Management (RCSA §§ 22a-209-1 to 15)	Applicable	Establishes standards for closure of solid waste disposal areas.	These portions of the regulations that are more stringent than Federal RCRA Subtitle D regulations will be met.
Waste	State Safe Storage of Oil and Chemical Liquids (RCSA §§ 29-337-1 to 3)	Applicable	These rules govern the storage of hazardous materials, including flammable liquids and other chemicals.	Storage of oil and other waste materials will be conducted in accordance with the requirements of these regulations.
FEDERAL				
Air	Federal Clean Air Act - National Emission Standards for Hazardous Air Pollutants (NESHAPs), 40 CFR Part 61.	Relevant and Appropriate	Establishes emission levels for eight listed hazardous air pollutants emitted from particular types of facilities.	The gas collection and treatment system for the required RCRA cap will be designed to attain the NESHAP numerical standards for potential landfill gases, including benzene and vinyl chloride.
Air	Federal Clean Air Act - Non-methane organic compounds (NMOCs) (Proposed rule - 56 FR 24468, to be codified at 40 CFR Part 60 Subpart WWW).	TBC	Regulations would require NMOC-specific gas collection and control systems, monitoring, and gas generation estimates. The proposed rule would also establish a performance standard for NMOC emissions from municipal solid waste landfills.	The proposed regulations will be considered in the design of the landfill gas collection and treatment system for the required RCRA cap.

TABLE 2-2 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Air	State Air Pollution Control - Control of Organic Compound Emissions (RCSA § 22a-174-20)	Applicable	Subsection (f) sets standards for emission of organic compounds. Incineration of organohalocarbons is prohibited under subsection (f)(6)(A).	The landfill gas collection and treatment system for the required RCRA cap will be designed to comply with the substantive requirements of this regulation.
Air	State Air Pollution Control - Control of Odors (RCSA § 22a-174-23)	Applicable	This section prohibits emission of any substance that constitutes a nuisance because of objectionable odor. Several compounds are deemed to constitute a nuisance if they exceed specific concentrations.	Site remediation activities will be planned to control the release of objectionable odors from the site so that the activities comply with the substantive requirements of this regulation.
Air	State Air Pollution Control - Control of Hazardous Air Pollutants (RCSA § 22a-174-29)	Applicable	This section establishes testing requirements and allowable stack concentrations for many specific substances.	Direct discharges to the air from the landfill gas collection and treatment system will be designed to meet the substantive requirements of these regulations so that the numeric criteria are not exceeded.
Air	State Air Pollution Control - Control of Particulate Emissions (RCSA § 22a-174-18)	Applicable	This subsection sets specific standards for particulate emissions. Specific standards that may apply particularly to the landfill include Fugitive Dust (18b) and Incineration (18c). Gas flares are regulated as incinerators.	Any activities involving excavation, landfill cap construction, or landfill gas flaring will be designed to meet with the substantive requirements of these regulations so that the numeric criteria are not exceeded.

TABLE 2-2 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
Air	State Air Pollution Control - Stationary Sources (RCSA § 22a-174-3)	Applicable	This regulation requires stationary sources of emissions to meet specified standards. Pollution abatement controls may be required. Specific standards are listed for many pollutants. Any landfill with potential emissions of any particular air pollutant (including methane) exceeding 5 tons per year may require an active gas collection system with emissions controls under subsection 3(a)(1)(K).	Any landfill gas collection and treatment system required as part of the remedial action will be designed to meet with the substantive requirements of this regulation.
Air	State Air Pollution Control - Sulfur Compound Emissions (RCSA § 22a-174-19)	Applicable	This section regulates emission of sulfur compounds including sulfur dioxide and hydrogen sulfide. Subsection 19(a)(8) contains specific standards for sulfur compound emissions by gas flares.	Any landfill gas collection and treatment system will be designed to meet with the substantive requirements of this regulation.
Air	State Control of Noise Regulations (RCSA §§ 22a-69-1 to 7.4)	Applicable	These regulations establish allowable noise levels.	Noise levels from construction activities are exempt from these requirements. The remedial action shall be designed and constructed so that any noise emitted after construction will meet the substantive requirements of these regulations.
FEDERAL				
Water	Federal National Pollution Discharge Elimination System (NPDES) (40 CFR Parts 122-125)	Applicable	These standards govern the discharge of water into surface waters.	Collection and discharge of groundwater, including treatment if necessary, will be conducted in accordance with these requirements.

TABLE 2-2 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Water	State Water Pollution Control (CGS § 22a-430)	Applicable	This section prohibits discharge to the waters of the state without meeting the substantive requirements of the state's Water Quality Standards. This section establishes requirements for many categories of discharges, including stormwater.	Some of the proposed remedies may create stormwater runoff that may require treatment under CGS § 22a-430b. Any discharges, including stormwater, will meet the substantive requirements of this section, including treatment if necessary.
Water	State Connecticut Water Diversion Policy Act (CGS §§ 22a-365 to 378)	Applicable	These rules regulate many diversions of the waters of the state. Several broad categories are exempt, including any diversion of less than 50,000 gallons per day and any discharge permitted under CGS § 22a-430. Under Section 22a-373, the Commissioner may impose limitations and conditions including monitoring, schedule of diversion, etc. Under CGS § 22a-378, the Commissioner may temporarily suspend such requirements if a water supply emergency has been declared.	Any non-exempt diversion will be carried out in accordance with the substantive requirements of these statutes. The Navy will coordinate with the Connecticut Department of Environmental Protection to identify any such requirements and ensure that they are met.

TABLE 2-3
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL
LOCATION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
Wetlands	**Federal** Executive Order on Protection of Wetlands (E.O. 11990, 40 CFR Part 6, App. A).	Applicable	Requires federal agencies to avoid impacts associated with the destruction or loss of wetlands, minimize potential harm, preserve and enhance wetlands, and avoid support of new construction in wetlands if a practicable alternative exists.	The landfill cap and any other activities will be designed to minimize impacts to the adjacent wetlands. To the extent necessary, wetlands restoration and/or replication will be undertaken.
Wetlands	**Federal** Clean Water Act § 404 - Dredge and Fill Activities (40 CFR Part 230; 33 CFR Parts 320-328).	Applicable	Requires that for dredging or filling of wetlands: no practicable alternatives exist; the activity will not cause a violation of state water quality standards or significant degradation of the water; and adverse effects will be minimized.	The required landfill cap will be designed to meet these standards and minimize impacts to the adjacent wetlands. To the extent necessary, wetlands restoration and/or replication will be undertaken.
STATE				
Surface Water and Wetlands	**State** - Inland Wetlands and Watercourses Regulations (RCSA §§ 22a-39-1 through 15).	Applicable	Regulates any operation within or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetland or watercourse.	The required landfill cap and the dredging of waste materials will be designed to minimize impacts to the Area A Wetland. To the extent necessary, wetlands restoration and/or replication will be undertaken.
Surface Water and Wetlands	**State** - Inland Wetlands and Watercourses Act - General Requirements (CGS § 22a-45a)	TBC	This section governs minor activities including installation of water quality monitoring equipment such as staff gauges, water recording and water quality testing devices, and survey activities, including excavation of test pits and core sampling. The Commissioner may require implementation of best management practices. The Department is currently drafting these requirements, and expects to issue them before the final remedy is selected for this site.	Once regulations are adopted, any wells, test borings, soil sampling, or other similar activities will be conducted in accordance with the substantive requirements of these regulations, if any.

The TBC value for DDT is applicable to edible raw fruits and is not appropriate for soils. The DDT contamination above TBC levels is isolated and is not present in concentrations that would be expected to pose unacceptable hazards to human health or the environment. Risks to a construction worker exposed to the maximum concentration of DDTR in soil were low (approximately 1 E^{-6}). For these reasons, the TBC value for DDT will not be used as a remedial action objective.

The TBC value for PCBs, which is from the TSCA spill cleanup guidance, has been incorporated as a target remediation goal in the remedial action objective for surface soils at this site as discussed in subsection 2.2.3.

One of the goals of the remedy to be selected in this FFS is to mitigate further groundwater contamination from landfill wastes; however, the effectiveness of this remedy by itself will be evaluated by ongoing groundwater monitoring. The need for and type of groundwater remediation that may be required to address groundwater will be decided after the Phase II RI report and further groundwater monitoring. Any such groundwater remediation alternatives will be developed and evaluated in a separate feasibility study. The FFS was developed primarily to address risks identified in the Phase I RI which are related to the landfill contents/soils operable unit. As such, no chemical-specific remedial action objectives have been developed to address contaminated groundwater. Potential groundwater remedial options must be compatible with any remedy selected for landfill contents/soils.

Action-Specific and Location-Specific ARARs

The most significant action-specific or location-specific ARARs involve those regulations (federal and CTDEP hazardous waste management standards) for closure of hazardous waste disposal areas. While several other action-specific and location-specific ARARs have been identified and must be met, the hazardous-waste closure requirements are the most significant and can be translated to a specific remedial action objective. The general performance standard for closure of a hazardous waste management area states that closures should be performed in a manner which controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous substances to the environment. In addition, these requirements include the installation of a final cover at closure designed to:

- provide long-term minimization of migration of liquids through the closed landfill;
- function with minimum maintenance;
- promote drainage and minimize erosion or abrasion of the cover;
- accommodate settling and subsidence so that the cover's integrity is maintained; and
- have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present.

The hazardous waste requirements also have specific requirements for post-closure care and monitoring of a closed disposal area. As a result, the general performance standard for closure of hazardous waste sites will be a specific remedial action objective for this FFS.

2.2.3 Preliminary Remedial Action Objectives

This subsection provides an explanation of the selection of preliminary remedial action objectives (RAOs) to be used in this FFS, based on risk and ARAR analyses and other

considerations. Table 2-4 presents a summary of risk-based and chemical-specific TBC-based target remediation levels along with the selected target remediation levels, including comments regarding the selection of these levels. As stated, there are no chemical-specific ARAR values applicable to soils.

The final remedy will also have to comply with standards for all the applicable location-specific and action-specific ARARs identified in Tables 2-2 and 2-3. As previously mentioned, of the more significant groups of the action-specific and location-specific ARARs are the federal and state hazardous waste landfill closure standards. As such, the general performance standard for closure of hazardous waste management areas was made a remedial action objective.

2.3 Step 2: General Response Actions

General response actions describe all potentially feasible remedial measures that will satisfy the remedial action objectives. Potentially feasible remedial measures for the Area A Landfill site include limited action, containment, removal, *in situ* treatment, aboveground treatment, off-site disposal, or a combination of these options. General response actions establish the framework for identifying specific technologies and process options which are discussed subsequently in this report. The general response actions to meet each remedial action objective for the site are shown in Table 2-5. This table contains information regarding area or volume of contaminated media, general response actions, technology types for each remedial action objective, and a description of how each response action could achieve remedial action objectives. Further information regarding volumes and technology process options is provided in subsequent sections of this report.

The number of practicable general response actions for landfills is limited. The response actions were selected based on engineering judgment, EPA guidance for conducting feasibility studies for landfill sites (U.S. EPA, 1991), and the NCP. As stated in the NCP, the EPA expects that containment technologies generally will be appropriate for wastes that pose a relatively low, long-term threat or where treatment is impracticable (40 CFR 300.430(a)(iii)(A)). However, the EPA expects treatment to be considered for identifiable areas of highly toxic and/or mobile material that constituted the principal threat(s) posed by the site (40 CFR 300.430(A)(iii)(c)). As a result, the general response actions developed for the Area A Landfill include only limited action and containment actions for the landfill contents/soils. The only identified hot spot at the Area A Landfill is the PCB-contaminated soils near the bituminous concrete pad. For these materials, the full range of general response actions which include treatment will be evaluated.

2.4 Step 3: Identification of Volume or Areas of Site Media

In this subsection, the media to which remedial actions may be applied are defined, taking into account the characteristics of the site.

Volume estimates were calculated using data from the Phase I RI (Appendix A) and supplemented with the remedial actions field investigation data (Appendix B). The extent and degree of contamination was determined across the site, and hot spot areas were defined, based on the remedial action objectives.

TABLE 2-4
CHEMICAL-SPECIFIC RAO FOR SOILS

Constituent	Risk-Based Target Remediation Level (ppm)		Site Risk Level After Remediation To Target Level [2]	TBC-Based Target Remediation Levels (ppm)	Selected Target Remediation Level (ppm)		Comments
	Surficial (0-1')	Accessible (1-10')	Future Construction Workers		Surficial (0-1')	Accessible (1-10')	
PCB	10	50	1E-5 to 1E-6 (1) 1E-5 to 1E-6 (2)	10 (U.S. EPA) 2 (CTDEP)	10	50	By removing all surficial hot spots containing >10 ppm PCB and accessible hot spots containing >50 ppm PCB average site levels will below 2 ppmand average risk levels will be <1E-6.
Metals (3)	None	None	Not applicable	MCL in TCLP extract	None	None	No sources of hot spots containing metals have been identified despite the occurrance of TCLP extract levels above MCL values. In addition, levels in groundwater do not indicate a distinct plume or area of groundwater contaminated with metals.
DDTR	None	None	Not applicable	500	None	None	Not appropriate for soils. Risk assessment did not predict risk due to DDTR.

Notes: (1) Based on workers moving pallets over surface soils.
(2) Based on utility workers involved in excavations.
(3) Barium, cadmium, and lead have been detected in soils above TBC value.

TABLE 2-5
GENERAL RESPONSE ACTIONS

Remedial Action Objective	Area or Volume	General Response Actions	Technology Types	Description of How Remedial Action Objective is Achieved
Area "A" Landfill				
Reduce exposure of workers to PCBs located near the bituminous concrete pad. Target remediation levels of 10 ppm for surface soils and 50 ppm for subsurface soils will achieve this objective.	300 cubic yards	Limited Action	Access Restrictions	By use of fences, deed restrictions and other access restrictions workers will not be near any areas of contamination thereby preventing contact with contaminated materials and associated risks.
		Containment	Horizontal Barriers, Surface Water Control	Impervious or soil caps covering the areas of contamination will prevent direct contact by persons to contaminated materials, thereby eliminating that exposure pathway and associated risk.
		Removal	Excavation	If areas containing contaminants above target remediation levels are excavated and either sent to an off-site TSDF or properly treated or disposed on-site persons working at this site will no longer be exposed to PCB and risk to them will be eliminated.
		Treatment (*in situ* & aboveground)	Biological, Physical/Chemical, Thermal	There are several available *in situ* and aboveground treatment technologies that are capable of destroying the PCB contamination. Once the PCB is destroyed there are no longer any risks to human health.
		Disposal (On-Site & Off-Site)	Landfill, Reuse	These technologies would be for excavated materials. Because contaminated materials are removed, risks to site workers are eliminated. Materials must be landfilled in a sound manner to prevent any increase in risk at the new disposal location. Reuse applications as fill would only be used for soils that have been treated to reduce PCB concentrations to very low levels.

TABLE 2-5 (continued)
GENERAL RESPONSE ACTIONS

Remedial Action Objective	Area or Volume	General Response Actions	Technology Types	Description of How Remedial Action Objective is Achieved
Control, minimize or eliminate, to the extent necessary to protect human health and the environment, post-closure escape of hazardous substances to the environment.	13 acres	Limited Action	Access Restrictions	These actions by themselves will do little to prevent post-closure escape of hazardous constituents; however, they are necessary for the maintenance of containment systems which are discussed below. For example, a cap could be easily damaged if access to this site is not controlled. Only authorized personnel and activities will be allowed after a cap is placed.
		Containment	Horizontal Barriers, Surface Water Control	The placement of a horizontal barrier such as a cap will prevent erosion of landfill soils/contents and if the cap is impervious infiltration will also be prevented. Surface water controls will minimize run-on and promote runoff, thereby reducing erosion and the amount of water available for infiltration. These technologies, therefore whether used in combination or by themselves will reduce the post-closure escape of hazardous substances.

The following subsection describes the general methodology used and assumptions made in computing the volume of PCB-contaminated soil and landfill contents/soils. In the detailed analysis of alternatives, the effects that variations in volume estimates may have on total estimated remedial costs are discussed in the cost estimate sensitivity analysis.

The analytical results for PCBs detected in concentrations above target remediation levels and areas of contamination are shown in Figure 2-1. The soils being considered for removal were selected, based on elevated levels of PCBs. The removal action at this site is aimed specifically at removing source or hot-spot areas. These areas are defined as areas where levels of PCBs in surface soils exceed 10 ppm or where levels of PCBs in subsurface soils exceed 50 ppm. The derivations of these standards are contained in subsection 2.2. Target-cleanup levels for PCBs are risk-based; therefore, only surficial and accessible soils are being considered for removal. These soils could be accessed during routine maintenance or construction activities. Persons would not be expected to be exposed to soils beneath this depth (10 feet); therefore, these deeper soils do not present a risk to human health. For the purpose of this report, accessible soils are defined as soils that range from the surface to 10 feet below the surface. This depth is based on the depth of underground utilities at this site.

Two distinct areas of soil contamination have been identified as depicted in Figure 2-1. The soils surrounding 2LSS2 contain elevated PCBs above the surface soil standard of 10 ppm, and the soils surrounding 2LTB23 contain elevated levels of PCBs above the subsurface soil standard of 50 ppm from a depth of 4 to 10 feet below grade. The total volume of PCB-contaminated soils was estimated to be approximately 300 cubic yards, based on the areas defined in Figure 2-1, at a depth of 2.0 feet surrounding 2LSS2, and at a depth of 4.0 to 10.0 feet surrounding 2LTB23. The estimated volume assumes that a contingent amount of greater than 100% may also require removal to meet target cleanup levels.

The total area and volume of the landfill was developed based on the landfill thickness isopleth map (Figure 1-20). This map was developed using available boring logs. Based on this analysis, the landfill covers approximately nine acres and contains more than 200,000 cubic yards of material.

2.5 Step 4: Identification and Screening of Technologies

In this step of the FFS, potential remediation technologies were identified, as discussed in subsection 2.5.1. Also, a preliminary screening, based upon technical implementability, was conducted as described in subsection 2.5.2.

2.5.1 Identification of Technologies

Table 2-6, a list of remedial technologies identified for initial screening, was developed for landfill soils contents and soils/hot spots, soils being the medium of concern. Technologies applicable to the landfill contents/soils have been shaded, whereas all the technologies apply to the hot soils/spots. The technologies for landfill contents/soils are limited to engineering controls. The NCP and the EPA presumptive remedy guidance for landfills contains the expectation that engineering controls generally will be the only appropriate remedies for large

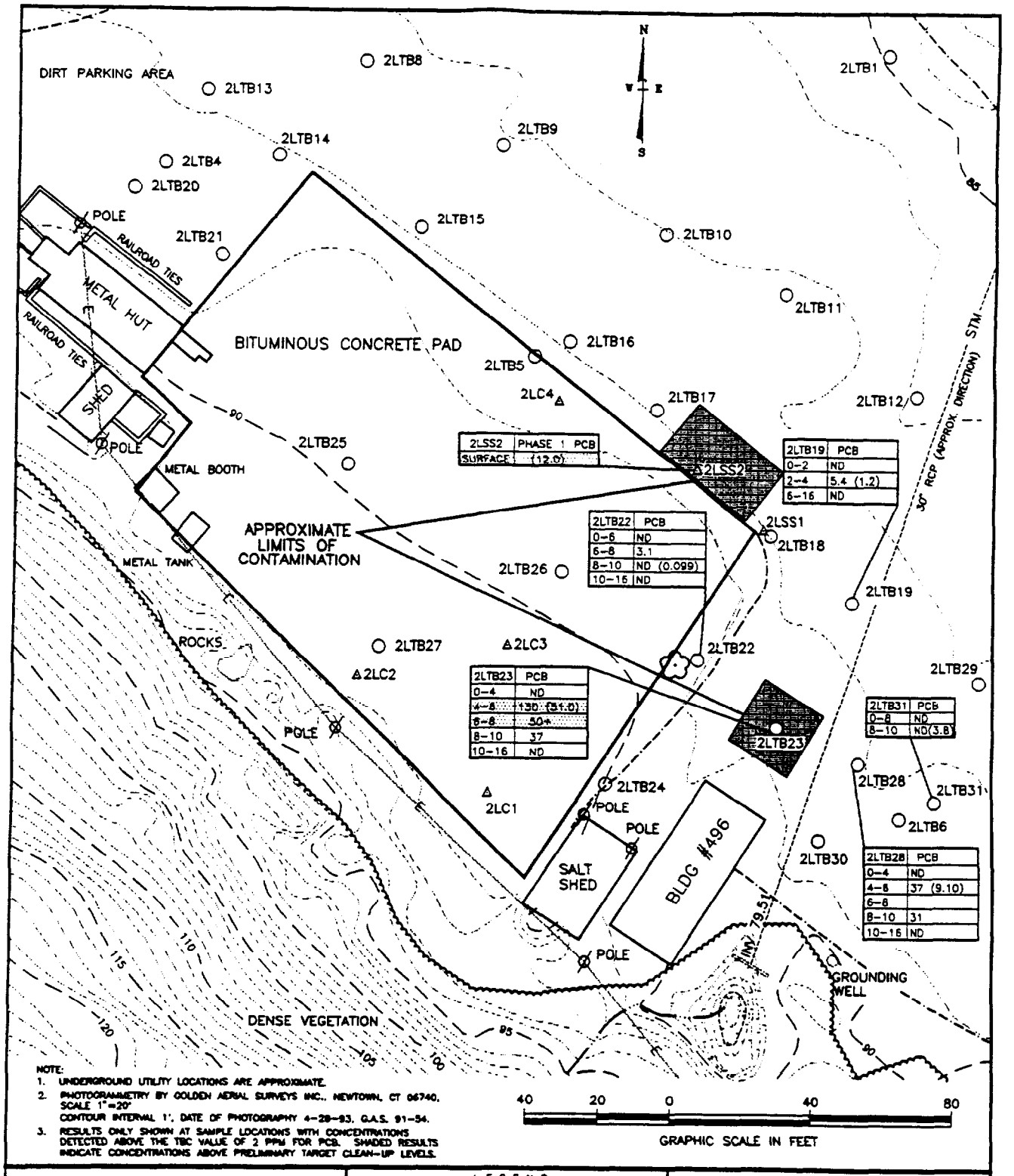

DIRT PARKING AREA
2LTB8
2LTB13
2LTB1
2LTB14
2LTB9
2LTB4
2LTB20
POLE
RAILROAD TIES
METAL HUT
2LTB21
2LTB15
2LTB10
2LTB11
BITUMINOUS CONCRETE PAD
2LTB16
2LTB5
2LC4
2LTB17
2LTB12
30" RCP (APPROX. DIRECTION) STM
SHED
2LTB25
METAL BOOTH
APPROXIMATE LIMITS OF CONTAMINATION
2LSS2
2LSS1
2LTB18
2LTB26
METAL TANK
2LTB19
ROCKS
2LTB27
2LC3
2LTB22
2LC2
2LTB29
2LTB23
2LTB31
2LTB28
2LTB24
2LC1
2LTB6
SALT SHED
BLDG #496
2LTB30
GROUNDING WELL
DENSE VEGETATION
2LTB23 PCB
0–4 ND
4–6 130 (31.0)
6–8 50+
8–10 37
10–16 ND
2LTB22 PCB
0–6 ND
6–8 3.1
8–10 ND (0.099)
10–16 ND
2LSS2 PHASE I PCB
SURFACE (12.0)
2LTB19 PCB
0–2 ND
2–4 5.4 (1.2)
6–16 ND
2LTB31 PCB
0–8 ND
8–10 ND(3.8)
2LTB28 PCB
0–4 ND
4–6 37 (9.10)
6–8
8–10 31
10–16 ND
NOTE:
1. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE.
2. PHOTOGRAMMETRY BY GOLDEN AERIAL SURVEYS INC., NEWTOWN, CT 06740, SCALE 1"=20'
CONTOUR INTERVAL 1', DATE OF PHOTOGRAPHY 4-28-93, G.A.S. 91-54.
3. RESULTS ONLY SHOWN AT SAMPLE LOCATIONS WITH CONCENTRATIONS DETECTED ABOVE THE TBC VALUE OF 2 PPM FOR PCB. SHADED RESULTS INDICATE CONCENTRATIONS ABOVE PRELIMINARY TARGET CLEAN-UP LEVELS.
40 20 0 40 80
GRAPHIC SCALE IN FEET
INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE-NEW LONDON
GROTON, CONN.
LEGEND
2LTB1 TEST BORING
2LSS1 SURFACE SOIL SAMPLE
10 EXISTING CONTOUR
123 BUILDING NUMBER
STREAM
STM STORM SEWER
PHASE II SAMPLE RESULT
SAMPLE I.D.
2LTB26 PCB
0–2 ND (2.3)
PPM
DEPTH
ANALYTICAL
FIELD SCREENING
FIGURE 2-1
SOIL ANALYTICAL RESULTS SUMMARY
AREA A LANDFILL
BITUMINOUS CONCRETE PAD
ATLANTIC ENVIRONMENTAL SERVICES, INC.

TABLE 2-6
TECHNOLOGY LIST
MEDIA: SOILS FOR SOILS

LIMITED ACTION	CONTAINMENT	REMOVAL
No Action • No Action ***Access Restriction*** • Institutional Controls • Fencing	***Horizontal Barriers*** • Caps ***Surface Water Control*** • Dikes • Floodwall • Site Grading & Stormwater Management	***Excavation*** • Backhoe • Auger • Soil Freezing
***IN SITU* TREATMENT**	**ABOVEGROUND TREATMENT**	**DISPOSAL**
Biological • Aerobic • Genetic Engineered • Anaerobic ***Physical/Chemical*** • Soil Venting/Air Sparging • Soil Washing • Steam Injection • CROW™ (contained recovery of oily wastes) • Stabilization • Degradation (hydrolysis, oxidation) ***Thermal*** • Vitrification • Electro-Acoustic • Radio-Frequency Destruction	***Biological*** • Landfarming • Composting • Bioslurry • Anaerobic • Genetic Engineered ***Physical/Chemical*** • Steam Stripping • Air Stripping • Dechlorination • Hydrolysis • Oxidation • Dewatering • Soil Washing • Solvent Extraction • Photolysis • Stabilization ***Thermal*** • Incineration • Pyrolysis • Low Temperature Thermal Desorption	***On-Site Landfill*** • Solid Waste Disposal Area • RCRA Landfill ***Off-Site Landfill*** • Solid Waste Disposal Area • RCRA Landfill ***On-Site Reuse*** • Use in Asphalt Batch Plant • Fill After Treatment • Fuel for Boilers/Kilns ***Off-Site Reuse*** • Use in Asphalt Batch Plant • Use in Cement Manufacturing (Raw Material) • Fill After Treatment • Fuel for Boilers/Kilns

Note: Shading indicates technologies applicable to landfill contents/soils, whereas all the technologies apply to hot spots/soils.

quantities of wastes such as the Area A Landfill contents/soils that pose a relatively low-level threat. Process options identified for each technology are also included in the list. Since all excavations at the site will be above the water table, and since groundwater is not the focus of this FFS, an evaluation of treatment methods for water is not included. References used to facilitate identification of technologies are listed at the end of this report.

2.5.2 Screening of Technologies

The list of technologies comprising Table 2-6 was screened to eliminate or modify technologies that cannot be effectively implemented. The screening was based on a knowledge of site conditions, waste characteristics, and technical requirements. The technologies included those that might prove extremely difficult to implement, would require unreasonable time periods to utilize, or were insufficiently developed.

Difficulty of implementation was judged, based on engineering constraints such as the ability of a particular technology to remove, destroy, or otherwise treat the constituents of concern, availability of equipment or contractors with proper expertise, or physical site constraints. Institutional implementability, such as permit requirements or public acceptance, was not used to eliminate process options during this initial screening.

Unreasonable time periods were considered with respect to the time it takes to reduce the risks posed (i.e., the time to stop migration to critical exposure pathways). As such, technologies that take longer than a few years to implement were eliminated. However, technologies that require long-term maintenance or operation were not necessarily eliminated during the initial screening.

Insufficiently developed or innovative technologies were defined as technologies that have not been demonstrated to be successful at the field scale. However, some innovative technologies that appear promising, have had limited field scale demonstrations and are directly applicable to NSB-NLON were retained for further evaluation. Since the intent of the FFS was to select an interim action to be implemented under an accelerated schedule, there is not sufficient time available in such an accelerated schedule to develop an innovative technology to field-scale operation. Innovative technologies are those that have undergone limited or no field-scale demonstration and have been demonstrated only on a pilot scale, bench scale, or laboratory scale.

The results of the initial screening are presented in Table 2-7. Potentially appropriate and feasible process options are also identified in this table. Technologies applicable to landfill soils/contents have been shaded, whereas all technologies listed apply to soil hot spots.

2.6 Step 5: Evaluation of Process Options

The process options selected in Step 4 (subsection 2.5) were evaluated based on effectiveness, implementability, and relative cost (Appendix F). A summary table of this evaluation is provided in this subsection.

The effectiveness of each process option was evaluated based on the following criteria:

TABLE 2-7
INITIAL SCREENING OF TECHNOLOGIES
MEDIA: SOILS

TECHNOLOGY	PROCESS OPTION	DESCRIPTION	SCREENING COMMENTS	OPTION RETAINED
RESPONSE ACTION: LIMITED ACTION				
No Action	No Action	No Action	Does not reduce contaminant volume or migration. Easy to implement.	•
Access Restriction	Deed Restriction	Property deed would contain notice regarding contaminated soils and would restrict disturbance of these soils.	Easy to implement. Only effective in preventing direct contact. Could be used in conjunction with containment response actions. Does not reduce contamination volume or migration.	•
	Fencing	A physical barrier to prevent outside entry.	Easy to implement. Only effective in preventing direct contact. Does not reduce contaminant volume or migration. Could be used in conjunction with contaminant.	•
RESPONSE ACTION: CONTAINMENT				
Horizontal Barriers	Cap	A low permeability cover placed over wastes to prevent precipitation infiltration, erosion of contaminated soils, and direct contact.	Easy to implement. Proven technology. Not effective for soils below groundwater elevation. Prevents direct contact and fugitive dusts. Requires long-term maintenance. Does not reduce contaminant volume.	•
Surface Water Control	Dikes	Well compacted earthen berms on the downgradient of the contaminated area.	Structure may interfere with existing land use. Would not reduce contaminant volume or migration. Difficult to implement. Washout adequately controlled by cap and site grading. Flooding is not a concern at this site.	
	Floodwall	Reinforced concrete wall on the downgradient of the contaminated area.	Structure may interfere with existing land use. Would not reduce contaminant volume or migration. Difficult to implement. Requires less area than a dike.	
	Site Grading and Stormwater Management	Grading and stormwater structures to prevent transport of contaminants from surface soils or sediments.	Easy to implement. Requires minimal maintenance. Does not reduce contaminant volume. Does not prevent infiltration of direct precipitation. Washout adequately controlled by cap and site grading. Flooding is not a concern at this site.	•
RESPONSE ACTION: REMOVAL				
Excavation	Backhoe	Physical removal of contaminated soil by mechanical equipment such as backhoe, bulldozer, loader, etc.	Difficult to implement in areas with building and utilities, or for materials with high-water content. Relatively fast implementation. Reduces contaminants on site. Depth limited. Difficult to work below groundwater without dewatering.	•
	Auger	Physical removal of contaminated soils by a mechanical auger.	Difficult to implement in areas with buildings and utilities, or for materials with high-water content. Quick. Reduces contaminants on site. Difficult to work below groundwater. Less surface disturbance. Ability to work at greater depths. Due to the shallow depth of excavations at the site, a backhoe is preferable.	
	Soil Freezing	Soils frozen to facilitate excavation.	This is an innovative technology which has not been field-demonstrated at a Superfund site and, therefore, it will not be considered for use at this site.	
RESPONSE ACTION: IN SITU TREATMENT				
Biological	Aerobic Degradation	Enhancement of natural biological activity by the addition of oxygen, nutrients and sometimes cultured microorganisms.	Reduces volume of organic contaminants and therefore contaminant migration. Application is very site-specific. Site soils are not homogeneous, making implementation difficult. PCB may be difficult to degrade to levels desired.	•
	Genetic Engineered	Microorganisms are genetically engineered to utilize target compounds.	Technology is in the research and development stage; therefore, it will not be further considered.	

TABLE 2-7 (continued)
INITIAL SCREENING OF TECHNOLOGIES
MEDIA: SOILS

TECHNOLOGY	PROCESS OPTION	DESCRIPTION	SCREENING COMMENTS	OPTION RETAINED
Biological (continued)	Anaerobic Degradation	Anaerobic microbial species and conditions are developed to enhance utilization of target compounds.	Pilot-stage technology; therefore, it will not be further considered.	
Physical/ Chemical	Soil Venting/Air Sparging	Injection and extraction wells pump ambient air through soil to remove contaminants.	Not effective for areas with soils with very low permeability or that are not homogenous. Not effective for PCB removal.	
	Soil Washing	Removal of contaminants from soil by flushing soils with aqueous surfactants or solvents.	Not effective on soils with high silt/clay concentrations. Recovery of washing solution may not be 100 percent. Pilot-stage technology; therefore, it will not be further considered.	
	Steam Injection	Steam is injected into the soil to enhance the recovery of petroleum hydrocarbons.	Not effective for saturated soils or soils with very low permeability. Can only remove volatile and semivolatile organics. Demonstration projects have not been completed; therefore, it will not be further considered for use at this site.	
	Contained Recovery of Oily Wastes (CROW™)	Steam and hot water are injected. Displacement by the steam and hot water move the oily wastes and water aboveground for treatment.	Applicable to heavy No. 6 oils. Demonstration projects have not been completed and effectiveness on PCBs is unknown; therefore, it will not be further considered for use at this site.	
	Stabilization	Subsurface soils are solidified, fixated or encapsulated to prevent leaching of contaminants.	Involves disturbance of soils. Difficult to implement in areas with underground utilities. Does not reduce volume of contaminants. Very effective in reducing contaminant mobility.	•
	Degradation	Chemicals are injected into subsurface soils to oxidize, reduce or hydrolyze subsurface chemicals.	Chemicals injected may be toxic. Contact with contaminants difficult to control. Degradation products may be toxic. Pilot-stage technology; therefore, it will not be further considered for use at this site.	
Thermal	Vitrification	Electrically heating contaminated soils into a glass/crystalline structure.	Very effective. Air emissions may need to be collected. Reduces contaminant migration. Applicable to inorganics and organics.	•
	Electro-Acoustic	Application of direct current and acoustic fields to increase migration of leachable contaminants through soil.	Technology is in the research and development stage; therefore, it will not be further considered.	
	Radio-Frequency Destruction	Radio-frequency electrodes placed along the ground surface heat the subsurface and volatize and/or destroy organics.	Technology is in the research and development stage; therefore, it will not be further considered.	

TABLE 2-7 (continued)
INITIAL SCREENING OF TECHNOLOGIES
MEDIA: SOILS

TECHNOLOGY	PROCESS OPTION	DESCRIPTION	SCREENING COMMENTS	OPTION RETAINED
RESPONSE ACTION: ABOVEGROUND				
Biological	Landfarming	Controlled application of contaminated soil, nutrients, and microbes to land area that is tilled.	Requires large land area and treatment takes several months. Reduces volume of contaminants. Effective for organic contaminants; therefore, it will be retained for evaluation.	•
	Composting	Degradation of wastes using thermophilic aerobic microbes under forced air conditions.	Reduces volume of contaminants. Effective for organic contaminants; therefore, it will retained for evaluation.	•
	Bioslurry	Enhanced biodegradation by increasing the mass transfer of organics into the aqueous phase.	Reduces volume of contaminants. Effective for organic contaminants; therefore, it will be retained for evaluation.	•
	Anaerobic	Anaerobic microbial species and conditions are developed to enhance utilization of hazardous constituents.	Not field-demonstrated. Potential use for treatment in series with aerobic processes to treat PCB. Effective for organic contaminants, including PCB; therefore, it will be retained for evaluation.	•
	Genetic Engineering	Microorganisms are genetically engineered to utilize hazardous constituents.	Technology is in the research and development stage; therefore, it will not be further considered. considered.	
Physical/ Chemical	Steam Stripping	Steam is pumped through contaminated soils to remove contaminants.	Not effective in soils with high silt/clay content. Contaminated water must be treated. Not proven effective for PCBs.	
	Air Stripping	Air is pumped through contaminated soils to remove contaminants.	Not proven effective for PCBs.	
	Dechlorination	Chemical dechlorination using a sodium reagent.	Effective for chlorinated compounds such as PCB; therefore, it will be retained for evaluation.	•
	Hydrolysis	Displacement of a functional group on an organic molecule with a hydroxyl group to chemically degrade hazardous constituents.	Degradation products may be toxic. Not proven effective for PCBs.	
	Oxidation	Process by which oxidizing agents decompose organic compounds to carbon dioxide and water and inorganics to salts.	Complete degradation may not occur. Many compounds cannot be easily oxidized. Effective for destruction of organic contaminants such as VOC and PCB; therefore, it will be retained for evaluation.	•
	Dewatering	A mechanical technique to separate solids from liquids such as centrifuge, filter press, etc.	Water still may require treatment and soils still may require special disposal. Volume reduction technique only. Effective if used in series with other treatment methods. Necessary process to remove free liquids for materials prior to landfilling.	•
	Soil Washing	Extraction of contaminants from soil by aqueous solutions and solvents.	Not effective on silt/clay particles. Extraction fluid requires treatment. Not proven for PCBs on a commercial scale; however, potentially a cost-effective method.	•
	Solvent Extraction	Extraction of contaminants from soil by use of solvents or superficial fluids.	Not effective on silt/clay particles. Extraction fluid requires treatment. Effective at removing PCBs; therefore, it will be retained.	•
	Photolysis	Use of ultraviolet light to dechlorinate organic compounds.	Cannot penetrate soils or opaque solutions. Laboratory scale technology; therefore, it will not be further considered.	

TABLE 2-7 (continued)
INITIAL SCREENING OF TECHNOLOGIES
MEDIA: SOILS

TECHNOLOGY	PROCESS OPTION	DESCRIPTION	SCREENING COMMENTS	OPTION RETAINED
Physical/ Chemical (cont'd)	Stabilization	Excavated soils are solidified, fixated, or encapsulated to prevent leaching of contaminants.	Stabilized soils may require special disposal. Contaminants are not destroyed. Very effective in decreasing contaminant mobility.	•
Thermal	Incineration	High temperature oxidation of organics in a controlled combustion process.	Supplemental fuel required. Very effective in destroying all types of organic contamination.	•
	Pyrolysis	High temperature heating of materials in the absence of air to thermally degrade wastes to a volatile gaseous portion and residual solid comprising of fixed carbons and ash.	Supplemental fuel required. Very effective in destroying organic contamination.	•
	Low Temperature Thermal Desorption	Separation of VOCs and semi-VOCs from solids by heating the mixture to drive off contaminants.	Supplemental fuel required. Effective for PCB.	•
RESPONSE ACTION: DISPOSAL				
On-Site Landfill	Solid Waste Disposal Area	Removal and transportation of wastes to an existing landfill permitted to handle nonhazardous solid waste.	Wastes must be solid and cannot contain PCBs or RCRA hazardous waste. Somewhat difficult to implement.	
	RCRA Landfill	Removal and transportation of wastes to an existing landfill permitted to handle PCBs and/or hazardous waste.	Wastes must be solids and may require pretreatment to meet land disposal restriction requirements. Very effective method at eliminating on-site contamination. May be difficult to implement.	•
Off-Site Landfill	Solid Waste Disposal Area	Removal and transportation of wastes to an existing landfill permitted to handle nonhazardous solid waste.	Wastes must be solid and cannot contain PCBs or RCRA hazardous waste. Disposal site may be unlined. Some soils may be suitable for use as cover. Easy to implement.	
	RCRA Landfill	Removal and transportation of wastes to an existing landfill permitted to handle PCBs and/or hazardous waste.	Wastes must be solids and may require pretreatment to meet land disposal restriction requirements. Easy to implement.	•
On-Site Reuse	Use in Asphalt Batch Plant	Removal and transportation of wastes to an existing batch plant to be used as supplemental aggregate. In the aggregate kiln, organics are volatized and incinerated.	Soil particle size and moisture content must meet specification, or pretreatment is required. Technology primarily applicable to petroleum hydrocarbons and PAHs. Very effective for these types of contaminants. Not suitable for PCB disposal.	
	Fill After Treatment	Use of treated soils as landfill material in nonregulated areas.	High degree of treatment required for soils to be classified as "clean" fill; however, reuse as backfill in excavations after such treatment is viable alternative. Therefore **backfill after treatment** will be retained as a potentially applicable process option.	•
	Fuel for Boiler or Kilns	Use of wastes as supplemental fuel in industrial boilers or kilns.	Wastes must have heat value generally greater than 5,000 BTU/lb. None of the soils or sediments at NSB-NLON are expected to meet this criterion. No boiler capable of burning solids is available at NSB-NLON.	

TABLE 2-7 (continued)
INITIAL SCREENING OF TECHNOLOGIES
MEDIA: SOILS

TECHNOLOGY	PROCESS OPTION	DESCRIPTION	SCREENING COMMENTS	OPTION RETAINED
Off-Site Reuse	Use in Asphalt Batch Plant	Removal and transportation of wastes to an existing batch plant to be used as supplemental aggregate. In the aggregate kiln, organics are volatized and incinerated.	Not suitable for PCB disposal.	
	Use in Cement Manufacturing	Removal and transportation of soils to an existing plant to be used as raw material. In the cement kiln, organics are incinerated.	Process applicable only to soils. Permitted sites for PCBs and other chlorinated organics are not be available. Effective method for organic constituents which results in destruction of organic contaminants and ultimately stabilization of inorganic contaminants in a concrete matrix.	•
	Fill After Treatment	Use of treated soils as landfill material in nonregulated areas.	High degree of treatment required for soils to be classified as "clean" fill. Extra treatment and QA/QC required to classify materials as clean fill is not cost-effective.	
	Fuel for Boiler or Kilns	Use of wastes as supplemental fuel in industrial boilers or kilns.	Wastes must have heat value generally greater than 5,000 BTU/lb. None of the soils or sediments at NSB-NLON meet this criterion.	

Note: Shading indicates technologies applicable to landfill contents/soils, whereas all listed technologies apply to hot spots/soils.

- The potential effectiveness of process options in handling the estimated areas and volumes of media and in achieving the RAOs.

- The potential impacts to human health and the environment that would be posed by use of the process option during the construction and implementation phase.

- The proven reliability of the process with respect to the contaminants and conditions present at the site.

The implementability of each process option was evaluated based on the following criteria:

- technical implementability and

- institutional implementability:

  - ability to obtain permits;
  - availability and capacity of TSD services; and
  - availability of necessary equipment and skilled workers.

The cost of each process option was evaluated, based on a comparison of the estimated relative costs for each remedial process options considered. The cost analysis was made on the basis of:

- engineering judgment and
- estimates of typical costs, based on available information.

Cost estimates were based on cost information from similar applications of each process option at other sites throughout the country.

Based on the results of these evaluations, process options which would not be feasible at the Area A Landfill site were eliminated from further consideration. The remaining process options were grouped to form remedial alternatives. These alternatives were then evaluated as described in Section 3.0 of this report the alternatives that passed the evaluation were analyzed in detail, as described in Section 4.0.

A comprehensive report on the evaluation of process options is provided in Appendix F. This evaluation was performed during preparation of the initial work on the FS and therefore addresses contaminants and site conditions at the Area A Landfill site, as well as at other sites at the overall NSB-NLON site.

Based upon the evaluation of process options provided in Appendix F, a summary (Table 2-8) of the evaluation of process options relative to the Area A Landfill was prepared. The summary table lists all process options retained after the initial screening of technologies. Technologies applicable solely to landfill contents/soils have been shaded, whereas all listed technologies apply to hot spots/soils. Options that were retained for the development of

TABLE 2-8
EVALUATION AND SCREENING SUMMARY
AREA A LANDFILL/BITUMINOUS CONCRETE PAD

Technology	Process Option	Screening Comments	Option Retained
		SOILS	
LIMITED ACTION			
No Action	No Action	Evaluation required by CERCLA.	•
Access Restriction	Institutional Controls/ Fencing	Effective at preventing direct contact at minimal cost.	•
CONTAINMENT			
Horizontal Barrier	Caps	This process option can meet risk-based remedial action objectives, minimize infiltration and erosion, and is easily implemented; however, it does not reduce the volume of toxicity of contaminants through treatment.	•
Surface Water Control	Site Grading and Storm-Water Management	Can improve effectiveness of other process options such as capping and, by itself, can prevent off-site migration of surface soils.	•
REMOVAL			
Excavation	Backhoe	Common method easily implemented for shallow soils and readily available.	•
IN SITU TREATMENT			
Biological	Aerobic	Not a proven technology and not proven effective in degrading PCBs. In addition, site soils are not homogenous thereby decreasing the potential effectiveness of this option.	
Physical/ Chemical	Stabilization	These processes have been proven to be effective at reducing the leaching of PCBs; however, the major hazards posed by PCBs at this site are not due to leaching of PCBs from the soil matrix. Direct contact risks are not reduced by the stabilization process, therefore this process option was not retained.	
Thermal	Vitrification	Pilot scale tests have been successfully completed on PCB wastes. Mobilization costs are substantial. Not a proven commercial technology, therefore implementation is difficult.	
ABOVEGROUND TREATMENT			
Biological	Landfarming	Not proven to be effective at degrading PCBs to levels below target remediation levels. Also difficult to implement due to extensive treatability and pilot scale testing required.	
	Composting		
	Bioslurry		
	Anaerobic		

TABLE 2-8 (continued)
EVALUATION AND SCREENING SUMMARY
AREA A LANDFILL/BITUMINOUS CONCRETE PAD

Technology	Process Option	Screening Comments	Option Retained
Physical/ Chemical	Dechlorination	High destruction of PCBs possible. Biphenyl end-product is not believed to be bioaccumulative or toxic. Potential handling problems and no commercial vendors are available.	
	Oxidation	High costs. Not very effective for hydrophilic compounds such as PCB. Only laboratory scale treatments of PCBs have been successfully completed.	
	Dewatering	Effective method for dewatering soils. Commercial units readily available. Would only be required if soils were being removed from beneath the water table and dewatering was required prior to disposal. No such dewatering is anticipated.	
	Soil Washing	This is primarily a volume-reduction alternative which may not be effective for PCB. Ultimately, soils are contained in an off-site landfill. Due to the small volume of contaminated soils, the volume reduction offered by this process is not cost-effective. For this reason and as this process is difficult to implement and may not be effective, it will not be retained for further evaluation.	
	Solvent Extraction	High PCB removal has been demonstrated. Potentially very effective in spite of implementation difficulty.	•
	Stabilization	Has been proven effective in stabilizing PCBs and reducing risk due to leaching of PCBs; however, the hazards posed by PCBs at this site are not due to leaching of PCBs from the soil matrix. The risks are due to direct contact. Stabilization is not effective in reducing risks due to direct contact.	
On-Site Thermal	Incineration	Field-scale operations for a variety of substances have been performed. This is the most effective technology in destruction of PCB. The rotary kiln was selected as the representative process option.	•
	Pyrolysis	Incineration was selected as the representative process option; pyrolysis is not widely available.	
	Thermal Desorption	Field-scale operations for a variety of substances have been performed. This is more cost-effective and produces fewer air emissions than incineration.	•
Off-Site Thermal	Incineration	Highly effective but very expensive. Availability may be limited.	•
	Pyrolysis	No commercial facilities permitted to accept PCBs or hazardous waste have been located; therefore, this option will not be retained.	
	Thermal Desorption	No commercial facilities permitted to accept PCBs or hazardous waste have been located; therefore, this option will not be retained.	
DISPOSAL			
On-Site Landfill	RCRA Landfill	This is essentially a containment option. It is effective in meeting remedial action objectives; however, it is not a permanent remedy. Since no suitable locations exist on site for construction of a new facility and as the off-site RCRA landfill is as effective and comparable in cost, this option will not be retained.	

TABLE 2-8 (continued)
EVALUATION AND SCREENING SUMMARY
AREA A LANDFILL/BITUMINOUS CONCRETE PAD

Technology	Process Option	Screening Comments	Option Retained
Off-Site Landfill	RCRA Landfill	This is essentially a containment option. It is very effective in meeting remedial action objectives; however, it is not a permanent remedy.	•
On-Site Reuse	Backfill After Treatment	After treatment, this is an easy to implement disposal alternative. Its effectiveness is based on the treatment performed.	•
Off-Site Reuse	Cement Manufacturing	This is essentially an incineration option providing an effective permanent remedy. No facilities permitted to manage PCBs or hazardous waste have been located.	

Note: Shading indicates technologies applicable to landfill contents/soils, whereas all listed technologies apply to hot spots/soils.

alternatives and further evaluation are so indicated. Only potentially effective, implementable, and cost-effective options were retained. At least one option was retained per technology type (if potentially effective options were available). When a group of options representing a technology were similar in cost, effectiveness, and implementability, a single representative option was selected. The process option selected in each group was chosen as the best option overall based on available information. Note that Table 2-8 is only a summary of the evaluation of process options, the complete evaluation is provided in Appendix F.

3.0 DEVELOPMENT AND SCREENING OF REMEDIAL ALTERNATIVES

This section describes the development and screening of remedial alternatives for the Area A Landfill (soils/landfill operable unit) site at NSB-NLON. Alternatives for remediation are developed by assembling combinations of process options into alternatives that address contamination for an identified operable unit. Alternatives are screened, based upon short and long-term effectiveness, implementability, and cost. The following subsections describe the development of remedial alternatives (subsection 3.1), criteria for screening alternatives (subsection 3.2), and the screening of alternatives (subsection 3.3).

3.1 Development of Remedial Alternatives

Alternatives were developed to meet site-specific remedial action objectives by recycling waste or by eliminating, reducing, and/or controlling risks posed through each pathway of a site. Site-specific remedial action objectives are described in subsection 2.2 of this report. The range of alternatives developed incorporate requirements of the NCP in light of site-specific characteristics and contaminant distribution. The NCP in 40 CFR 300.430(e)(3) through (7) requires that alternatives developed and screened should include:

- a range of alternatives in which **treatment** that reduces the toxicity, mobility, or volume of the hazardous substances pollutants, or contaminants **is a principal element**;

- as appropriate, this range shall include an alternative **that removes or destroys hazardous substances, pollutants, or contaminants to the maximum extent feasible,** eliminating or minimizing to the degree possible, the need for long-term management to prevent hazards;

- as appropriate, other alternatives which, at a minimum, **treat the principal threats** posed by the site but vary in the degree of treatment employed and the quantities and characteristics of the treatment residuals and untreated waste that must be managed;

- one or more alternatives that involve little or no treatment and utilize **engineering controls** to prevent hazards;

- for **groundwater response** actions, alternatives that meet remedial action objectives in different restoration time periods;

- if appropriate, one or more alternatives in which an **innovative treatment process** option is used if such technologies offer the potential for comparable or superior performance or implementability; fewer or lesser adverse impacts than other available approaches; or lower costs for similar levels of performance than demonstrated treatment technologies; and

- the **no-action** alternative.

Representative process options were selected in subsections 2.5 and 2.6. In this subsection of the report, process options are assembled into an appropriate range of alternatives. These alternatives are the same alternatives presented in the Briefing Document for the Proposed Interim Remedial Actions at NSB-NLON. The entire set of alternatives selected for the Area A Landfill is depicted in Table 3-1. This table lists all of the representative process options retained and defines which individual process options comprise each alternative. With respect to PCB-contaminated soils, the table indicates how each alternative satisfies one or more of the NCP criteria described in the previous paragraph describing NCP criteria. Key words in the NCP criteria described in the previous paragraph are highlighted. These same key words are used in Table 3-1 to indicate how each alternative meets the NCP criteria. Engineering controls (access restrictions and horizontal containment) were the only technologies in the alternatives used to address the landfill soils/contents contaminated with lower-level hazardous constituents. The NCP contains the expectation that engineering controls generally will be appropriate remedies for wastes that pose a relatively low-level threat or where treatment is impracticable. This nine-acre landfill contains greater than 110,000 cubic yards of contaminated material, thereby making treatment impracticable. As described in the development of remedial action objectives in subsection 3.1, the only hot spots identified were small areas containing PCB.

Alternatives were developed to address all accessible soils that have been identified as containing PCBs above target remediation levels (referred to as hot spots), along with the entire landfill contents. All but two alternatives include an impervious surface cap. Alternatives 2L-1 and 2L-2 (titled "No Action" and "Access Restrictions," respectively) do not contain a cap. Alternative 2L-3, titled "Cap," only includes a cap. The remaining alternatives (i.e., Alternatives 2L-4 through 2L-8) include a cap and some type of remediation for the PCB hot spot. The impervious surface cap was deemed necessary as part of these alternatives (i.e., Alternatives 2L-4 through and 2L-8), although all accessible soils above target remediation levels are being remediated because the cap will: (1) ensure that remaining accessible landfill contents/soils are not disturbed and therefore do not pose a risk to human health; (2) reduce leachate generation from the landfill contents/soils in the unsaturated zone; and (3) prevent erosion of surficial landfill soils. Further detail regarding each alternative is provided in subsection 3.3 (Screening of Remedial Alternatives), which contains detailed descriptions of each alternative.

3.2 Criteria for Screening Alternatives

The remedial alternatives discussed in subsection 3.1 were screened based upon short and long-term effectiveness, implementability, and cost, as required by 40 CFR Part 300.430 of the NCP. The objective of this screening step is to eliminate from further consideration any alternatives that are undesirable with respect to these criteria, while still preserving a range of options. Each of the evaluation criteria (i.e., effectiveness, implementability, and cost) are described in subsections 3.2.1 through 3.2.3.

3.2.1 Effectiveness

Each alternative was evaluated with respect to the degree in which an alternative (on a short and long-term basis):

TABLE 3-1
AREA A LANDFILL — SOILS/LANDFILL CONTENTS
DEVELOPMENT OF ALTERNATIVES

Soil/Landfill Contents	Limited Action		Containment	Off-Site Alternatives[1]		On-Site Alternatives		
	Alt. 2L-1 No Action	Alt. 2L-2 Access Restrictions	Alt. 2L-3 Cap	Alt. 2L-4 Incineration	Alt. 2L-5 RCRA Landfill	Alt. 2L-6 Incineration	Alt. 2L-7 Thermal Desorption	Alt. 2L-8 Solvent Extraction
No Action	●							
Access Restrictions		●	●	●	●	●	●	●
Horizontal Barrier Cap			●	●	●	●	●	●
Site Grading & Stormwater Management			●	●	●	●	●	●
Excavation - Backhoe				●	●	●	●	●
Solvent Extraction								●
On-Site Incineration						●		
On-Site Thermal Desorption							●	
Off-Site Incineration				●				
Off-Site RCRA Chemical Landfill					●			
On-Site Backfill After Treatment						●	●	●
Relationship to NCP range of alternatives regarding PCB-contaminated soils	No Action	Treat principal threat. Engineering Controls	Treat principal threat. Engineering Controls	Treatment of principal element. Hazardous substances destroyed to maximum extent possible.	Treat principal treat. Engineering controls.	Treatment of principal element. Hazardous substances destroyed to maximum extent possible.	Treatment of principal element. Treat principal threat.	Treatment of principal element. Treat principal threat. Innovative technology.

Notes: 1. Off-site low temperature thermal desorption or off-site reuse (asphalt or cement) will be reconsidered if a permitted off-site facility is located.
2. Shading indicates process options retained for landfill contents/soils, and nonshaded areas indicate process options retained for PCB-contaminated soils located near the bituminous concrete pad.

- complies with ARARs;
- minimizes short-term impacts;
  of Alternatives
- achieves protection quickly;
- reduces toxicity, mobility, or volume through treatment; and
- minimizes residual risks and affords long-term protection.

Alternatives providing significantly less effectiveness than others are eliminated from further evaluation, as are alternatives that do not provide adequate protection of human health and the environment.

3.2.2 Implementability

Each alternative was evaluated on a short and long-term basis with respect to the technical feasibility and availability of the technologies each alternative would employ, including the administrative feasibility of implementation. Alternatives that are technically or administratively infeasible, or would require equipment, specialists, or facilities that are not available within a reasonable period of time, may be eliminated from further consideration.

3.2.3 Cost

Each alternative was evaluated regarding the costs of construction and the estimated present worth of any long-term operation and maintenance (O&M) costs. In computing the estimated present worth of O&M costs for caps, fencing, and storm-water systems, the service life of these units was assumed to be 30 years. The basis for unit prices used in the cost estimates is presented in Appendix G. Costs that are grossly excessive compared to the overall effectiveness of alternatives may be considered as one of several factors used to eliminate alternatives. Alternatives which are as effective and easy to implement as another alternative and employ a similar method of treatment or engineering control, but at greater cost, may also be eliminated.

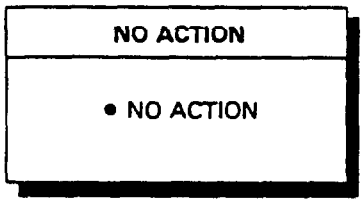
3.3 Screening of Remedial Alternatives

Each alternative discussed in subsection 3.1 was screened against criteria presented in subsection 3.2 to determine whether the alternative warranted a more detailed evaluation. For each alternative, the following five criteria are provided:

- Description,
- Effectiveness,
- Implementability,
- Cost, and
- Screening.

3.3.1 Alternative 2L-1: No Action

Description. The No Action alternative is required by the NCP as a baseline to aid in the comparative analysis of alternatives. This alternative is depicted in Figure 3-1.



INSTALLATION RESTORATION STUDY NAVAL SUBMARINE BASE - NEW LONDON GROTON, CT	FIGURE 3-1 AREA A LANDFILL, ALTERNATIVE 2L-1 NO ACTION ATLANTIC ENVIRONMENTAL SERVICES, INC.

Effectiveness. Alternative 2L-1 is the least effective alternative. All contaminated materials are left on site untreated. Nothing is done to eliminate exposure pathways or contaminant migration. There is no short-term or long-term minimization or elimination of hazards to human health or the environment.

Implementability. Since no action is required, this alternative is easy to implement.

Cost. Since no action is required, there is no cost associated with this option. Although there is no cost, this alternative is the least effective.

Screening. This alternative will be retained, since its detailed evaluation is required by the NCP as a framework or basis to judge the benefits of other alternatives.

3.3.2 Alternative 2L-2: Access Restriction

Description. This alternative consists of preventing access to the landfill via institutional controls and perimeter fencing. Institutional controls, such as operation procedures, security procedures, and access requirements, will be instituted upon closure. Perimeter fencing would include existing fencing and some additional fencing around hot spots. NSB-NLON personnel would not be allowed access to the site. Groundwater would be monitored to measure any intrinsic remediation of groundwater. This alternative is depicted in Figure 3-2.

Effectiveness. Alternative 2L-2 would not be considered permanent, since the volume and toxicity of contamination would remain unchanged. Institutional controls would ensure that the future land use would be limited, while fencing would reduce the risk of incidental contact. The expected lifetime of this remedy is finite and would be contingent upon continued maintenance.

Migration of contaminated soils by water and air erosion would not be prevented, and infiltration would not be minimized.

This Access Restriction remedy would not afford long-term protection of human health and the environment because contaminants could migrate off site. However, the remedy would be effective in minimizing risk due to direct contact and incidental ingestion.

Alternative 2L-2, Access Restriction, affords immediate protection. The time required to implement this remedy fully is estimated to be six months.

Implementability. All aspects of Alternative 2L-2 are technically feasible.

This Access Restriction alternative is expected to be reliable in meeting the performance goal of limiting access to the site. Delays due to technical problems associated with this alternative are not expected.

No significant coordination with any outside environmental agencies is expected. No permits are expected to be required to implement this remedy. However, obtaining concurrence from other agencies to implement this option may be difficult.

LIMITED ACTION

ACCESS RESTRICTIONS

- INSTITUTIONAL CONTROLS
- FENCING

INSTALLATION RESTORATION STUDY NAVAL SUBMARINE BASE - NEW LONDON GROTON, CT	FIGURE 3-2 AREA A LANDFILL, ALTERNATIVE 2L-2 ACCESS RESTRICTIONS ATLANTIC ENVIRONMENTAL SERVICES, INC.

There is a likelihood that future remedial action could be necessary, based on the fact that the contaminants would remain in the soil and could migrate off site by wind or water erosion.

All technologies associated with this Access Restriction alternative are commercially available. This alternative would require routine maintenance and monitoring to assure continued protection. Therefore, the duration of the effectiveness of the remedy is finite.

Cost. The cost of Alternative 2L-2 has been estimated to be approximately $1,695,000. Refer to Table 3-2 for the cost estimate breakdown; the basis of unit costs is provided in Appendix G. The cost of this Access Restriction alternative, relative to other alternatives, is low, being the second lowest alternative out of eight.

Screening. Alternative 2L-2 would be cost-effective and provide protection to human health by preventing direct contact with contaminated soils, while demonstrating cost-effectiveness. However, this Access Restriction alternative would not meet remedial action objectives because it would not provide a permanent treatment remedy, would not minimize infiltration, and would not prevent the off-site migration of contaminated soils by wind and water erosion. Therefore, this alternative will not be retained for further analysis.

3.3.3 Alternative 2L-3: Cap

Description. Alternative 2L-3 consists of installing a 13-acre impervious surficial cap over areas of the site where waste materials have been disposed, including areas that contain contaminated soils above target remediation levels. Access to the site would continue to be restricted via existing perimeter fencing; however, the Area A Landfill operations would remain active. Institutional controls would be established to limit use of this site. The site would be graded and storm-water management would be provided to promote runoff and prevent run-on. Site groundwater would be monitored during the post-closure care period. This alternative is depicted in Figure 3-3.

Effectiveness. The primary benefit of capping is that capping would eliminate the risk to human health via ingestion and dermal contact. The cap will also prevent erosion of landfill soils. Site-grading and storm-water management, along with the impervious cap layer, would minimize infiltration and subsequent leaching from unsaturated soils. Since contaminated fill would remain in the saturated zone, the overall effect this cap would have on groundwater quality would be limited. Institutional controls would ensure that the future land use be limited, while fencing would prevent unauthorized access and damage to the cap. Alternative 2L-3, Cap, is not permanent, since contaminated soils would remain on site untreated. The expected lifetime of this remedy is finite and would be contingent upon continued maintenance and monitoring of the integrity of the cap.

This alternative affords immediate protection. The time required to fully implement it is estimated to be 12 months.

INPUT VARIABLES/ASSUMPTIONS

Discount Rate (%) =	10%
Number of years O & M =	30
Total volume insitu soil (cy) =	300
Density of soil (ton/cy) =	1.50
Average concentration of residual (%) =	1%
Moisture content of soil (%) =	15%
Surface area of horizontal containment barrier (sf) =	566280

TABLE 3-2
SCREENING ALTERNATIVE COST ESTIMATES
AREA A LANDFILL - PCB CONTAMINATED SOILS
ALTERNATIVES 2L-1 THROUGH 2L-10b

PROCESS OPTIONS		QUAN	UNITS	UNIT COST	No Action 2L-1	Access Restriction 2L-2	Cap 2L-3	Off-Site Incineration 2L-4	Off-Site Landfill 2L-5	On-Site Incineration 2L-6a	On-Site Incineration 2L-6b	On-Site Thermal Desorption 2L-7a	On-Site Thermal Desorption 2L-7b	On-Site Solvent Extraction 2L-8a	On-Site Solvent Extraction 2L-8b
DEED RESTRICTION	CAP	1	EACH	1000		1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
FENCING	CAP	625	LF	13		8125	0	0	0	0	0	0	0	0	0
	O&M	2500	LF	1.30		33887	33887	33887	33887	33887	33887	33887	33887	33887	33887
CAPPING	CAP	6E+05	SF	3.50			1981980	1981980	1981980	1981980	1981980	1981980	1981980	1981980	1981980
	O&M	6E+05	SF	0.0125			73807	73807	73807	73807	73807	73807	73807	73807	73807
SITE GRADING & STORMWATER MANAGEMENT	CAP	2600	LF	60			156000	156000	156000	156000	156000	156000	156000	156000	156000
	O&M	2600	LF	0.30			8133	8133	8133	8133	8133	8133	8133	8133	8133
SUBSURFACE DRAINAGE TRENCH	CAP	1800	LF	40.00			72000	72000	72000	72000	72000	72000	72000	72000	72000
GAS VENTING TRENCH	CAP	2225	LF	15.00			33375	33375	33375	33375	33375	33375	33375	33375	33375
EXCAVATION	CAP	300	CY	8				2400	2400	2400	2400	2400	2400	2400	2400
IN-SITU STABILIZATION	CAP	450	TON	150											
SOLVENT EXTRACTION	CAP	450	TON	250										112500	112500
ABOVE-GROUND STABILIZATION	CAP	450	TON	150											
ON-SITE INCINERATION	CAP	450	TON	500						225000	225000				
OFF-SITE INCINERATION *	CAP	450	TON	800				360000							
ON-SITE LOW TEMP THERMAL DESORPTION	CAP	450	TON	200								90000	90000		
ON-SITE BACKFILL	CAP	450	TON	3.50						1575	1575	1575	1575	1575	1575
RCRA CHEMICAL LANDFILL *	CAP	450	TON	300					135000						
WASTEWATER DISPOSAL *	CAP	9088	GAL	0.30								2726	2726	2726	2726
RESIDUAL TREATMENT - INCINERATION *	CAP	4.50	TON	800								3600	3600	3600	3600
BACKFILL - PROCURE & PLACE**	CAP	450	CY	10				4500	4500						
BACKFILL - PROCURE & PLACE**	CAP	150	CY	10			1500								
GROUNDWATER MONITORING	O&M	1	YR	1E+05		1303364	1303364	1303364	1303364	1303364	1303364	1303364	1303364	1303364	1303364
TOTAL CAPITAL					0	9125	2245855	2611255	2386255	2473330	2473330	2344656	2344656	2367156	2367156
TOTAL O&M					0	1337252	1419192	1419192	1419192	1419192	1419192	1419192	1419192	1419192	1419192
SUBTOTAL 1 (CAPITAL + O&M)					$0	$1,346,377	$3,665,047	$4,030,447	$3,805,447	$3,892,522	$3,892,522	$3,763,848	$3,763,848	$3,786,348	$3,786,348
SITE PREP		LUMP SUM AS SHOWN			0	0	0	1000	1000	1000	1000	1000	1000	1000	1000
MOB/DEMOB - PROCESS EQUIPMENT		LUMP SUM AS SHOWN			0	0	0	0	0	0	500000	0	500000	0	500000
MOB/DEMOB - WORKERS, EQUIPMENT		LUMP SUM AS SHOWN			0	0	1000	2000	2000	0	2000	0	2000	0	2000
TREATABILITY STUDY		LUMP SUM AS SHOWN			0	0	0	0	0	25000	25000	25000	25000	25000	25000
SITE RESTORATION		LUMP SUM AS SHOWN			0	0	0	1000	1000	1000	1000	1000	1000	1000	1000
OTHER		LUMP SUM AS SHOWN			0	10000	20000	50000	50000	50000	50000	50000	50000	50000	50000
SUBTOTAL 2 (SUB1 + SITE PREP thru OTHER)					$0	$1,356,377	$3,686,047	$4,084,447	$3,859,447	$3,969,522	$4,471,522	$3,840,848	$4,342,848	$3,863,348	$4,365,348
ENGINEERING ADMINISTRATION		10% OF SUBTOTAL 2			0	135638	368605	408445	385945	396952	447152	384085	434285	386335	436535
CONTINGENCIES		15% OF SUBTOTAL 2			0	203457	552907	612667	578917	595428	670728	576127	651427	579502	654802
TOTAL					**$0**	**$1,695,471**	**$4,607,558**	**$5,105,558**	**$4,824,308**	**$4,961,902**	**$5,589,402**	**$4,801,060**	**$5,428,560**	**$4,829,185**	**$5,456,685**

1. UNIT COST - UNITS FOR CAPITAL ARE $/UNIT, AND UNITS FOR O&M ARE $/UNIT/YEAR
2. O&M IS COMPUTED TO PRESENT VALUE = ((QUANT/YR*UNIT COST)*(1-((1+DISCOUNT RATE)^-(YRS)))/DISCOUNT RATE) = @PV(COST/YEAR, DISCOUNT RATE, # YEARS)
3. REFER TO APPENDIX H FOR UNIT COSTS

* INCLUDES TRANSPORTATION AND DISPOSAL

** INCLUDES 150 CUBIC YARDS TO FACILITATE SITE GRADING

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CONTAINMENT

HORIZONTAL BARRIER
- SURFACE CAP

SURFACE WATER CONTROL
- SITE GRADING AND STORMWATER MANAGEMENT

LIMITED ACTION

ACCESS RESTRICTION
- INSTITUTIONAL CONTROLS
- FENCING

INSTALLATION RESTORATION STUDY NAVAL SUBMARINE BASE - NEW LONDON GROTON, CT	FIGURE 3-3 AREA A LANDFILL, ALTERNATIVE 2L-3 CAP
	ATLANTIC ENVIRONMENTAL SERVICES, INC.

Implementability. All aspects of Alternative 2L-3 are technically feasible and could be implemented in a reasonable amount of time. No difficulties or uncertainties are expected.

There is not expected to be any significant coordination with any outside environmental agencies, and no permits are expected to be required to implement this remedy.

All technologies associated with this alternative are commercially available. Experienced vendors for the capping, fencing, and grading activities are available locally. This alternative would require routine maintenance and monitoring to ensure the continual integrity of the cap.

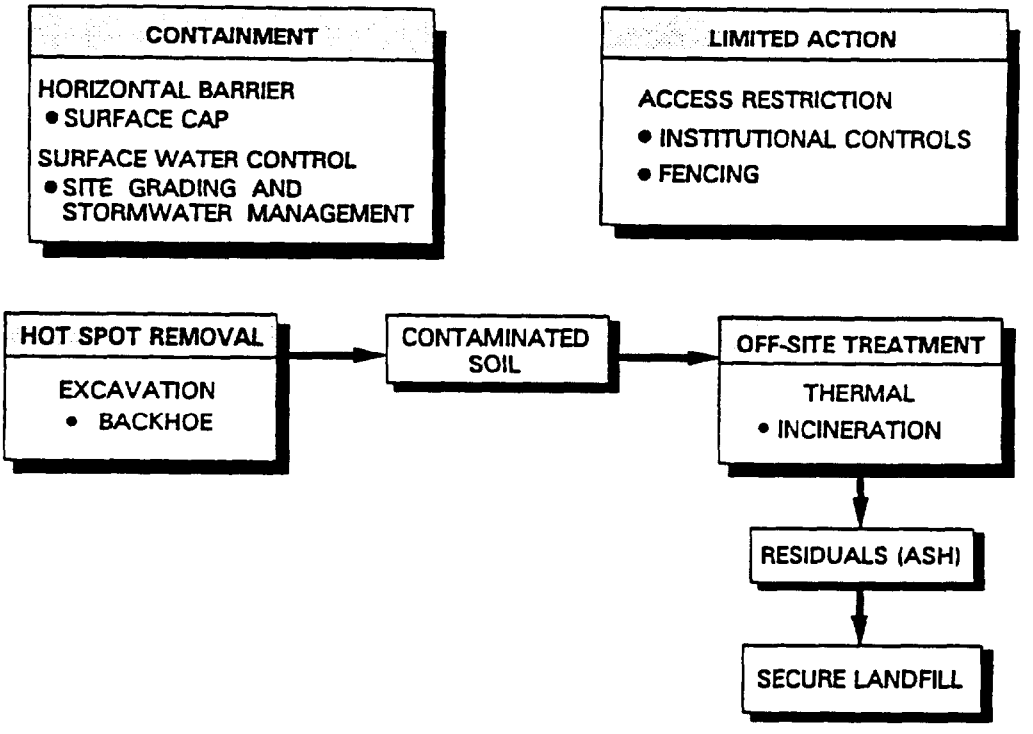
Cost. The estimated present worth of implementing Alternative 2L-3 is approximately $4,608,000. (Refer to Table 3-2 for the cost estimate breakdown and Appendix G for the basis of unit costs.) The cost of this alternative, relative to other alternatives, is in the medium range, being the third least expensive alternative out of eight.

Screening. Alternative 2L-3, Cap, would meet remedial action objectives and provide adequate protection to human health and the environment by reducing the risks associated with the contaminated soil, while demonstrating cost-effectiveness and ease of implementability. As such, this alternative will be retained for further analysis.

3.3.4 Alternative 2L-4: Off-Site Incineration (Cap and Off-Site Incineration of Hot Spots)

Description. Alternative 2L-4 consists of removing contaminated soil hot spots containing PCBs above target remediation levels. Following the removal of contaminated soil, an impervious surface cap would be installed over the site where waste materials have been disposed. Area A Landfill operations would remain on site. Contaminated soil hot spots include surficial soils containing PCBs above 10 ppm and deeper accessible soils (up to 10 feet deep) containing PCBs above 50 ppm. The contaminated soil would be transported off site and treated in a RCRA incinerator. Solid treatment residuals or ash from the incineration process would be disposed in the landfill utilized by the RCRA incinerator for disposal of its treatment residuals. Access to the Area A Landfill site would continue to be restricted via existing perimeter fencing and security procedures (institutional controls). The site would be graded, and storm-water management would be provided to promote runoff and prevent run-on. The cap would cover approximately 13 acres, and 300 cubic yards of contaminated soils would be removed. Groundwater would be monitored during the post-closure care period. This Off-Site Incineration alternative is depicted in Figure 3-4.

Effectiveness. Accessible soils containing contaminants above target cleanup levels would be removed and treated, thereby providing a permanent solution regarding these soils. PCBs in the removed soils ultimately would be destroyed in the off-site incinerator. An incinerator can achieve contaminant destruction/removal efficiencies of 99.99 percent. Residual levels of contaminated soils (below target remediation levels) and inaccessible contaminated soils would remain on site untreated. There would be some short-term risk due to spills during transport. However, these risks are considered low because the chance of a spill is unlikely and, if a spill does occur, the soils can be easily contained, since they are solid.



INSTALLATION RESTORATION STUDY NAVAL SUBMARINE BASE - NEW LONDON GROTON, CT	FIGURE 3-4 AREA A LANDFILL, ALTERNATIVE 2L-4 OFF-SITE INCINERATION ATLANTIC ENVIRONMENTAL SERVICES, INC.

The primary benefit of capping is that it would eliminate the risk of ingestion and dermal contact by preventing contact with the lightly contaminated landfill contents/soils to remain on site. The cap will also minimize erosion. Site grading and storm-water management, along with an impervious cap layer, would minimize infiltration and subsequent leaching from unsaturated soils. The amount of contaminated soil remaining in the unsaturated zone would be slightly reduced under this alternative, and the entire area would be covered by an impervious cap. Therefore, some improvements to groundwater are predicted. However, due to remaining contamination in the saturated zone, these improvements may be limited. Institutional controls would ensure that the future land use be limited while fencing would prevent access and damage to the cap. The expected lifetime of this remedy is finite, since it is contingent upon continued maintenance and monitoring of the integrity of the cap.

This alternative affords immediate protection and can be implemented in approximately 14 months.

Implementability. All aspects of this Off-Site Incineration alternative are technically feasible and could be implemented within a reasonable length of time. No difficulties or uncertainties are expected. No significant coordination with any outside environmental agencies is expected, and no permits are expected to be required to implement this remedy. All technologies associated with this alternative are commercially available. Experienced vendors for the capping, fencing, excavation, incineration, and grading activities are available locally. There could be some minor delays due to the limited capacity of existing commercial incinerators to treat bulk soils. This alternative would require routine maintenance and monitoring to ensure continued integrity of the cap.

Cost. The estimated present worth of this Off-Site Incineration alternative is $5,106,000. Refer to Table 3-2 for the cost estimate breakdown and Appendix G for the basis of unit costs. The cost of this alternative, relative to other alternatives, is the highest off-site alternative for the Area A Landfill site and slightly (10%) less costly than the on-site alternatives.

Screening. Alternative 2L-4 would meet remedial action objectives and provide adequate protection to human health and the environment by reducing the risks associated with the contaminated soil, while demonstrating ease of implementability. This alternative is equally effective and easier to implement than on-site thermal treatment. Due to the small amount of contaminated soil, this alternative is also more cost effective than on-site treatment. For these reasons, this alternative will be retained for detailed analysis.

3.3.5 Alternative 2L-5: Off-Site RCRA Landfill (Cap and Off-Site RCRA Landfill of Hot Spots)

Description. Alternative 2L-5 consists of removing contaminated soil hot spots that contain contaminants above target cleanup levels. Following the removal and disposal of contaminated soil, an impervious surface cap would be installed over areas of the site where waste materials have been disposed. Contaminated soil hot spots include surficial soils containing PCBs above 10 ppm and deeper accessible soils (up to 10 feet deep) containing PCBs above 50 ppm. The contaminated soil would be transported off site and disposed in a RCRA

or TSCA landfill, depending upon PCB concentration. Materials containing greater than 50 ppm PCB may only be disposed in a TSCA landfill. Access to this site would continue to be restricted via existing perimeter fencing and security procedures, and Area A Landfill operations would remain. The site would be graded, and storm-water management would be provided to promote runoff and prevent run-on. The cap would cover approximately 13 acres and 300 cubic yards of contaminated soils would be removed. Groundwater would be monitored during the post-closure care period. This alternative is depicted in Figure 3-5.

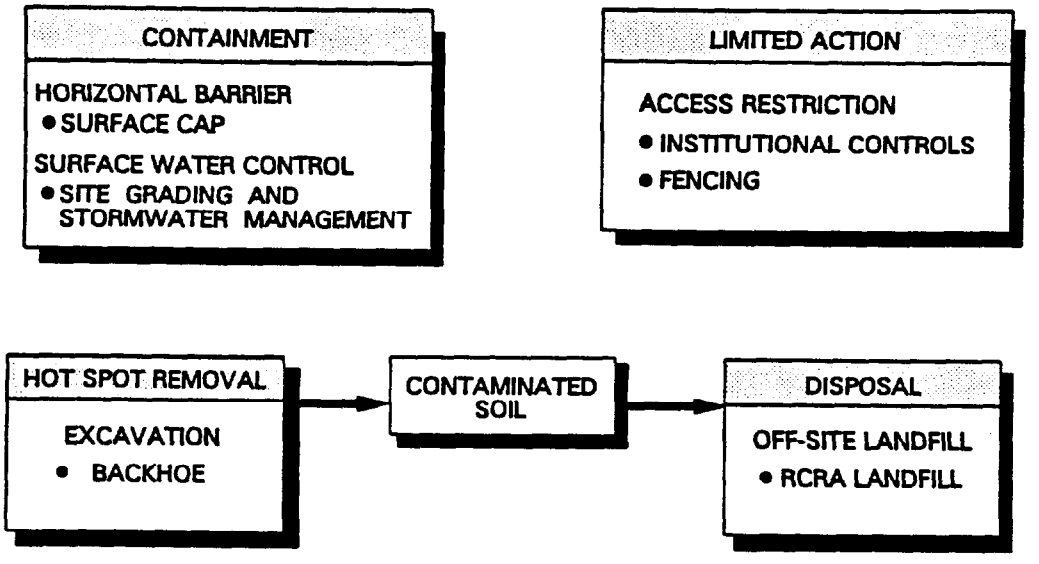
Effectiveness. Accessible soils containing contaminants above target cleanup levels would be removed, thereby providing a permanent on-site solution regarding these soils. Contaminants in the removed soils would ultimately be contained in the off-site RCRA landfill. There would be no destruction of hazardous constituents. Lower level contaminated soils (below target remediation levels) and inaccessible contaminated soils would remain on site untreated. There would be some short-term risk due to spills during transport. However, these risks are considered low because the chance of a spill is unlikely and, if a spill does occur, the soils can be easily contained, since they are solid.

The primary benefit of capping is that it would eliminate the risk of ingestion and dermal contact by removing accessible soils that are contaminated and by preventing contact with the lightly contaminated soils remaining on site. Site grading and storm-water management, along with an impervious cap layer, would minimize infiltration and subsequent leaching from unsaturated soils, and it would minimize erosion. The amount of contaminated soil remaining in the unsaturated zone would be reduced slightly under this Off-Site RCRA Landfill alternative, and the entire area would be covered by an impervious cap. Therefore, some improvements to groundwater are predicted. However, due to remaining contamination in the saturated zone, these improvements may be limited. Institutional controls would ensure that the future land use be limited, while fencing and security procedures would prevent access and damage to the cap. The expected lifetime of this remedy is finite, since it is contingent upon continued maintenance and monitoring of the integrity of the cap.

Alternative 2L-5 affords immediate protection and can be implemented in approximately 13 months.

Implementability. All aspects of Alternative 2L-5, Off-Site RCRA Landfill, are technically feasible and could be implemented within a reasonable time period. No difficulties or uncertainties would be expected; however, there is a possibility that some portions of the excavated wastes may not be directly acceptable at a hazardous waste landfill, thus requiring treatment or incineration. No significant coordination with any outside environmental agencies and no permits are required to implement this remedy. All technologies associated with this alternative are commercially available. Experienced vendors for the capping, fencing, excavation, landfill, and grading activities are available locally. There is more than adequate off-site landfill capacity available. Alternative 2L-5 would require routine maintenance and monitoring to ensure the continual integrity of the cap.

Cost. The estimated present worth of Alternative 2L-5 is $4,824,000. Refer to Table 3-2 for the cost estimate breakdown and Appendix G for the basis of unit costs. The cost of this



INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CT

FIGURE 3-5
AREA A LANDFILL, ALTERNATIVE 2L-5
OFF-SITE RCRA LANDFILL

ATLANTIC ENVIRONMENTAL SERVICES, INC.

alternative, relative to other alternatives for the Area A Landfill site, is in the medium range, being the fourth least expensive alternative out of eight.

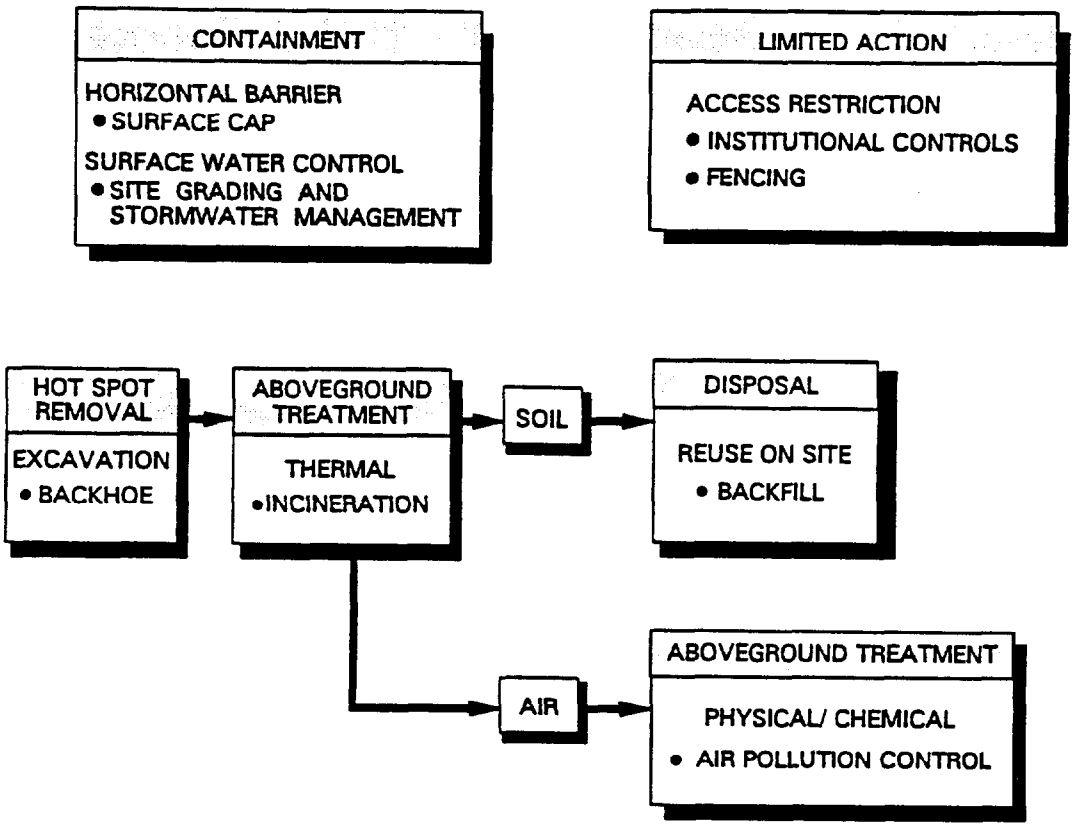
Screening. Alternative 2L-5, Off-Site RCRA Landfill, would meet remedial action objectives, protect human health by reducing the risks associated with the contaminated soil, and minimize erosion and infiltration. The alternative would be easy to implement, is cost-effective, and would permanently reduce the total volume of contaminants on site. Therefore, it will be retained for further evaluation.

3.3.6 Alternative 2L-6: On-Site Incineration (Cap and On-Site Incineration of Hot Spots)

Description. Alternative 2L-6 consists of removing accessible contaminated soil hot spots containing PCBs above target-remediation levels. Following the removal of contaminated soil, an impervious surface cap would be installed over areas of the site where waste materials have been disposed. Contaminated soil hot spots include surficial soils containing PCBs above 10 ppm and deeper accessible soils (up to 10 feet deep) containing PCBs above 50 ppm. The removed contaminated soil would first be treated in an on-site incinerator to destroy organic contaminants. The treated soils would then be reused as backfill. Access to this area would continue to be restricted via existing perimeter fencing and security procedures. The site would be graded, and storm-water management would be provided to promote runoff and prevent run-on. The cap would cover approximately 13 acres, and 300 cubic yards of contaminated soil would be removed. Groundwater would be monitored during the post-closure care period. This alternative is depicted in Figure 3-6.

Effectiveness. Accessible soils containing PCBs above target cleanup levels would be excavated. Organic contaminants in these soils would be destroyed on site by the incineration process. This On-Site Incineration alternative would provide a permanent treatment solution for PCBs. Lower level contaminated soils/landfill contents (below target remediation levels) and inaccessible soils/landfill contents would remain on site, untreated. Incineration is the most effective treatment technology for organic contamination, providing destruction/removal efficiencies greater than 99.99 percent. Short-term risks to the community from air emissions are a concern. However, air pollution control devices would be effective in controlling these risks.

The primary benefit of capping is that it would eliminate the risk of ingestion and dermal contact for the remaining low level and inaccessible, contaminated soils. Site grading and storm-water management, along with an impervious cap layer, would minimize infiltration and subsequent leaching from unsaturated soils, along with the erosion of surficial landfill soils. In addition, the contaminated soil remaining in the unsaturated zone would contain less organic contaminants. Therefore, some improvements to groundwater are predicted. However, due to remaining contamination in the saturated zone, these improvements may be limited. Institutional controls would ensure that the future land use be limited, while fencing would reduce the risk of incidental contact. This alternative would not be permanent, since inaccessible, contaminated soils and lower level landfill contents/soils would remain on site untreated.



INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CT

FIGURE 3-6
AREA A LANDFILL, ALTERNATIVE 2L-6
ON-SITE INCINERATION

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This On-Site Incineration alternative could be implemented in approximately 21 months and, once completed, provide complete protection. The expected lifetime of the remedy is finite, since it is contingent upon continued maintenance and monitoring of the integrity of the cap.

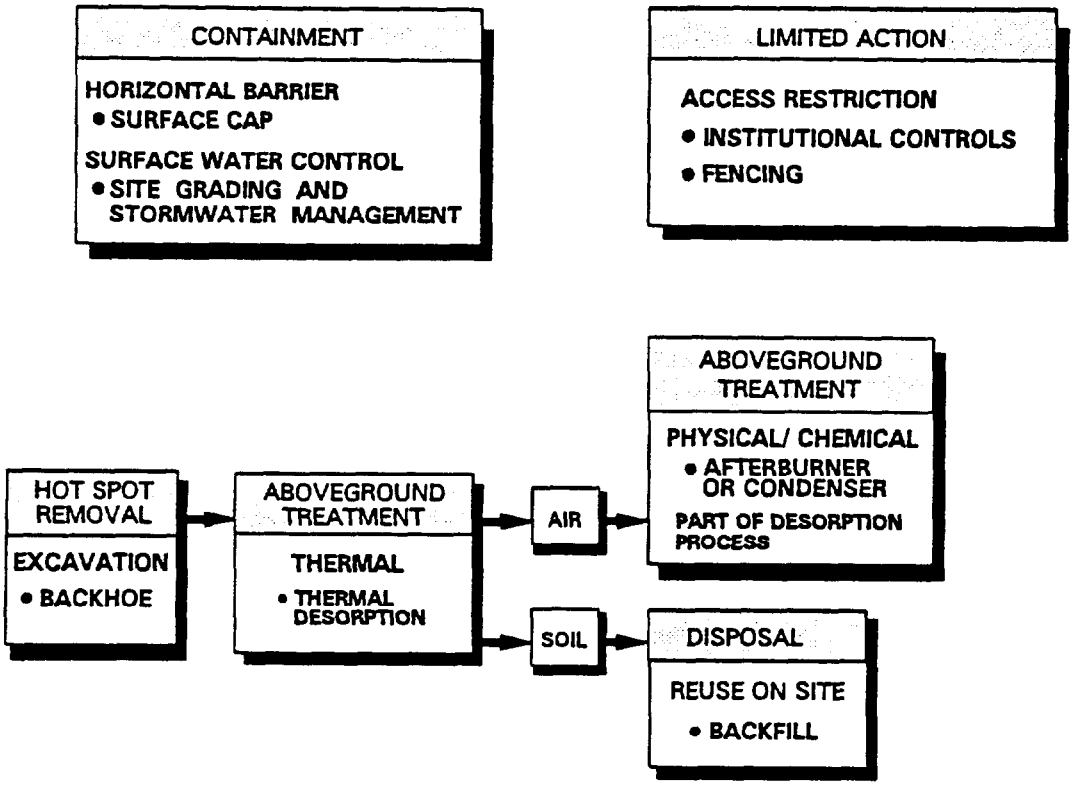
Implementability. Excavation and capping activities are easily implemented. Mobile incinerators could be mobilized to the site, and commercial vendors are available. No access, boundary, or utility limitations exist at the site, although mobilization of an incinerator requires a large effort, since it can require up to 30 tractor trailer trucks to bring a unit on site. A high level of coordination with air pollution control agencies would be necessary for the successful implementation of this On-Site Incineration alternative.

Cost. The estimated present worth of Alternative 2L-6 has been derived in two ways. One way assumes that the treatment units would be mobilized solely to treat soils at the Area A Landfill site, and the other assumes that the treatment units would be mobilized to treat soils at Area A Landfill and at other sites at NSB-NLON, thereby distributing mobilization costs over a larger volume of soils. Potentially, an incinerator could be used to treat DDT-contaminated sediments from Area A Downstream/OBDA and PCB-contaminated soils from the DRMO. Refer to Table 3-2 for the cost estimate breakdown and Appendix G for the basis of unit costs. The cost for this alternative, assuming mobilization solely for Area A Landfill, is $5,589,000. The cost of this alternative, relative to other alternatives, is in the high range, being the second most expensive out of eight. If a unit is to be mobilized for other sites at NSB-NLON, there could be a cost savings.

Screening. Alternative 2L-6 utilizes proven technologies, meets remedial action, objectives and achieves optimum destruction/removal efficiencies; however, it is costly. Off-site thermal treatment can achieve equal destruction/removal efficiencies at similar or lesser cost, and is easier to implement. For these reasons, this on-site alternative will not be retained for further evaluation.

3.3.7 Alternative 2L-7: On-Site Thermal Desorption (Cap and On-Site Thermal Desorption of Hot Spots)

Description. Alternative 2L-7 consists of removing accessible contaminated soil hot spots containing PCB above target remediation levels. Following the removal of contaminated soil, an impervious surface cap would be installed over areas of the site where waste materials have been disposed. Contaminated soil hot spots include surficial soils containing PCBs above 10 ppm and deeper accessible soils (up to 10 feet deep) containing PCBs above 50 ppm. The removed soil would first be treated on site in a thermal desorber to remove PCBs. The treated soils would then be reused as backfill. Organic contaminants removed by the thermal desorber would either be destroyed on site in an afterburner or condensed on site and shipped off site to be destroyed in an incinerator. Access would continue to be restricted via existing perimeter fencing and security procedures. The site would be graded, and storm-water management would be provided to promote runoff and prevent run-on. The cap would cover approximately 13 acres, and 300 cubic yards of contaminated soils would be removed. Groundwater would be monitored during the post-closure care period. This On-Site Thermal Desorption alternative is depicted in Figure 3-7.



INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CT

FIGURE 3-7
AREA A LANDFILL, ALTERNATIVE 2L-7
ON-SITE THERMAL DESORPTION

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Effectiveness. Thermal desorption is an effective treatment technology for organic contamination, providing destruction/removal efficiencies ranging from 75 to 99 percent as compared to the 99.99% destruction/removal efficiency provided by an incinerator. Desorbed contaminants are either treated in an afterburner or condensed and shipped off site for incineration. In either case, destruction removal efficiencies for desorbed contaminants is greater than 99.99 percent. Short-term effects to the community from air emissions are a concern. If a condenser is used rather than an afterburner, the amount of emissions would be greatly reduced. In either case, air pollution control devices would be effective in controlling these risks.

The primary benefit of capping is that it would eliminate the risk of ingestion and dermal contact for any remaining contaminants. The cap will also prevent erosion of contaminated soils. Site grading and storm-water management, along with an impervious cap layer, would minimize infiltration and subsequent leaching from unsaturated soils. In addition, the contaminated soil remaining in the unsaturated zone would not contain organic contaminants. Therefore, some improvements to groundwater are predicted. However, due to remaining contamination in the saturated zone, these improvements may be limited. Institutional controls would ensure that the future land use be limited, while fencing and security procedures would reduce the risk of incidental contact. This alternative is not permanent, since inaccessible contaminated soils and lower level landfill contents/soils would remain on site untreated.

The expected lifetime of this On-Site Thermal Desorption remedy is finite, since it is contingent upon continued maintenance and monitoring of the integrity of the cap. This alternative provides immediate protection and can be implemented in approximately 20 months.

Implementability. Excavation and capping activities are easily implemented. Mobile thermal desorption units could be mobilized to the site, and commercial vendors are available. Although units could be mobilized, a large effort would be required because several tractor trailer trucks would be necessary to bring a unit on site. Field-scale treatments have been successfully completed on PCBs. However, only a few vendors have experience with materials other than petroleum hydrocarbons and VOCs. A high level of coordination with air pollution control agencies would be necessary for the successful implementation of this alternative. This alternative would require routine maintenance and monitoring to ensure continued integrity of the cap.

Cost. The estimated present worth of this alternative has been derived in two ways. One way assumes the treatment units would be mobilized solely to treat soils at Area A Landfill, and the other assumes that the treatment units would be mobilized to treat soils at Area A Landfill and at other sites at NSB-NLON, thereby distributing mobilization costs over a larger volume of soils. Potentially, a thermal desorber could be used to treat DDT-contaminated sediments from Area A Downstream/OBDA and PCB-contaminated soil from the DRMO. Refer to Table 3-2 for the cost estimate breakdown and Appendix G for the basis of unit costs. The cost of this On-Site Thermal Desorption alternative is $5,429,000. The cost of this alternative, relative to other alternatives, is in the medium range, being the fourth most expensive out of eight. If a unit is to be mobilized for other sites at NSB-NLON, there could be a cost savings.

Screening. Alternative 2L-7 utilizes proven technologies, meets remedial action objectives, and achieves acceptable destruction/removal efficiency; however, it is costly. Off-site thermal treatment can achieve equal destruction/removal efficiencies at similar or lesser costs and is easy to implement. For these reasons, this On-Site Thermal Desorption alternative will not be retained for further evaluation.

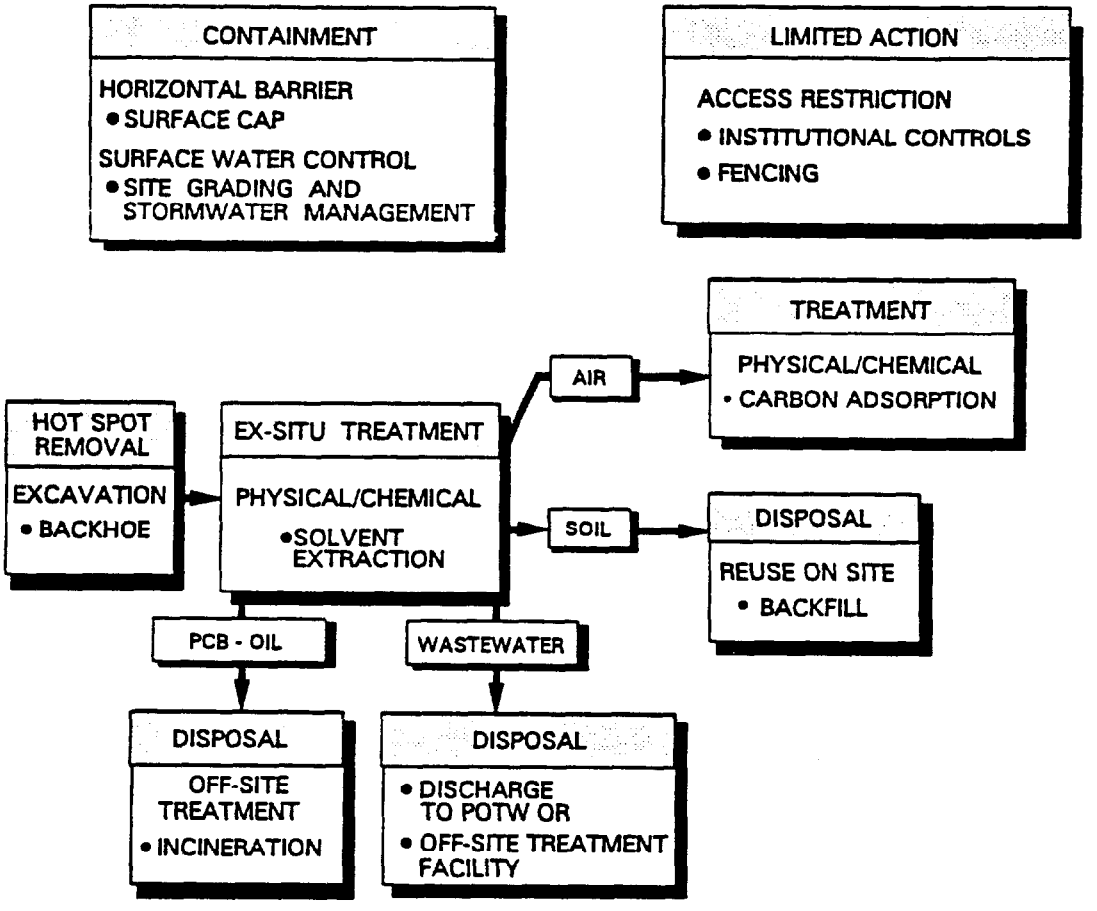
3.3.8 Alternative 2L-8: On-Site Solvent Extraction (Cap and On-Site Solvent Extraction of Hot Spots)

Description. Alternative 2L-8 consists of removing accessible contaminated soil hot spots containing PCB above target remediation levels. Following the removal of contaminated soil, an impervious surface cap would be installed over areas of the site where waste materials have been disposed. Contaminated soil hot spots include surficial soils containing PCBs above 10 ppm and deeper accessible soils (up to 10 feet deep) containing PCBs above 50 ppm. The removed soil would first be treated on site in a solvent extraction unit to remove organic contaminants. The treated soils would then be used as backfill. Organic contamination removed by the solvent extraction unit would be shipped off site to be destroyed in an incinerator. Access to this area would continue to be restricted via existing perimeter fencing and security procedures. The site would be graded, and storm-water management would be provided to promote runoff and prevent run-on. The cap would cover approximately 13 acres and 300 cubic yards of contaminated soils would be removed. Groundwater would be monitored during the post-closure care period. This alternative is depicted in Figure 3-8.

Effectiveness. Solvent extraction is an effective treatment technology for organic contamination, providing removal efficiencies from 60 up to 98 percent. Extracted contaminants would be shipped off site and incinerated, thereby providing a 99.99 percent destruction/removal efficiency for the extracted contaminants. Short-term risks to workers and the community due to spillage, fire, or air emissions from the extraction solvents are a concern. However, by implementation of proper safety procedures and by the use of air pollution control devices, these risks can effectively be controlled.

The primary benefit of capping is that capping would eliminate the risk of ingestion and dermal contact for remaining residual contamination. The cap would also minimize erosion of surficial landfill soils. Site grading and storm-water management, along with an impervious cap layer, would minimize infiltration and subsequent leaching from unsaturated soils. In addition, the amount of organic contaminated soil left in the unsaturated zone is reduced slightly by the solvent extraction process. Therefore, some improvements to groundwater are predicted. However, due to remaining contamination in the saturated zone, these improvements may be limited. Institutional controls would ensure that the future land use be limited, while fencing would reduce the risk of incidental contact. This alternative is not permanent, since inaccessible contaminated soils and lower level landfill contents/soils would remain on site untreated.

The expected lifetime of this remedy is finite; it is contingent upon continued maintenance and monitoring of the integrity of the cap. This alternative provides immediate protection and can be implemented in 30 months.



INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CT

FIGURE 3-8
AREA A LANDFILL, ALTERNATIVE 2L-8
ON-SITE SOLVENT EXTRACTION

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Implementability. Excavation and capping activities are easily implemented. There are limited vendors available with solvent extraction equipment, and a field-scale unit has not yet been built. As a result, implementation would be delayed while a system was being designed and built. The process may not be reliable in meeting treatment objectives because the contaminated soils are not homogeneous. Bench-scale treatments have demonstrated removal efficiencies greater than 99 percent for PCBs. Bench and pilot-scale testing would be necessary prior to implementation to ensure that remedial action objectives can be met. Implementation would almost certainly encounter unforeseen difficulties that would delay treatment, since on-site solvent extraction is not yet a proven technology. Due to the number of unit processes (steam distillation, batch extraction, centrifugation, etc.), there is some concern regarding the operational reliability of this process option. Air emissions controls would be required; however, these controls are readily available and reliable. Since this unit would generate both air and water discharges, although small, coordination with regulatory agencies would be required.

Cost. Since no fields units have been constructed, developing an accurate cost is difficult. Technology vendors claim that unit costs would be less than incineration or thermal desorption due to the lower energy requirements of this process option. Based primarily on information provided by vendors, the estimated present worth for this On-Site Solvent Extraction alternative is $5,457,000. Refer to Table 3-2 for the cost estimate breakdown and Appendix G for the basis of unit costs. The cost of this alternative is in the high range, being the third most expensive out of the eight alternatives. If a unit is to be mobilized for other sites at NSB-NLON, there could be a cost savings.

Screening. Solvent extraction is considered an innovative technology and, therefore, is difficult to implement. This alternative does not exhibit significant potential to provide an equally effective treatment at a reasonable cost as the other more proven technologies such as off-site thermal treatment. Therefore, the On-site Solvent Extraction alternative will not be retained for further analysis.

3.3.9 Alternative Screening Summary

Based upon the screening of alternatives performed in this subsection, the following alternatives have been retained for detailed analyses.

- Alternative 2L-1: No Action
- Alternative 2L-3: Cap
- Alternative 2L-4: Off-Site Incineration
- Alternative 2L-5: Off-Site RCRA Landfill

4.0 DETAILED ANALYSIS OF ALTERNATIVES

4.1 Introduction

Based on the results of the screening process described in Section 3.0, specific remedial alternatives were cited warranting a detailed evaluation. The purpose of the detailed evaluation was to facilitate the selection of the most appropriate remedial actions for the Area A Landfill site. In the detailed evaluation, which is the subject of this section, each selected alternative was evaluated against the nine criteria specified in the revised NCP and the RI/FS Guidance (U.S. EPA, 1988). A comparative analysis of the alternatives is the subject of Section 5.0.

4.2 Alternative Evaluation

The objective of the detailed evaluation is to obtain and present sufficient information on each alternative to facilitate the selection of the most appropriate remedial action for the site.

Requirements for remedial action considerations under CERCLA have been incorporated into nine specific evaluation criteria. These criteria, developed to address CERCLA requirements and other technical policy considerations the EPA deems important for selecting a site remedy are specified in the NCP as follows:

- Overall Protection of Human Health and the Environment;
- Compliance With ARARs;
- Long-Term Effectiveness and Permanence;
- Reduction of Toxicity, Mobility, or Volume;
- Short-Term Effectiveness;
- Implementability;
- Cost;
- State Acceptance; and
- Community Acceptance.

These nine criteria are arranged into three groups in the NCP:

- **Threshold Criteria.** Criteria that must be satisfied before a remedy is considered, including:

  - overall protection of human health and the environment and
  - compliance with ARARs (federal and state environmental laws).

- **Primary Balancing Criteria.** Criteria used to weigh trade-offs among alternatives, including:

  - long-term effectiveness and permanence;
  - reduction of toxicity, mobility, or volume;
  - short-term effectiveness;
  - implementability; and
  - cost.

- **Modifying Criteria.** Criteria which may modify a proposed cleanup remedy, including:

  - state acceptance and
  - community acceptance.

4.2.1 Detailed Evaluation Criteria

The detailed evaluation includes a description of each alternative, including the technologies used and their specific components. Anticipated work activities are summarized with graphics included to describe process flows and equipment for each alternative. The description is followed by an assessment of the nine evaluation criteria. Descriptions of each of these criteria developed in the RI/FS Guidance (U.S. EPA, 1988) and the NCP are presented in the following subsections.

4.2.1.1 Overall Protection of Human Health and the Environment

Alternatives will be assessed to determine whether they can adequately protect human health and the environment, in terms of both the short-term and long-term requirements, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site. Each alternative will be analyzed to determine how it achieves protection over time, how site risks are reduced for the pathways being addressed, and how each source of contamination is to be eliminated, reduced, or controlled.

4.2.1.2 Compliance With ARARs

Each alternative will be evaluated to determine how it complies with federal and state, chemical-specific ARARs, action-specific ARARs, location-specific ARARs, and other criteria, advisories, and guidance (e.g., TBCs). When an ARAR is not met, the basis for establishment of an alternative concentration limit or for a waiver as allowed under CERCLA will be discussed.

4.2.1.3 Long-Term Effectiveness and Permanence

This criterion requires an evaluation of the risk remaining at the site after the remedial action has been completed. Areas that would be addressed for each alternative include the magnitude of remaining risks (i.e., the volume, toxicity, mobility, and propensity to bioaccumulate untreated wastes or treatment residuals); the adequacy and suitability of controls used to manage treatment residuals or untreated wastes remaining on site; and the long-term reliability of the management controls for providing protection from residuals or untreated wastes.

4.2.1.4 Reduction of Toxicity, Mobility, and Volume

This criterion addresses the CERCLA preference for remedial alternatives that permanently and significantly reduce the mobility, toxicity, or volume of the hazardous materials

at a site. Each alternative will be evaluated on: the degree to which it destroys or recycles hazardous materials; the expected reduction in toxicity; mobility; or volume; the extent to which the treatment is irreversible; and the type and quantity of residuals that would remain after treatment. Emphasis will be placed on whether treatment is used to reduce the principal concerns at the site.

4.2.1.5 Short-Term Effectiveness

The evaluation of short-term effectiveness is based on the protectiveness of human health and the environment achieved during the construction and implementation phase of the remedial action. Factors to be considered in this evaluation include protection of the community, protection of workers, environmental impacts, and the time until the remedial action objectives are achieved.

4.2.1.6 Implementability

The implementability of each alternative will be evaluated, based on its technical and administrative feasibility and the availability of services and materials. Technical feasibility takes into consideration the difficulties that may be encountered during construction and operation, the reliability of the technologies, the ease of undertaking additional remedial action, and the ability to monitor the effectiveness of a remedy. Administrative feasibility encompasses the activities required to coordinate with other offices and agencies, such as obtaining permits for off-site activities. The availability of services and materials includes the ability to secure the necessary equipment, specialists, materials, off-site treatment, and storage and disposal services.

4.2.1.7 Cost

Evaluation of the cost of each alternative includes the calculation of capital costs, operation and maintenance (O&M) costs, and the estimated present worth. Capital costs consist of the direct costs for items such as labor, materials, equipment, land, and services, plus the indirect costs for engineering management, permits, startup, and contingencies. O&M costs, or annual costs, are the post-construction costs necessary to maintain the remedial action. O&M costs include such items as operating labor, maintenance, auxiliary materials and energy, and periodic site reviews. The basis for unit costs used in the cost estimate is provided in Appendix G. The estimated present worth provides a means of comparing the cost of different alternatives. The estimated present worth uses a discount rate of ten percent (in accordance with EPA guidelines) over the period of performance of the various components of the alternative to sum the capital and O&M costs for each alternative into a single overall cost estimate. The period of performance for O&M has a maximum value of 30 years as specified in EPA guidance, although several components such as caps have a longer service life. O&M costs included in the cost estimates include costs for O&M of fencing, surface caps, storm-water management systems, and post-closure groundwater monitoring.

4.2.1.8 State Acceptance

State acceptance will be fully evaluated later in the remedial decision-making process.

4.2.1.9 Community Acceptance

Community acceptance will be fully evaluated later in the remedial decision-making process.

4.3 Alternative 2L-1: No Action

4.3.1 Alternative 2L-1 Description

This alternative consists of taking no action to either contain, treat, or otherwise minimize risk. In addition, no long-term maintenance, monitoring, or institutional controls would be implemented at the site.

4.3.2 Alternative 2L-1 Overall Protection of Human Health on the Environment

This alternative provides no control of exposure to the contaminated soils. Therefore, no reduction in risk to human health or the environment is realized. This alternative also allows for the further migration of contaminants via erosion and infiltration.

4.3.3 Alternative 2L-1 Compliance with ARARs

ARARs and TBCs and potential ARARs and TBCs for the Area A Landfill site are listed and evaluated in subsection 2.2.2. This subsection herein provides a further evaluation of the ability of the No-Action alternative to comply with the ARARs and TBCs previously identified.

Tables 4-1 through 4-3 list the requirements applicable to each ARAR and TBC identified, indicate whether a requirement is applicable, relevant, and appropriate, or TBC, provide a synopsis of the ARAR or TBC, and describe the activities to be taken for the No Action alternative to comply with each listed ARAR or TBC.

This alternative will comply with all ARARs except for federal and state RCRA hazardous waste disposal area closure standards because it will not provide a cap and associated systems designed to meet these requirements.

TABLE 4-1
NAVAL SUBMARINE BASE - NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-1
NO ACTION
CHEMICAL-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
N/A	**Federal** EPA Human Health Assessment Cancer Slope Factors (CSFs)	TBC	CSFs are developed by EPA for health effects assessments or evaluation by the Human Health Assessment Group (HHAG).	These values present the most up to date cancer risk potency information. CSFs were used to compute the individual cancer risk resulting from exposure to contaminants.
N/A	**Federal** EPA Reference Doses (RfDs)	TBC	RfDs are dose levels developed by EPA for use in the characterization of risks due to non-carcinogens in various media.	RfDs are typically employed to characterize risks of groundwater contaminant exposure (for ingestion pathways).
STATE				
Soil	**State** Proposed Connecticut Cleanup Standard Regulations (CGS § 22a-133k)	TBC	These regulations are being adopted under the statutory authority provided by CGS § 22a-133k. They will provide specific numeric cleanup criteria for a wide variety of contaminants in soil. Separate criteria will be established for threats to human health and environmental receptors posed by direct contact with contaminants.	The Soil Cleanup Standards will be considered in the design of the proposed remedy.
Water	**State** Water Quality Standards (CGS § 22a-426)	Applicable	Connecticut's Water Quality Standards were adopted under this statute. They establish specific numeric criteria, and anti-degradation policies for groundwater and surface water.	Remedial activities will be undertaken in a manner that is consistent with the antidegradation policy in the Water Quality Standards. If any remedial activities occur that are regulated under these provisions, the use of engineering controls and best management practices may be required to prevent or minimize adverse impacts to the waters of the State.
Water	**State** Water Pollution Control (RCSA §§ 22a-430-1 to 8)	Applicable	These rules establish criteria for water and stormwater discharge to surface water, groundwater and POTWs.	The proposed alternative does not include any discharges.

TABLE 4-2
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-1
NO ACTION
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
Waste	**Federal** RCRA - General requirements (40 CFR Part 264 Subpart A)	Relevant and Appropriate	Establishes general requirements for owners and operators of hazardous waste treatment, storage, and disposal facilities.	A RCRA cap is required. The cap and associated systems should be designed to meet these requirements. This alternative does not include a cap.
Waste	**Federal** RCRA - Preparedness and Prevention (40 CFR Part 264 Subpart C)	Relevant and Appropriate	Establishes requirements for minimizing the possibility of fire, explosion, or release of hazardous material.	A RCRA cap is required. The cap and associated systems should be designed to meet these requirements. This alternative does not include a cap.
Waste	**Federal** RCRA - Contingency Plan and Emergency Procedures (40 CFR Part 264 Subpart D).	Relevant and Appropriate	Establishes contingency plan requirements in the event of fire, explosion, or release from a facility.	The interim remedy will not meet the substantive requirements specified in these regulations through the preparation and implementation of appropriate plans and procedures.
Waste	**Federal** RCRA - Releases from Solid Waste Management Units (40 CFR Part 264 Subpart F	Relevant and Appropriate	Regulates releases from Solid Waste Management Units (SWMUs).	The interim remedy will not meet the substantive requirements specified in these regulations.
Waste	**Federal** RCRA - Closure and Post-Closure Requirements (40 CFR Part 264 Subpart G).	Relevant and Appropriate	Details general requirements for closure and post-closure of hazardous waste facilities.	The cap and associated systems will be designed to meet these requirements. This alternative does not include a cap.
Waste	**Federal** EPA Technical Guidance - Final Covers on Hazardous Waste Landfills and Surface Impoundments, EPA/530-SW-89-047.	TBC	Presents technical specifications for the design of multi-layer covers at landfills where hazardous wastes were disposed.	The cap and associated systems will be designed to meet these design specifications. This alternative does not include a cap.
Waste	**Federal** PCB regulation under TSCA (40 Part CFR 761)	Applicable	These standards govern the storage of PCB items.	No PCB items are managed under this alternative.

TABLE 4-2 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-1
NO ACTION
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Waste	State Hazardous Waste Management: Generator & Handler Requirements - General Standards, Listing, & Identification (RCSA §§ 22a-449(c)100-101)	Applicable	These sections establish standards for listing and identification of hazardous waste. The standards of 40 CFR Parts 260 to 261 are incorporated by reference. Chromium is not exempted from listing as a hazardous waste.	Hazardous waste determinations will be performed and the wastes will be managed in accordance with requirements of these regulations, if necessary. No wastes are generated by this alternative.
Waste	State Hazardous Waste Management: Generator Standards (RCSA §§ 22a-449(c)102)	Applicable	This section establishes standards for various classes of generators. The standards of 40 CFR Part 262 are incorporated by reference. Storage requirements given at 40 CFR § 265.15 are also included. The selected remedy calls for off-site management of hazardous waste. However, these provisions would be applicable if hazardous waste is generated on the site as part of the remedy.	Any hazardous waste generated through excavation or other activities will be managed in accordance with the substantive requirements of these regulations. No wastes are generated by this alternative.
Waste	State Hazardous Waste Management: TSDF Standards (RCSA § 22a-449(c)104)	Relevant and Appropriate	This section establishes standards for treatment, storage, and disposal of hazardous waste, and establishes standards for closure, post-closure, and groundwater monitoring. The standards of 40 CFR Part 264 are incorporated by reference. Underground injection of hazardous wastes, and placement of free liquids in landfills are prohibited.	The proposed remedial action does not include any on-site treatment, storage, or disposal of hazardous waste. The proposed remedy does not include a cap design to comply with the closure requirements of this regulation. The proposed remedial action does not include groundwater monitoring to comply with these regulations.

TABLE 4-2 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-1
NO ACTION
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
Waste	State Hazardous Waste Management: Interim Status Facilities and Groundwater Monitoring Requirements, Closure and Post-Closure Requirements (RCSA § 22a-449(c)105)	Relevant and Appropriate	This section establishes interim status standards for treatment, storage, and disposal of hazardous waste, and establishes standards for closure, post-closure, and groundwater monitoring. The standards of 40 CFR Part 265 are incorporated by reference. The Commissioner may require groundwater monitoring based on site specific considerations.	The proposed remedial action does not include any on-site treatment, storage, or disposal of hazardous waste. The proposed remedy does include the cap design in compliance with the closure requirements of this regulation. The proposed remedial action does not include groundwater monitoring as required by these regulations.
Waste	State Solid Waste Management (RCSA §§ 22a-209-1 to 15)	Applicable	Establishes standards for closure of solid waste disposal areas.	These portions of the regulations that are more stringent than Federal RCRA Subtitle D regulations will not be met.
Waste	State Safe Storage of Oil and Chemical Liquids (RCSA §§ 29-337-1 to 3)	Applicable	These rules govern the storage of hazardous materials, including flammable liquids and other chemicals.	Storage of oil and other waste materials will not be conducted.
FEDERAL				
Air	Federal Clean Air Act - National Emission Standards for Hazardous Air Pollutants (NESHAPs), 40 CFR Part 61.	Relevant and Appropriate	Establishes emission levels for eight listed hazardous air pollutants emitted from particular types of facilities.	This remedy does not include any air emissions.
Air	Federal Clean Air Act - Non-methane organic compounds (NMOCs) (Proposed rule - 56 FR 24468, to be codified at 40 CFR Part 60 Subpart WWW).	TBC	Regulations would require NMOC-specific gas collection and control systems, monitoring, and gas generation estimates. The proposed rule would also establish a performance standard for NMOCs emissions from municipal solid waste landfills.	This remedy does not include any air emissions.

TABLE 4-2 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-1
NO ACTION
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Air	State Air Pollution Control - Control of Organic Compound Emissions (RCSA § 22a-174-20)	Applicable	Subsection (f) sets standards for emission of organic compounds. Incineration of organohalocarbons is prohibited under subsection (f)(6)(A).	This remedy does not include any air emissions, dusts, or odors.
Air	State Air Pollution Control - Control of Odors (RCSA § 22a-174-23)	Applicable	This section prohibits emission of any substance that constitutes a nuisance because of objectionable odor. Several compounds are deemed to constitute a nuisance if they exceed specific concentrations.	This remedy does not include any air emissions, dusts, or odors.
Air	State Air Pollution Control - Control of Hazardous Air Pollutants (RCSA § 22a-174-29)	Applicable	This section establishes testing requirements and allowable stack concentrations for many specific substances.	This remedy does not include any air emissions, dusts, or odors.
Air	State Air Pollution Control - Control of Particulate Emissions (RCSA § 22a-174-18)	Applicable	This subsection sets specific standards for particulate emissions. Specific standards that may apply particularly to the landfill include Fugitive Dust (18b), and Incineration (18c). Gas flares are regulated as incinerators.	This remedy does not include any air emissions, dusts, or odors.

TABLE 4-2 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-1
NO ACTION
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
Air	State Air Pollution Control - Stationary Sources (RCSA § 22a-174-3)	Applicable	This regulation requires stationary sources of emissions to meet specified standards. Pollution abatement controls may be required. Specific standards are listed for many pollutants. Any landfill with potential emissions of any particular air pollutant including methane exceeding 5 tons per year may require an active gas collection systems with emissions controls under subsection 3(a)(1)(K).	This remedy does not include any air emissions.
Air	State Air Pollution Control - Sulfur Compound Emissions (RCSA § 22a-174-19)	Applicable	This section regulates emission of sulfur compounds including sulfur dioxide and hydrogen sulfide. Subsection 19(a)(8) contains specific standards for sulfur compound emissions by gas flares.	This remedy does not include any air emissions.
Air	State Control of Noise Regulations (RCSA §§ 22a-69-1 to 7.4)	Applicable	These regulations establish allowable noise levels.	This alternative will not generate any noise.
FEDERAL				
Water	Federal National Pollution Discharge Elimination System (NPDES) (40 CFR Parts 122-125)	Applicable	These standards govern the discharge of water into surface waters.	This alternative does not include any water discharges.

TABLE 4-2 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-1
NO ACTION
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Water	State Water Pollution Control (CGS § 22a-430)	Applicable	This section prohibits discharge to the waters of the State without meeting the substantive requirements of the State's Water Quality Standards. This section establishes requirements for many categories of discharges, including stormwater.	The proposed remedy will not create stormwater runoff that may require treatment under CGS § 22a-430b.
Water	State Connecticut Water Diversion Policy Act (CGS §§ 22a-365 to 378)	Applicable	These rules regulate many diversions of the waters of the State. Several broad categories are exempt, including any diversion of less than 50,000 gallons per day and any discharge permitted under CGS § 22a-430. Under Section 22a-373, the Commissioner may impose limitations and conditions including monitoring, schedule of diversion, etc. Under CGS § 22a-378, the Commissioner may temporarily suspend such requirements if a water supply emergency has been declared.	Any non-exempt diversion will be carried out in accordance with the substantive requirements of these statutes. The Navy will coordinate with the Connecticut Department of Environmental Protection to identify any such requirements and ensure that they are met. This alternative does not include any water diversion.

TABLE 4-3
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-1
NO ACTION
LOCATION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
Wetlands	**Federal** Executive Order on Protection of Wetlands (E.O. 11990, 40 CFR Part 6, App. A).	Applicable	Requires federal agencies to avoid impacts associated with the destruction or loss of wetlands, minimize potential harm, preserve and enhance wetlands, and avoid support of new construction in wetlands if a practicable alternative exists.	The no-action alternative will have no impact to wetlands.
Wetlands	**Federal** Clean Water Act § 404 - Dredge and Fill Activities (40 CFR Part 230; 33 CFR Parts 320-328).	Applicable	Requires that for dredging or filling of wetlands: no practicable alternatives exist; the activity will not cause a violation of state water quality standards or significant degradation of the water; and adverse effects will be minimized.	The no-action alternative will have no impact to wetlands.
STATE				
Surface Water and Wetlands	**State** - Inland Wetlands and Watercourses Regulations (RCSA §§ 22a-39-1 through 15).	Applicable	Regulates any operation within or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetland or watercourse.	The no-action alternative will have no impact to wetlands.
Surface Water and Wetlands	**State** - Inland Wetlands and Watercourses Act - General Requirements (CGS § 22a-45a)	TBC	This section governs minor activities including installation of water quality monitoring equipment such as staff gauges, water recording and water quality testing devices, and survey activities, including excavation of test pits and core sampling. The Commissioner may require implementation of best management practices. The Department is currently drafting these requirements, and expects to issue them before the final remedy is selected for this site.	Once regulations are adopted, any wells, test borings, soil sampling, or other similar activities will be conducted in accordance with the substantive requirements of these regulations, if any.

4.3.4 Alternative 2L-1 Long-Term Effectiveness and Performance

The No Action alternative includes no controls for exposure and no long-term management measures. All potential current and future risks would remain under this alternative.

4.3.5 Alternative 2L-1 Reduction of Toxicity, Mobility, or Volume

Alternative 2L-1, the No Action alternative, would provide no reduction in toxicity, mobility, or volume of the contaminated soil, except reduction which would occur through natural processes.

4.3.6 Alternative 2L-1 Short-Term Effectiveness

There is be no additional risks to the community, site workers, or the environment as a result of this Alternative 2L-1 being implemented.

4.3.7 Alternative 2L-1 Implementability

Since no action would be taken, there would be no difficulties or uncertainties associated with the implementation of this alternative.

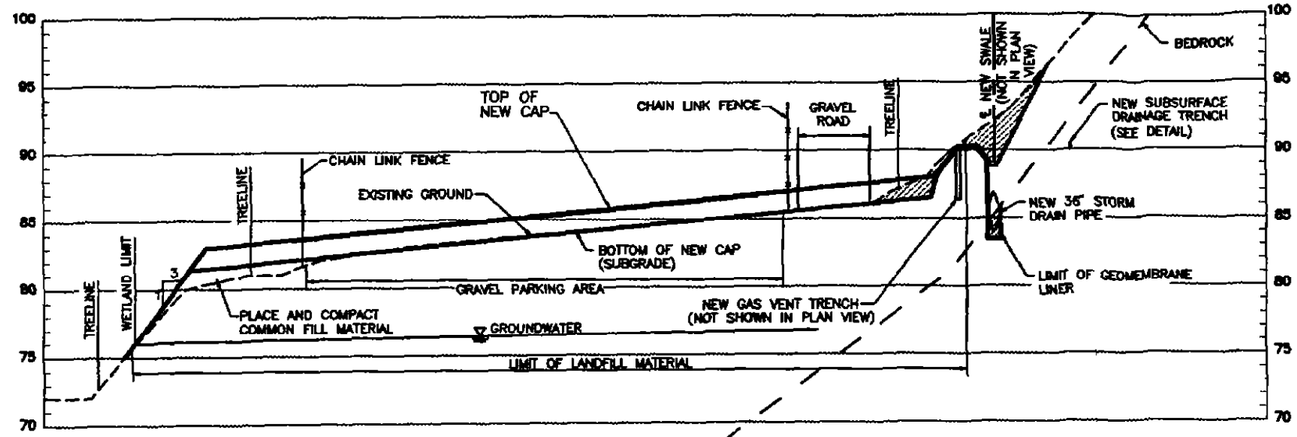
4.3.8 Alternative 2L-1 Cost

There would be no cost associated with this No Action alternative.

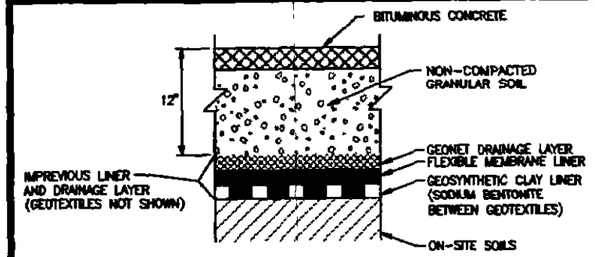
4.4 Alternative 2L-3: Cap

4.4.1 Alternative 2L-3 Description

Alternative 2L-3 consists of the installation of a thirteen-acre impervious cap over areas of the site where wastes have been disposed. The cap would consist of a double liner overlain with drainage netting, along with an operating surface. The double liner is impervious and will prevent infiltration, the drainage netting will remove water to prevent ponding above the liner, and the operating surface will protect the underlying cap layers from damage. The double liner would consist of a geosynthetic clay liner overlain with a flexible membrane liner. The operating surface will be 12 inches thick and consist of non-compacted, granular soil overlain with an asphalt surface. Between the liners and the operating surface would be a geonet drainage layer. The cap would be graded to prevent run-on and promote runoff. A conceptual design is shown in Figure 4-1. Existing storm drainage lines passing through the landfill will be plugged, and storm water will be rerouted around the landfill as shown in Figure 4-1. Any subsurface drains will be constructed so that they will not act as a preferential flow path for leachate. Concrete collars and/or impervious liners will be provided as necessary to the storm sewer system to prevent leachate migration. A subsurface drainage trench would be installed uphill of the landfill to reroute non-contaminated water in the shallow overburden around the landfill to prevent the water from contacting landfill contents/soils. This trench would extend

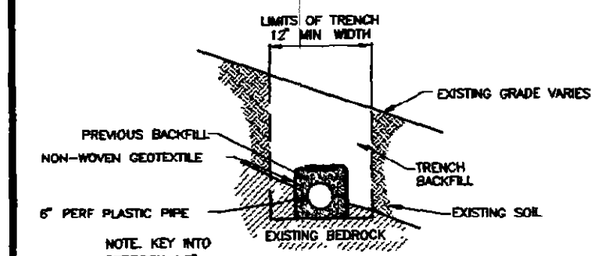


SECTION A–A'



LANDFILL CAP WITH GEO-COMPOSITE CLAY LINER

NOT TO SCALE



SUBSURFACE DRAINAGE TRENCH DETAIL

NOT TO SCALE

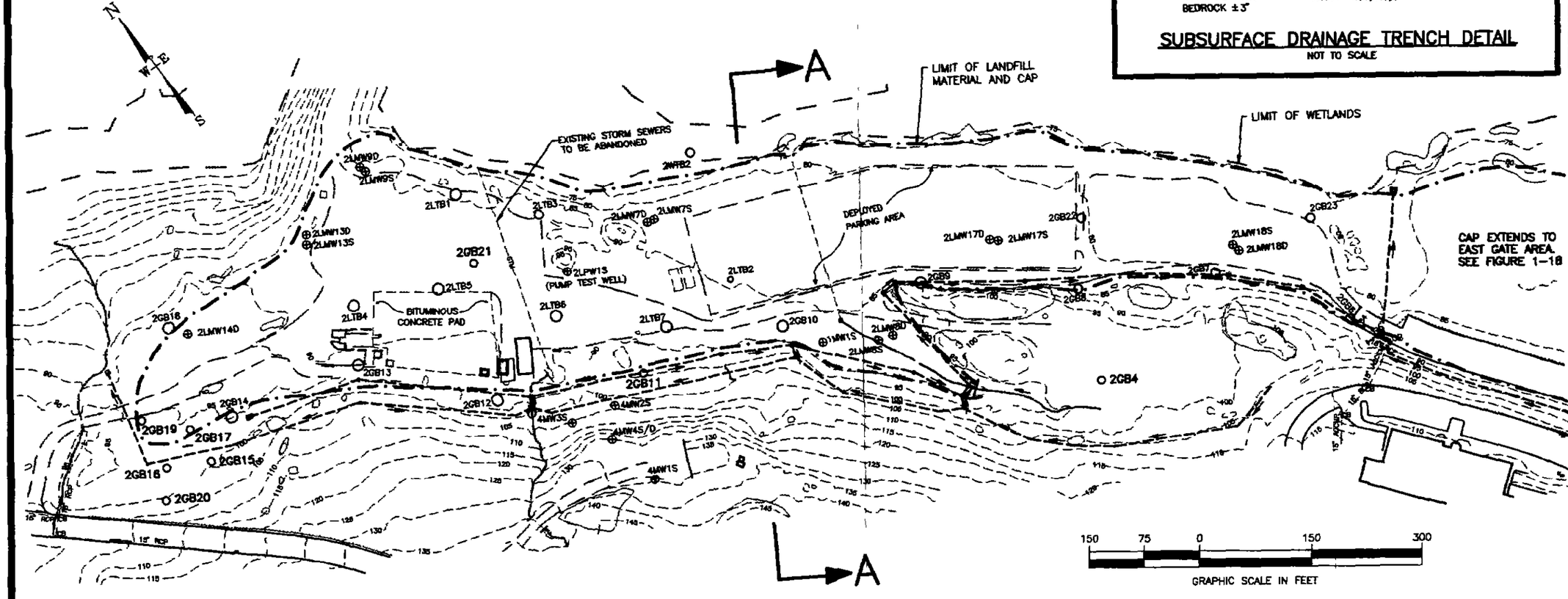


FIGURE 4-1
ALTERNATIVE 2L-3
CAP
AREA A LANDFILL

ATLANTIC ENVIRONMENTAL SEVICES, INC

LEGEND

- 10 — EXISTING CONTOUR
- 123 — BUILDING No
- WATERCOURSE
- STM — EXISTING STORM SEWER
- CATCH BASIN
- 2LMW1 MONITORING WELL
- 2LTB1 TEST BORING
- NEW SUBSURFACE DRAINAGE TRENCH
- NEW STORM DRAIN PIPE
- MH-11 NEW MANHOLE

INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE-NEW LONDON
GROTON, CONN.

0072408Z

from the ground surface to the depth of bedrock and would be located along the slope of the step ridge south of the landfill. The bottom of this trench would be high enough so that it would not be possible for it to collect landfill leachate. The cap would be designed to collect and vent landfill gas to prevent damage to the cap and migration of landfill gas to structures. Access to the site would be controlled by continued maintenance of the existing perimeter fence and security procedures. Site activities would remain the same except for crane testing activities which will be relocated somewhere outside of the Area A Landfill site.

Owing to the closure of several Navy bases, the Subase could gain several additional duties. Accordingly, there may be a need for new construction projects. In particular, the Navy may need to build a new nuclear power school, including a new barracks and a dental clinic, if the Base Realignment and Closure (BRAC) law requires the school to be built in Groton, Connecticut. The school needs to be completed by April 1997 in order to facilitate closure of the school in Orlando, Florida. If the school goes to the Subase, the Navy plans to build in the south central part of the Subase, near Rock Lake.

Thousands of trucks are anticipated by these construction activities. To prevent excess noise and air pollution from construction traffic from disturbing the residential community, the Navy would build a temporary construction access road westward from Route 12 and along the steep slope of the woods adjacent to Area A Landfill. The access road will be needed until the end of 1997.

If the school goes to Groton, the Navy may need to accelerate construction of the Area A Landfill cap. As stated above, the Navy's Preferred Alternative includes an asphalt topped operating surface over the entire cap. The access road would be part of the landfill's operating surface (lines will be painted on the asphalt to delineate the road). Early construction will not delay the CERCLA cleanup. The access road will be designed so as not to damage the cap.

The area to be covered by the cap, along with a cap detail and cross-section, are depicted in Figure 4-1. The cross-section shows actual elevations at the point of the cross-sections; however, the relative elevations among groundwater, the bedrock surface, the storm drain pipe, and the new subsurface drainage pipe (interceptor trench) will vary at different locations along the landfill. Two alternatives are being considered for the subsurface drain trench. One is shown in detail in Figure 4-1; the other system would combine the surface water run-on and ground drainage systems into one channel and consist of a crushed-stone layer extending down to bedrock alongside the length of the landfill cap and immediately upgradient (south) of it.

Proper maintenance of the cap and fence would be required to ensure their long-term integrity. Operation procedures would be developed for persons working at the Area A Landfill site to prevent any digging or other activities (without prior approval) that could jeopardize the integrity of the cap. Also, institutional controls providing notice of remaining hazardous materials at the site would be implemented. This restriction could include a provision for proper approval of any site excavation/construction activities to ensure the integrity of the cap, adequate worker protection, and other environmental considerations.

Groundwater will be monitored during the post-closure care period. Depending upon the results of this monitoring, some type of groundwater remediation may be determined to be necessary. If groundwater remediation is necessary, it will be addressed in the final remedy for this site.

4.4.2 Alternative 2L-3 Overall Protection of Human Health and the Environment

In the short term, some exposure of fugitive emissions of particulates and volatiles would be sustained by the environment, by workers putting the cap in place, and potentially by the community. However, the incremental health risks from this activity are not expected to be of concern. Installation of an impervious cap would effectively eliminate human exposure to surface soils and landfill contents, since they become inaccessible, thereby eliminating risks due to direct contact and ingestion. However, construction workers performing excavations to maintain utilities or engage in similar below-grade activities would still be exposed to contaminants in both surface and subsurface soils, since they would need to penetrate the cap to accomplish the work. Such construction activities are unlikely, and O&M procedures to be implemented at the Area A Landfill site would prevent unauthorized construction activities.

Capping does not eliminate the possibility that contaminants in the saturated zone could leach into the groundwater, or that organic compounds could migrate both laterally as well as vertically.

Current conditions pose little ecological risk which would not be altered by the capping alternative.

4.4.3 Alternative 2L 3 Compliance with ARARs

ARARs and TBCs and potential ARARs and TBCs for Area A Landfill site are listed and evaluated in subsection 2.2.2. This subsection further evaluates the potential of the cap alternative for compliance with the ARARs/TBCs previously identified.

Tables 4-4 through 4-6 list the requirements applicable to each ARAR and TBC identified, indicate whether a requirement is applicable, relevant and appropriate, or TBC, provide a synopsis of the ARAR, and describe the actions to be taken for the Alternative 2L-3 Cap to comply with each listed ARAR or TBC.

By taking the actions described in Tables 4-4 to 4-6 this alternative will comply with all ARAR and TBC. There should be no difficulties in taking the actions described. To ensure that wetland ARARs are achieved, the Navy is undertaking an analysis to identify the cap configuration that minimizes impacts to the wetland and procedures that will minimize indirect impacts to the wetland.

4.4.4 Alternative 2L-3 Long-Term Effectiveness

Risks due to direct contact with contaminated soils would be eliminated by capping. The entire area where wastes have been disposed would be covered by an impervious cap.

TABLE 4-4
NAVAL SUBMARINE BASE - NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-3
RCRA SUBTITLE C CAP
CHEMICAL-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
N/A	**Federal** EPA Human Health Assessment Cancer Slope Factors (CSFs)	TBC	CSFs are developed by EPA for health effects assessments or evaluation by the Human Health Assessment Group (HHAG).	These values present the most up to date cancer risk potency information. CSFs were used to compute the individual cancer risk resulting from exposure to contaminants.
N/A	**Federal** EPA Reference Doses (RfDs)	TBC	RfDs are dose levels developed by EPA for use in the characterization of risks due to non-carcinogens in various media.	RfDs are typically employed to characterize risks of groundwater contaminant exposure (for ingestion pathways).
STATE				
Soil	**State** Proposed Connecticut Cleanup Standard Regulations (CGS § 22a-133k)	TBC	These regulations are being adopted under the statutory authority provided by CGS § 22a-133k. They will provide specific numeric cleanup criteria for a wide variety of contaminants in soil. Separate criteria will be established for threats to human health and environmental receptors posed by direct contact with contaminants.	The Soil Cleanup Standards will be considered in the design of the proposed remedy.
Water	**State** Water Quality Standards (CGS § 22a-426)	Applicable	Connecticut's Water Quality Standards were adopted under this statute. They establish specific numeric criteria, and anti-degradation policies for groundwater and surface water.	Remedial activities will be undertaken in a manner that is consistent with the antidegradation policy in the Water Quality Standards. If any remedial activities occur that are regulated under these provisions, the use of engineering controls and best management practices may be required to prevent or minimize adverse impacts to the waters of the State.
Water	**State** Water Pollution Control (RCSA §§ 22a-430-1 to 8)	Applicable	These rules establish criteria for water and stormwater discharge to surface water, groundwater and POTWs.	The proposed alternative includes collection and discharge of upgradient surface and groundwater. Any discharges will meet the substantive requirements of these regulations, including treatment if necessary.

TABLE 4-5
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-3
RCRA SUBTITLE C CAP
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
Waste	**Federal** RCRA - General requirements (40 CFR Part 264 Subpart A)	Relevant and Appropriate	Establishes general requirements for owners and operators of hazardous waste treatment, storage, and disposal facilities.	The cap and associated systems will be designed to meet these requirements.
Waste	**Federal** RCRA - Preparedness and Prevention (40 CFR Part 264 Subpart C)	Relevant and Appropriate	Establishes requirements for minimizing the possibility of fire, explosion, or release of hazardous material.	The cap and associated systems will be designed to meet these requirements.
Waste	**Federal** RCRA - Contingency Plan and Emergency Procedures (40 CFR Part 264 Subpart D).	Relevant and Appropriate	Establishes contingency plan requirements in the event of fire, explosion, or release from a facility.	The interim remedy will meet the substantive requirements specified in these regulations through the preparation and implementation of appropriate plans and procedures.
Waste	**Federal** RCRA - Releases from Solid Waste Management Units (40 CFR Part 264 Subpart F	Relevant and Appropriate	Regulates releases from Solid Waste Management Units (SWMUs).	The interim remedy will meet the substantive requirements specified in these regulations.
Waste	**Federal** RCRA - Closure and Post-Closure Requirements (40 CFR Part 264 Subpart G).	Relevant and Appropriate	Details general requirements for closure and post-closure of hazardous waste facilities.	The cap and associated systems will be designed to meet these requirements.
Waste	**Federal** EPA Technical Guidance - Final Covers on Hazardous Waste Landfills and Surface Impoundments, EPA/530-SW-89-047.	TBC	Presents technical specifications for the design of multi-layer covers at landfills where hazardous wastes were disposed.	The cap and associated systems will be designed to meet these design specifications.
Waste	**Federal** PCB regulation under TSCA (40 Part CFR 761)	Applicable	These standards govern the storage of PCB items.	The management of PCB items during implementation of the remedy will be conducted in accordance with these standards.

TABLE 4-5 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-3
RCRA SUBTITLE C CAP
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Waste	State Hazardous Waste Management: Generator & Handler Requirements - General Standards, Listing, & Identification (RCSA §§ 22a-449(c)100-101)	Applicable	These sections establish standards for listing and identification of hazardous waste. The standards of 40 CFR Parts 260 to 261 are incorporated by reference. Chromium is not exempted from listing as a hazardous waste.	Hazardous waste determinations will be performed and the wastes will be managed in accordance with requirements of these regulations, if necessary.
Waste	State Hazardous Waste Management: Generator Standards (RCSA §§ 22a-449(c)102)	Applicable	This section establishes standards for various classes of generators. The standards of 40 CFR Part 262 are incorporated by reference. Storage requirements given at 40 CFR § 265.15 are also included. The selected remedy calls for off-site management of hazardous waste. However, these provisions would be applicable if hazardous waste is generated on the site as part of the remedy.	Any hazardous waste generated through excavation or other activities will be managed in accordance with the substantive requirements of these regulations.
Waste	State Hazardous Waste Management: TSDF Standards (RCSA § 22a-449(c)104)	Relevant and Appropriate	This section establishes standards for treatment, storage, and disposal of hazardous waste, and establishes standards for closure, post-closure, and groundwater monitoring. The standards of 40 CFR Part 264 are incorporated by reference. Underground injection of hazardous wastes, and placement of free liquids in landfills are prohibited.	The proposed remedial action does not include any on-site treatment, storage, or disposal of hazardous waste. The proposed cap design will comply with the closure requirements of this regulation. The proposed remedial action includes groundwater monitoring.

TABLE 4-5 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-3
RCRA SUBTITLE C CAP
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
Waste	State Hazardous Waste Management: Interim Status Facilities and Groundwater Monitoring Requirements, Closure and Post-Closure Requirements (RCSA § 22a-449(c)105)	Relevant and Appropriate	This section establishes interim status standards for treatment, storage, and disposal of hazardous waste, and establishes standards for closure, post-closure, and groundwater monitoring. The standards of 40 CFR Part 265 are incorporated by reference. The Commissioner may require groundwater monitoring based on site specific considerations.	The proposed remedial action does not include any on-site treatment, storage, or disposal of hazardous waste. The proposed cap design will comply with the closure requirements of this regulation. The proposed remedial action includes groundwater monitoring.
Waste	State Solid Waste Management (RCSA §§ 22a-209-1 to 15)	Applicable	Establishes standards for closure of solid waste disposal areas.	These portions of the regulations that are more stringent than Federal RCRA Subtitle D regulations will be met.
Waste	State Safe Storage of Oil and Chemical Liquids (RCSA §§ 29-337-1 to 3)	Applicable	These rules govern the storage of hazardous materials, including flammable liquids and other chemicals.	Storage of oil and other waste materials will be conducted in accordance with the requirements of these regulations.
FEDERAL				
Air	Federal Clean Air Act - National Emission Standards for Hazardous Air Pollutants (NESHAPs), 40 CFR Part 61.	Relevant and Appropriate	Establishes emission levels for eight listed hazardous air pollutants emitted from particular types of facilities.	The gas collection and treatment system will be designed to attain the NESHAP numerical standards for potential landfill gases, including benzene and vinyl chloride.
Air	Federal Clean Air Act - Non-methane organic compounds (NMOCs) (Proposed rule - 56 FR 24468, to be codified at 40 CFR Part 60 Subpart WWW).	TBC	Regulations would require NMOC-specific gas collection and control systems, monitoring, and gas generation estimates. The proposed rule would also establish a performance standard for NMOCs emissions from municipal solid waste landfills.	The proposed regulations will be considered in the design of the landfill gas collection and treatment system.

TABLE 4-5 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-3
RCRA SUBTITLE C CAP
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Air	State Air Pollution Control - Control of Organic Compound Emissions (RCSA § 22a-174-20)	Applicable	Subsection (f) sets standards for emission of organic compounds. Incineration of organohalocarbons is prohibited under subsection (f)(6)(A).	The landfill gas collection and treatment system will be designed to comply with the substantive requirements of this regulation.
Air	State Air Pollution Control - Control of Odors (RCSA § 22a-174-23)	Applicable	This section prohibits emission of any substance that constitutes a nuisance because of objectionable odor. Several compounds are deemed to constitute a nuisance if they exceed specific concentrations.	Site remediation activities will be planned to control the release of objectionable odors from the site so that the activities comply with the substantive requirements of this regulation.
Air	State Air Pollution Control - Control of Hazardous Air Pollutants (RCSA § 22a-174-29)	Applicable	This section establishes testing requirements and allowable stack concentrations for many specific substances.	Direct discharges to the air from the landfill gas collection and treatment system will be designed to meet the substantive requirements of these regulations so that the numeric criteria are not exceeded.
Air	State Air Pollution Control - Control of Particulate Emissions (RCSA § 22a-174-18)	Applicable	This subsection sets specific standards for particulate emissions. Specific standards that may apply particularly to the landfill include Fugitive Dust (18b), and Incineration (18c). Gas flares are regulated as incinerators.	Any activities involving excavation, landfill cap construction, or landfill gas flaring will be designed to meet with the substantive requirements of these regulations so that the numeric criteria are not exceeded.

TABLE 4-5 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-3
RCRA SUBTITLE C CAP
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
Air	State Air Pollution Control - Stationary Sources (RCSA § 22a-174-3)	Applicable	This regulation requires stationary sources of emissions to meet specified standards. Pollution abatement controls may be required. Specific standards are listed for many pollutants. Any landfill with potential emissions of any particular air pollutant including methane exceeding 5 tons per year may require an active gas collection systems with emissions controls under subsection 3(a)(1)(K).	Any landfill gas collection and treatment system required as part of the remedial action will be designed to meet with the substantive requirements of this regulations.
Air	State Air Pollution Control - Sulfur Compound Emissions (RCSA § 22a-174-19)	Applicable	This section regulates emission of sulfur compounds including sulfur dioxide and hydrogen sulfide. Subsection 19(a)(8) contains specific standards for sulfur compound emissions by gas flares.	Any landfill gas collection and treatment system will be designed to meet with the substantive requirements of this regulation.
Air	State Control of Noise Regulations (RCSA §§ 22a-69-1 to 7.4)	Applicable	These regulations establish allowable noise levels.	Noise levels from construction activities are exempt from these requirements. The remedial action shall be designed and constructed so that any noise emitted after construction will meet the substantive requirements of these regulations.
FEDERAL				
Water	Federal National Pollution Discharge Elimination System (NPDES) (40 CFR Parts 122-125)	Applicable	These standards govern the discharge of water into surface waters.	Collection and discharge of groundwater, including treatment if necessary, will be conducted in accordance with these requirements.

TABLE 4-5 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-3
RCRA SUBTITLE C CAP
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Water	State Water Pollution Control (CGS § 22a-430)	Applicable	This section prohibits discharge to the waters of the State without meeting the substantive requirements of the State's Water Quality Standards. This section establishes requirements for many categories of discharges, including stormwater.	The proposed remedy may create stormwater runoff that may require treatment under CGS § 22a-430b. Any discharges, including stormwater, will meet the substantive requirements of this section, including treatment if necessary.
Water	State Connecticut Water Diversion Policy Act (CGS §§ 22a-365 to 378)	Applicable	These rules regulate many diversions of the waters of the State. Several broad categories are exempt, including any diversion of less than 50,000 gallons per day and any discharge permitted under CGS § 22a-430. Under Section 22a-373, the Commissioner may impose limitations and conditions including monitoring, schedule of diversion, etc. Under CGS § 22a-378, the Commissioner may temporarily suspend such requirements if a water supply emergency has been declared.	Any non-exempt diversion will be carried out in accordance with the substantive requirements of these statutes. The Navy will coordinate with the Connecticut Department of Environmental Protection to identify any such requirements and ensure that they are met.

TABLE 4-6
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-3
RCRA SUBTITLE C CAP
LOCATION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
Wetlands	**Federal** Executive Order on Protection of Wetlands (E.O. 11990, 40 CFR Part 6, App. A).	Applicable	Requires federal agencies to avoid impacts associated with the destruction or loss of wetlands, minimize potential harm, preserve and enhance wetlands, and avoid support of new construction in wetlands if a practicable alternative exists.	The landfill cap will be designed to minimize impacts to the adjacent wetlands. To the extent necessary, wetlands restoration and/or replication will be undertaken.
Wetlands	**Federal** Clean Water Act § 404 - Dredge and Fill Activities (40 CFR Part 230; 33 CFR Parts 320-328).	Applicable	Requires that for dredging or filling of wetlands: no practicable alternatives exist; the activity will not cause a violation of state water quality standards or significant degradation of the water; and adverse effects will be minimized.	The landfill cap will be designed to meet these standards and minimize impacts to the adjacent wetlands. To the extent necessary, wetlands restoration and/or replication will be undertaken.
STATE				
Surface Water and Wetlands	**State** - Inland Wetlands and Watercourses Regulations (RCSA §§ 22a-39-1 through 15).	Applicable	Regulates any operation within or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetland or watercourse.	The landfill cap and the dredging of waste materials will be designed to minimize impacts to the Area A Wetland. To the extent necessary, wetlands restoration and/or replication will be undertaken.
Surface Water and Wetlands	**State** - Inland Wetlands and Watercourses Act - General Requirements (CGS § 22a-45a)	TBC	This section governs minor activities including installation of water quality monitoring equipment such as staff gauges, water recording and water quality testing devices, and survey activities, including excavation of test pits and core sampling. The Commissioner may require implementation of best management practices. The Department is currently drafting these requirements, and expects to issue them before the final remedy is selected for this site.	Once regulations are adopted, any wells, test borings, soil sampling, or other similar activities will be conducted in accordance with the substantive requirements of these regulations, if any.

Therefore, the cap would also minimize erosion and infiltration. Improvements to groundwater are predicted. However, due to remaining contamination in the saturated zone, these improvements may be limited. No future construction projects are planned for the Area A Landfill, and O&M procedures would disallow unauthorized excavation operations or other activities which could jeopardize the cap integrity. Thus, risks posed to workers involved in excavation/digging activities would be eliminated. Since wastes are to remain on site, a five-year review of this remedy would be required under CERCLA.

Capping is a very effective and reliable technology, provided the cap does not become damaged. Several activities will continue to take place at the landfill after the cap is installed which could damage the cap if it is not properly constructed. Operation of a crane at this site is the most significant activity in this regard. A structural analysis of a cap similar to the one proposed was performed to determine if it had the proper strength to prevent it from failing. This analysis (Atlantic, June 28, 1994), indicated that a cap of sufficient strength to withstand proposed loadings can be constructed. The other structural concern regarding a cap is settlement. To evaluate this concern, consolidation tests were run on samples of the dredge spoils beneath the landfill. Potential settlements were predicted (Atlantic, June 28, 1994), based on future loads. Settlement was not considered to be significant. Potential future groundwater remedial actions that result in dewatering of the landfill and dredge spoils beneath the landfill could cause excessive settlement of the cap. This issue will have to be carefully evaluated during the design of any such remedial actions. However, if damaged, the cap can be readily repaired. Both of the liners can be cut and patched to repair any damage. No operation functions are required for the cap to work. Long-term maintenance and monitoring requirements are minimal, involving only routine inspections, and maintenance of the surface. Routine inspections would be conducted to detect settlement of the cap and rutting, erosion, or other damage to the working surface. Should the cap need replacement, which seems unlikely, it would be replaced easily and not pose any threats or risk. This alternative could be implemented relatively quickly, in approximately 12 months.

4.4.5 Alternative 2L-3 Reduction of Toxicity, Mobility, or Volume

The Cap alternative effectively eliminates the principal threats posed by this site which are risks to human health due to direct contact. This alternative also minimizes infiltration and erosion, thereby reducing the off-site migration of contaminated soils.

Alternative 2L-3 does not include any treatment technologies; thus, the toxicity and volume of the contaminated soils would remain unchanged. However, contaminant mobility would be reduced since contaminated soils would not be exposed to erosion effects or infiltrating precipitation which could cause contaminants to migrate.

Capping is a containment technology and not a treatment technology; therefore, this alternative does not meet the statutory preference for use of alternatives which use treatment as a principal element of a remedial action.

4.4.6 Alternative 2L-3 Short-Term Effectiveness

The implementation of the cap alternative would pose virtually no risk to the public. No air emissions or short-term wastewater discharges are involved with this alternative. Inhalation of fugitive dust should not be a public risk or concern due to the relatively long distance to the nearest potential off-site receptors. Design provisions would include provisions to control fugitive dusts. Also, this alternative would not result in any increased traffic.

Certain risks would always exist as part of any construction project. Improper or careless operation of equipment or failure to comply with construction safety codes could prove dangerous to the worker. Improper handling of contaminated soils could result in increased risk for the worker. Potential exposure routes include ingestion and direct contact. These and other health and safety related concerns would be addressed in the site-specific Health and Safety Plan (HASP), which is included as part of this alternative. All workers would be required to have completed the OSHA 1910.120 40-hour hazardous materials course and participate in a health monitoring program. The overall design of this alternative would include procedures to minimize any inherent risks, including a personnel protective equipment (PPE) program and decontamination program, air monitoring, fugitive dust control procedures, and frequent safety briefings.

Alternative 2L-3, Cap, contains some potential environment impacts. Since surficial soils require grading, fugitive dust and erosion are potential concerns. As previously stated, fugitive dusts could be minimized by use of dust suppressants, and erosion of soils could be minimized by the proper implementation of a soil and erosion control plan, which would be required as part of this alternative.

4.4.7 Alternative 2L-3 Implementability

No difficulties or uncertainties are expected in implementing the Cap alternative. This alternative involves only construction equipment, materials, and procedures. Technical problems are unlikely to occur or cause scheduling delays; however, construction activities would have to be closely coordinated with existing Area A Landfill activities.

Potential future remedial actions include measures to control contaminated groundwater. Potential process options include extraction wells, vertical barriers, and *in situ* techniques such as sparging or biotreatment. These measures could be implemented just as easily after a cap has been installed. However, care would have to be taken to protect the integrity of the existing cap.

This alternative would not require any significant coordination with environmental regulatory agencies with the exception of some coordination with the CTDEP Water Bureau regarding the discharge of a clean upgradient groundwater to the Area A Wetland and both the CTDEP and EPA Waste Management Offices regarding solid waste closure requirements.

No treatment, storage, or disposal facilities (TSDF) are required to implement this alternative; thus, there would be no TSDF capacity problems. No problems would be expected

in contracting services because this alternative constitutes a relatively simple construction project. Other than the cap, no uniquely specialized equipment or materials would be required. However, the workers must have environmental experience and must have completed requirements stipulated by OSHA 1910.120. Many vendors are available with sufficient experience to complete this alternative, and a competitive bid would be fully expected.

4.4.8 Alternative 2L-3 Cost

The total costs of the Cap alternative are estimated to be as follows:

Total capital cost:	$2,834,000
Total O&M cost:	1,774,000
Total cost (present worth):	$4,608,000

A more detailed cost breakdown is presented in Table 4-7.

A sensitivity analysis was performed to determine what effect changes in unit costs or quantities have on total costs. Costs for which these parameters were uncertain were examined. The changes in total costs due to changes in key parameters are shown as follows.

Parameter	Base value	Sensitivity Range	Change in Total Cost
Discount Rate	10%	8% to 12%	-5 to 7%
Cap O&M	$0.0125/sf/yr	$0.0066 to $0.0250	-1% to 2%
Cap Unit Cost	$3.50/sf	$2.50 to $5.00	-15% to 23%
Cap Area	566,280	392,040 to 566,280	0% to 17%

If all of these values vary from the low to the high end of the range simultaneously, the total costs would range from -33% to 33%, or $3,070,994 to $6,089,288.

4.5 Alternative 2L-4: Off-Site Incinerator

4.5.1 Alternative 2L-4 Description

This alternative includes the removal and off-site incineration of all contaminated soil hot spots. The soil removal/disposal would be followed by the placement of an impervious cover over the entire area where wastes have been disposed. All surficial soils containing PCBs greater than 10 ppm and all deeper, accessible soils (i.e., to a depth of 10 feet) containing PCBs greater than 50 ppm would be excavated and incinerated off site. The excavation areas are located adjacent to the bituminous concrete pad. This area and the limits of the cover are shown in Figure 4-2. This area consists of a total of approximately 300 cubic yards. After completion of the initial excavation, excavation sidewalls would be sampled and analyzed to confirm that target cleanup levels were met. If target levels were not met in any area sampled, excavation would be continued until excavation sidewall samples confirmed that target cleanup levels were met or for bottom samples until a depth of 10 feet is reached. Testing of the excavation bottom would not be required because soils below this depth do not present a hazard

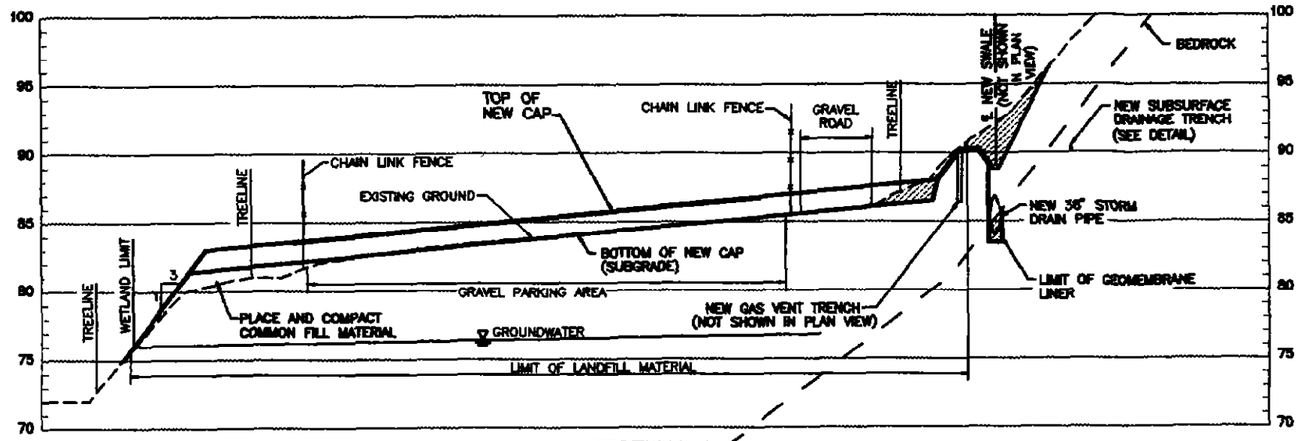
TABLE 4-7
DETAILED ALTERNATIVE COST ESTIMATE
AREA A LANDFILL - CONTAMINATED SOILS
ALTERNATIVE 2L-3, CAP

INPUT VARIABLES/ASSUMPTIONS	
Discount Rate (%) =	10%
Average # of years O & M =	30
Total volume insitu soil (cy) =	300
Total volume water (gal) =	0
Density of soil (ton/cy) =	1.50
Avg concentration of residual (%)=	1%
Moisture of soil (%) =	15%
# of recovery wells =	0
average pumping rate per well (gpm) =	0
surface area of contaminated soil (sf) =	566280

CATEGORY/DESCRIPTION	COMMENTS	CAPITAL COSTS				OPERATION & MAINTENANCE COSTS				
		QUANTITY	UNITS	UNIT COST	TOTAL	QUANT/YR	UNITS	UNIT COST	YRS	PW TOTAL
SOIL/SEDIMENT										
Limited action - access restriction	Deed restriction	1	LS	1000	$1,000				30	$0
	Fencing	0	LF	13	$0	2500	LF	1.3000	30	$33,887
Containment - horizontal barrier	Surface cap	566280	SF	3.5	$1,981,980	566280	SF	0.0125	30	$73,807
Containment - surface water control	Site grading and stormwater management	2600	LF	60	$156,000	2600	LF	0.3000	30	$8,133
Removal - excavation, dredging					$0				30	$0
Subsurface drainage trench		1800	LF	40	$72,000				30	$0
Gas venting trench		2225	LF	15	$33,375				30	$0
Groundwater monitoring					$0	1	LS	125000.00	30	$1,303,364
WATER										
Limited action - no action, access restriction					$0				30	$0
Containment - ground water control, horizontal barrier vertical barrier					$0				30	$0
Removal - subsurface drains, pumping					$0				30	$0
Insitu Treatment - biological, physical/chemical					$0				30	$0
Above ground Treatment - biological, physical/chemical thermal					$0				30	$0
Disposal - onsite/offsite					$0				30	$0
					$0				30	$0
INTERMEDIATE										
Residual Treatment/Disposal - onsite/offsite - biological, physical/chemical, thermal					$0				30	$0
Dewatering - filter press, centrifuge, drying bed, pumping					$0				30	$0
Trucking - onsite, offsite					$0				30	$0
Onsite containment (wastewater/soil) - lagoon, modu-tank, eq tank, berm, liner					$0				30	$0
Backfill - procure, place	Consists of 150cy to faciltate site grading	150	cy	10	$1,500				30	$0
					$0				30	$0
SUBTOTAL 1					$2,245,855					$1,419,192
OTHER										
Site Prep - office, utilities	0 % of subtotal 1				$0					
Mob/Demob - process equipment,	0 % of subtotal 1				$0					
Mob/Demob - construction equipment, workers		1	LS	1000	$1,000					
Treatability study	0 % of subtotal 1				$0					
Site Restoration - grading, seeding	0 % of subtotal 1				$0					
Other - health & safety, decon, project management, sampling & testing, travel & expenses		1	LS	20000	$20,000					
SUBTOTAL 2					$2,266,855					$1,419,192
Engineering Administration	10 % of Subtotal 2				$226,686					$141,919
Contingencies	15 % of Subtotal 2				$340,028					$212,879
TOTAL					$2,833,569					$1,773,990

TOTAL COST ESTIMATE OF THIS ALTERNATIVE INCLUDING CAPITAL AND O&M COSTS **$4,607,558**

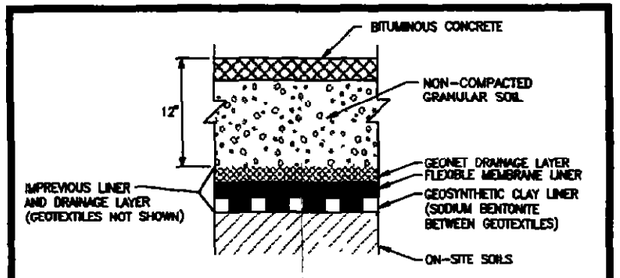
PRESENT WORTH TOTAL (INCLUDES YEAR ZERO) = ((QUANT/YR*UNIT COST)*(1-((1+DISCOUNT RATE)^-(YRS)))/DISCOUNT RATE)+(QUANT/YR*UNIT COST)



SECTION A–A'

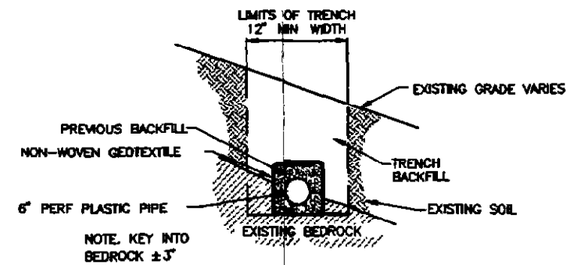
GRAPHIC HORIZONTAL SCALE (IN FEET)

GRAPHIC VERTICAL SCALE (IN FEET)



LANDFILL CAP WITH GEO-COMPOSITE CLAY LINER

NOT TO SCALE

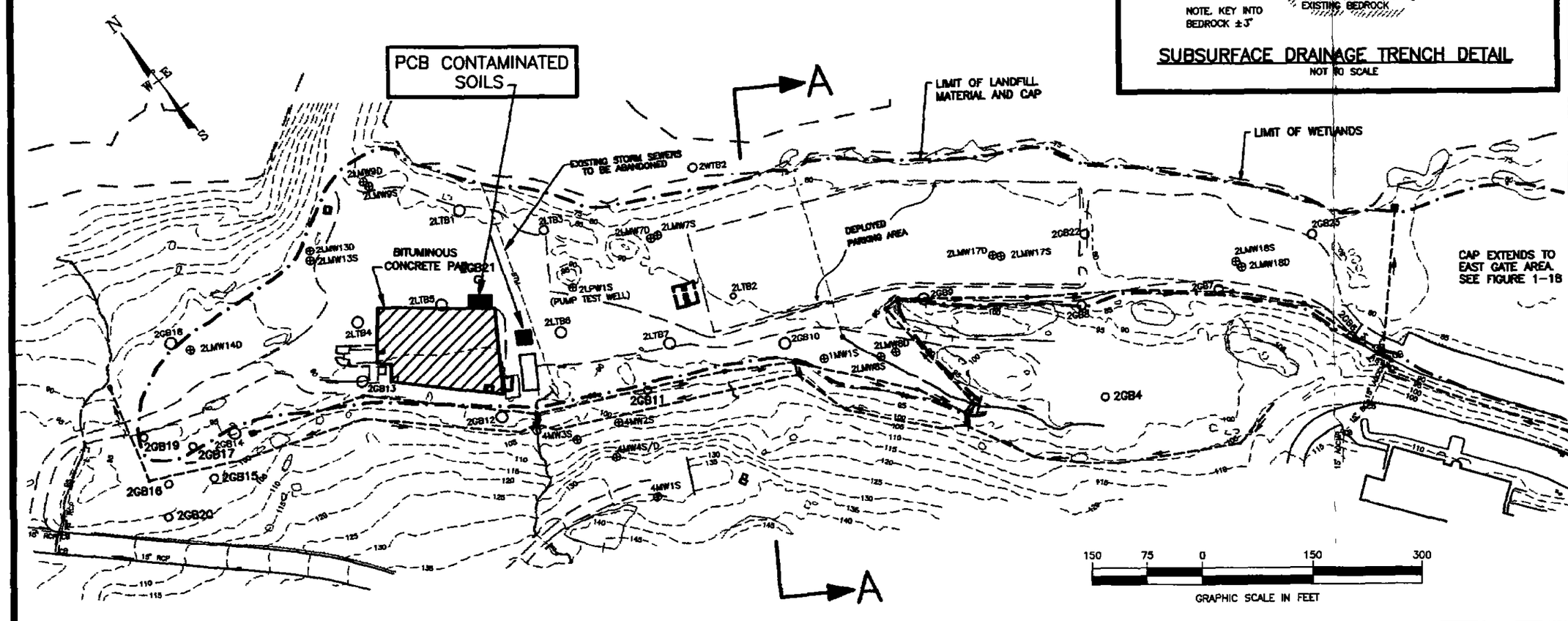


SUBSURFACE DRAINAGE TRENCH DETAIL

NOT TO SCALE

FIGURE 4–2
ALTERNATIVE 2L–4 AND 2L–5,
OFF–SITE INCINERATOR AND RCRA LANDFILL
AREA A LANDFILL

ATLANTIC ENVIRONMENTAL SEVICES, INC



LEGEND

—10—	EXISTING CONTOUR
123	BUILDING No
	WATERCOURSE
—STM—	EXISTING STORM SEWER
□	CATCH BASIN
⊕ 2LMW1	MONITORING WELL
○ 2LTB1	TEST BORING
— — —	NEW SUBSURFACE DRAINAGE TRENCH
— — —	NEW STORM DRAIN PIPE
MH–11 •	NEW MANHOLE

INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE–NEW LONDON
GROTON, CONN.

00724092

to human health, since because exposure to soils below this depth is not likely (i.e., these soils are not accessible to persons).

The cap, which would cover thirteen acres of the site and would be the same cap and provide the same post-closure care as the cap described in the Alternative 2L-3 cap.

4.5.2 Alternative 2L-4 Overall Protection of Human Health and the Environment

Short-term exposures to contaminated soil under this Off-Site Incinerator alternative would be of potential concern, as removal, grading, and transport would cause dermal and incidental ingestion of soils exposure as well as exposure to fugitive dust particulates and volatiles. These short-term exposures could be mitigated through the use of protective clothing, measures to reduce fugitive dust emissions, and other conditions specified by an on-site health and safety plan. Spills during transport also pose potential short-term risks. These risks, however, are considered low because the chance of a spill occurring is low and because a spill can be easily contained, since the soils are solid.

In the long term, removal and disposal of surface and subsurface soils off site would permanently eliminate exposures to accessible contaminated soils, since all of these soils would be removed and treated, thereby meeting risk-based remedial action objectives. Given that accessible soils would be removed and treated at an off-site location under this scenario, potential migration of contaminants from these soils through runoff or leaching would occur only in the short-term during implementation of the remedial action.

Installation of the impervious cap in the long-term would effectively eliminate human exposure to any unidentified, isolated hot spots or to inaccessible soils. There are no future construction projects proposed for the Area A Landfill site, and if there were to be any future construction, it is unlikely that excavation would go to the depth of inaccessible soils (which would be 11 to 12 feet below grade after the cap is installed). As previously discussed, institutional controls O&M procedures to be followed at the Area A Landfill site would prevent unauthorized construction activities. Installation of a cap does not eliminate the possibility that contaminants in the saturated zone may leach to groundwater or that organic compounds may migrate both laterally as well as vertically.

Current conditions pose little ecological risk, and this low risk would not be altered by the off-site incineration alternative.

4.5.3 Alternative 2L-4 Compliance with ARARs

ARARs and TBCs and potential ARARs and TBCs for the Area A Landfill site are listed and evaluated in subsection 2.2.2. This subsection herein further evaluates the potential of the Off-Site Incineration alternative for compliance with the ARARs and TBCs previously identified.

Tables 4-8 through 4-10 list the requirements applicable to each ARAR and TBC identified, indicate whether a requirement is applicable, relevant and appropriate, or TBC, provide a synopsis of the ARAR or TBC, and describe the actions to be taken for the Alternative

TABLE 4-8
NAVAL SUBMARINE BASE - NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
CHEMICAL-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
N/A	**Federal** EPA Human Health Assessment Cancer Slope Factors (CSFs)	TBC	CSFs are developed by EPA for health effects assessments or evaluation by the Human Health Assessment Group (HHAG).	These values present the most up to date cancer risk potency information. CSFs were used to compute the individual cancer risk resulting from exposure to contaminants.
N/A	**Federal** EPA Reference Doses (RfDs)	TBC	RfDs are dose levels developed by EPA for use in the characterization of risks due to non-carcinogens in various media.	RfDs are typically employed to characterize risks of groundwater contaminant exposure (for ingestion pathways).
STATE				
Soil	**State** Proposed Connecticut Cleanup Standard Regulations (CGS § 22a-133k)	TBC	These regulations are being adopted under the statutory authority provided by CGS § 22a-133k. They will provide specific numeric cleanup criteria for a wide variety of contaminants in soil. Separate criteria will be established for threats to human health and environmental receptors posed by direct contact with contaminants.	The Soil Cleanup Standards will be considered in the design of the proposed remedy.
Water	**State** Water Quality Standards (CGS § 22a-426)	Applicable	Connecticut's Water Quality Standards were adopted under this statute. They establish specific numeric criteria, and anti-degradation policies for groundwater and surface water.	Remedial activities will be undertaken in a manner that is consistent with the antidegradation policy in the Water Quality Standards. If any remedial activities occur that are regulated under these provisions, the use of engineering controls and best management practices may be required to prevent or minimize adverse impacts to the waters of the State.
Water	**State** Water Pollution Control (RCSA §§ 22a-430-1 to 8)	Applicable	These rules establish criteria for water and stormwater discharge to surface water, groundwater and POTWs.	The proposed alternative includes collection and discharge of upgradient surface and groundwater. Any discharges will meet the substantive requirements of these regulations, including treatment if necessary.

TABLE 4-9
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
Waste	**Federal** RCRA - General requirements (40 CFR Part 264 Subpart A)	Relevant and Appropriate	Establishes general requirements for owners and operators of hazardous waste treatment, storage, and disposal facilities.	The cap and associated systems will be designed to meet these requirements.
Waste	**Federal** RCRA - Preparedness and Prevention (40 CFR Part 264 Subpart C)	Relevant and Appropriate	Establishes requirements for minimizing the possibility of fire, explosion, or release of hazardous material.	The cap and associated systems will be designed to meet these requirements.
Waste	**Federal** RCRA - Contingency Plan and Emergency Procedures (40 CFR Part 264 Subpart D).	Relevant and Appropriate	Establishes contingency plan requirements in the event of fire, explosion, or release from a facility.	The interim remedy will meet the substantive requirements specified in these regulations through the preparation and implementation of appropriate plans and procedures.
Waste	**Federal** RCRA - Releases from Solid Waste Management Units (40 CFR Part 264 Subpart F	Relevant and Appropriate	Regulates releases from Solid Waste Management Units (SWMUs).	The interim remedy will meet the substantive requirements specified in these regulations.
Waste	**Federal** RCRA - Closure and Post-Closure Requirements (40 CFR Part 264 Subpart G).	Relevant and Appropriate	Details general requirements for closure and post-closure of hazardous waste facilities.	The cap and associated systems will be designed to meet these requirements.
Waste	**Federal** EPA Technical Guidance - Final Covers on Hazardous Waste Landfills and Surface Impoundments, EPA/530-SW-89-047.	TBC	Presents technical specifications for the design of multi-layer covers at landfills where hazardous wastes were disposed.	The cap and associated systems will be designed to meet these design specifications.
Waste	**Federal** PCB regulation under TSCA (40 Part CFR 761)	Applicable	These standards govern the storage of PCB items.	The management of PCB items during implementation of the remedy will be conducted in accordance with these standards.

TABLE 4-9 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Waste	State Hazardous Waste Management: Generator & Handler Requirements - General Standards, Listing, & Identification (RCSA §§ 22a-449(c)100-101)	Applicable	These sections establish standards for listing and identification of hazardous waste. The standards of 40 CFR Parts 260 to 261 are incorporated by reference. Chromium is not exempted from listing as a hazardous waste.	Hazardous waste determinations will be performed and the wastes will be managed in accordance with requirements of these regulations, if necessary.
Waste	State Hazardous Waste Management: Generator Standards (RCSA §§ 22a-449(c)102)	Applicable	This section establishes standards for various classes of generators. The standards of 40 CFR Part 262 are incorporated by reference. Storage requirements given at 40 CFR § 265.15 are also included. The selected remedy calls for off-site management of hazardous waste. However, these provisions would be applicable if hazardous waste is generated on the site as part of the remedy.	Any hazardous waste generated through excavation or other activities will be managed in accordance with the substantive requirements of these regulations.
Waste	State Hazardous Waste Management: TSDF Standards (RCSA § 22a-449(c)104)	Relevant and Appropriate	This section establishes standards for treatment, storage, and disposal of hazardous waste, and establishes standards for closure, post-closure, and groundwater monitoring. The standards of 40 CFR Part 264 are incorporated by reference. Underground injection of hazardous wastes, and placement of free liquids in landfills are prohibited.	The proposed remedial action does not include any on-site treatment, storage, or disposal of hazardous waste. The proposed cap design will comply with the closure requirements of this regulation. The proposed remedial action includes groundwater monitoring.

TABLE 4-9 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
Waste	State Hazardous Waste Management: Interim Status Facilities and Groundwater Monitoring Requirements, Closure and Post-Closure Requirements (RCSA § 22a-449(c)105)	Relevant and Appropriate	This section establishes interim status standards for treatment, storage, and disposal of hazardous waste, and establishes standards for closure, post-closure, and groundwater monitoring. The standards of 40 CFR Part 265 are incorporated by reference. The Commissioner may require groundwater monitoring based on site specific considerations.	The proposed remedial action does not include any on-site treatment, storage, or disposal of hazardous waste. The proposed cap design will comply with the closure requirements of this regulation. The proposed remedial action includes groundwater monitoring.
Waste	State Solid Waste Management (RCSA §§ 22a-209-1 to 15)	Applicable	Establishes standards for closure of solid waste disposal areas.	These portions of the regulations that are more stringent than Federal RCRA Subtitle D regulations will be met.
Waste	State Safe Storage of Oil and Chemical Liquids (RCSA §§ 29-337-1 to 3)	Applicable	These rules govern the storage of hazardous materials, including flammable liquids and other chemicals.	Storage of oil and other waste materials will be conducted in accordance with the requirements of these regulations.
FEDERAL				
Air	Federal Clean Air Act - National Emission Standards for Hazardous Air Pollutants (NESHAPs), 40 CFR Part 61.	Relevant and Appropriate	Establishes emission levels for eight listed hazardous air pollutants emitted from particular types of facilities.	The gas collection and treatment system will be designed to attain the NESHAP numerical standards for potential landfill gases, including benzene and vinyl chloride.
Air	Federal Clean Air Act - Non-methane organic compounds (NMOCs) (Proposed rule - 56 FR 24468, to be codified at 40 CFR Part 60 Subpart WWW).	TBC	Regulations would require NMOC-specific gas collection and control systems, monitoring, and gas generation estimates. The proposed rule would also establish a performance standard for NMOCs emissions from municipal solid waste landfills.	The proposed regulations will be considered in the design of the landfill gas collection and treatment system.

TABLE 4-9 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Air	State Air Pollution Control - Control of Organic Compound Emissions (RCSA § 22a-174-20)	Applicable	Subsection (f) sets standards for emission of organic compounds. Incineration of organohalocarbons is prohibited under subsection (f)(6)(A).	The landfill gas collection and treatment system will be designed to comply with the substantive requirements of this regulation.
Air	State Air Pollution Control - Control of Odors (RCSA § 22a-174-23)	Applicable	This section prohibits emission of any substance that constitutes a nuisance because of objectionable odor. Several compounds are deemed to constitute a nuisance if they exceed specific concentrations.	Site remediation activities will be planned to control the release of objectionable odors from the site so that the activities comply with the substantive requirements of this regulation.
Air	State Air Pollution Control - Control of Hazardous Air Pollutants (RCSA § 22a-174-29)	Applicable	This section establishes testing requirements and allowable stack concentrations for many specific substances.	Direct discharges to the air from the landfill gas collection and treatment system will be designed to meet the substantive requirements of these regulations so that the numeric criteria are not exceeded.
Air	State Air Pollution Control - Control of Particulate Emissions (RCSA § 22a-174-18)	Applicable	This subsection sets specific standards for particulate emissions. Specific standards that may apply particularly to the landfill include Fugitive Dust (18b), and Incineration (18c). Gas flares are regulated as incinerators.	Any activities involving excavation, landfill cap construction, or landfill gas flaring will be designed to meet with the substantive requirements of these regulations so that the numeric criteria are not exceeded.

TABLE 4-9 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
Air	State Air Pollution Control - Stationary Sources (RCSA § 22a-174-3)	Applicable	This regulation requires stationary sources of emissions to meet specified standards. Pollution abatement controls may be required. Specific standards are listed for many pollutants. Any landfill with potential emissions of any particular air pollutant including methane exceeding 5 tons per year may require an active gas collection systems with emissions controls under subsection 3(a)(1)(K).	Any landfill gas collection and treatment system required as part of the remedial action will be designed to meet with the substantive requirements of this regulations.
Air	State Air Pollution Control - Sulfur Compound Emissions (RCSA § 22a-174-19)	Applicable	This section regulates emission of sulfur compounds including sulfur dioxide and hydrogen sulfide. Subsection 19(a)(8) contains specific standards for sulfur compound emissions by gas flares.	Any landfill gas collection and treatment system will be designed to meet with the substantive requirements of this regulation.
Air	State Control of Noise Regulations (RCSA §§ 22a-69-1 to 7.4)	Applicable	These regulations establish allowable noise levels.	Noise levels from construction activities are exempt from these requirements. The remedial action shall be designed and constructed so that any noise emitted after construction will meet the substantive requirements of these regulations.
FEDERAL				
Water	Federal National Pollution Discharge Elimination System (NPDES) (40 CFR Parts 122-125)	Applicable	These standards govern the discharge of water into surface waters.	Collection and discharge of groundwater, including treatment if necessary, will be conducted in accordance with these requirements.

TABLE 4-9 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Water	State Water Pollution Control (CGS § 22a-430)	Applicable	This section prohibits discharge to the waters of the State without meeting the substantive requirements of the State's Water Quality Standards. This section establishes requirements for many categories of discharges, including stormwater.	The proposed remedy may create stormwater runoff that may require treatment under CGS § 22a-430b. Any discharges, including stormwater, will meet the substantive requirements of this section, including treatment if necessary.
Water	State Connecticut Water Diversion Policy Act (CGS §§ 22a-365 to 378)	Applicable	These rules regulate many diversions of the waters of the State. Several broad categories are exempt, including any diversion of less than 50,000 gallons per day and any discharge permitted under CGS § 22a-430. Under Section 22a-373, the Commissioner may impose limitations and conditions including monitoring, schedule of diversion, etc. Under CGS § 22a-378, the Commissioner may temporarily suspend such requirements if a water supply emergency has been declared.	Any non-exempt diversion will be carried out in accordance with the substantive requirements of these statutes. The Navy will coordinate with the Connecticut Department of Environmental Protection to identify any such requirements and ensure that they are met.

TABLE 4-10
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
LOCATION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
Wetlands	Federal Executive Order on Protection of Wetlands (E.O. 11990, 40 CFR Part 6, App. A).	Applicable	Requires federal agencies to avoid impacts associated with the destruction or loss of wetlands, minimize potential harm, preserve and enhance wetlands, and avoid support of new construction in wetlands if a practicable alternative exists.	The landfill cap will be designed to minimize impacts to the adjacent wetlands. To the extent necessary, wetlands restoration and/or replication will be undertaken.
Wetlands	Federal Clean Water Act § 404 - Dredge and Fill Activities (40 CFR Part 230; 33 CFR Parts 320-328).	Applicable	Requires that for dredging or filling of wetlands: no practicable alternatives exist; the activity will not cause a violation of state water quality standards or significant degradation of the water; and adverse effects will be minimized.	The landfill cap will be designed to meet these standards and minimize impacts to the adjacent wetlands. To the extent necessary, wetlands restoration and/or replication will be undertaken.
STATE				
Surface Water and Wetlands	State - Inland Wetlands and Watercourses Regulations (RCSA §§ 22a-39-1 through 15).	Applicable	Regulates any operation within or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetland or watercourse.	The landfill cap and the dredging of waste materials will be designed to minimize impacts to the Area A Wetland. To the extent necessary, wetlands restoration and/or replication will be undertaken.
Surface Water and Wetlands	State - Inland Wetlands and Watercourses Act - General Requirements (CGS § 22a-45a)	TBC	This section governs minor activities including installation of water quality monitoring equipment such as staff gauges, water recording and water quality testing devices, and survey activities, including excavation of test pits and core sampling. The Commissioner may require implementation of best management practices. The Department is currently drafting these requirements, and expects to issue them before the final remedy is selected for this site.	Once regulations are adopted, any wells, test borings, soil sampling, or other similar activities will be conducted in accordance with the substantive requirements of these regulations, if any.

2L-4 to comply with each listed ARAR or TBC.

By taking the actions described in Tables 4-8 to 4-10, this alternative will comply with all ARAR and TBC. There should be no difficulties in taking the actions described. To ensure that wetland ARARs are achieved, the Navy is undertaking an analysis to identify the cap configuration that minimizes impacts to the wetlands and procedures that will minimize indirect impacts to the wetland.

4.5.4 Alternative 2L-4 Long-Term Effectiveness and Permanence

Through removal and treatment of the accessible contaminated soil, the magnitude of residual risk would be very low and below the values established for the target cleanup levels. Once destroyed in the off-site incinerator, the risks associated with the contaminated soils would be eliminated. Contaminated soils remaining on site would consist of inaccessible soils (i.e., below 10 feet in depth), which contain contaminant concentrations above target cleanup levels and accessible soils (i.e., above 10 feet deep) containing contaminant levels below target cleanup levels. A five-year review would be required with this alternative, since not all hazardous substances are being removed.

The adequacy and reliability of the cap portion of this alternative is evaluated in subsection 5.4.4. The off-site incineration technology, which is a form of treatment, is fully expected to meet all performance specifications. Off-site incinerators, which are permitted to burn PCB under TSCA, will provide destruction/removal efficiencies greater than 99.99%.

The only operation and maintenance in this alternative is for the cap; this aspect is discussed in subsection 5.4.4. This Off-Site Incineration alternative could be implemented relatively quickly in approximately 14 months.

4.5.5 Alternative 2L-4 Reduction of Toxicity, Mobility, or Volume

This alternative effectively would eliminate the principal threats posed by this site which are risks to human health due to direct contact and the off-site migration of contaminants via erosion and infiltration. In addition, future workers involved in subsurface construction would be protected from risks, since accessible soils containing concentrations above target cleanup levels would be removed. In addition, O&M procedures to be followed at the Area A Landfill site, along with institutional controls, would protect the cap by preventing unauthorized excavation operations or other activities which could jeopardize the integrity of the cap. Future construction activities could involve disturbing contaminated soils; however, no future construction projects are planned for the Area A Landfill site.

Since this Off-Site Incineration alternative does include treatment technologies, the entire contaminant mass or volume in the hot spot soils would be destroyed by incineration. Therefore, the toxicity and volume of the contaminated soils would be reduced. The mobility of contaminants would be reduced by the cap because erosion and infiltration would be prevented. Leaching of remaining contaminants from soils located above the water table due to infiltrating precipitation would be prevented.

The process options used in this alternative to reduce hazards consist of containment technologies and incineration; therefore, treatment is a principal element in this alternative.

4.5.6 Alternative 2L-4 Short-Term Effectiveness

No risks to the community would exist as a direct result of implementing this alternative with the exception of the increased traffic due to the 15± trailer dump truck loads needed to transport the soil to an off-site incinerator. This small increase in traffic should not be noticeable, since the Subase is along major traffic routes. Potential exposure of local residents and other than subase personnel to the release of fugitive dusts from excavation and grading activities would be unlikely to occur because procedures would be implemented during construction to minimize fugitive dusts, air monitoring would be performed, and the distance from the nearest residential receptors is adequately long.

Certain risks would always exist as part of any construction project. Improper or careless operations of equipment or failure to comply with construction safety codes could prove dangerous to workers. Improper handling of contaminated soils could result in increased risk for the worker. Potential exposure routes include ingestion and direct contact. All of these and other health and safety-related concerns would be discussed in the site-specific HASP, which is included as part of this Off-Site Incineration alternative. All workers would be required to complete the OSHA 1910.120 40-hour hazardous materials course and participate in a health-monitoring program. The overall design of this alternative would include procedures to minimize any inherent risks, including a PPE program and decontamination program, air-monitoring fugitive dust control procedures, and frequent safety briefings.

Alternative 2L-4 contains some potential environmental impacts. Since soils are to be excavated and handled aboveground and surficial soils require grading, fugitive dust and erosion are potential concerns. Fugitive dusts can be minimized by use of dust suppressants, and erosion of soils would be minimized by the proper implementation of a soil and erosion control plan which would be required as part of this alternative.

This alternative can be completed in a short-time period (i.e., less than 14 months) and, upon completion, would be completely effective in meeting remedial action objectives.

4.5.7 Alternative 2L-4 Implementability

No difficulties or uncertainties are expected in implementing this Off-Site Incineration alternative. This alternative involves only construction equipment, materials, and standard procedures. Technical problems are unlikely to occur and unlikely to cause scheduling delays.

Potential future remedial actions include measures to control contaminated groundwater. Potential process options include extraction wells, vertical barriers, and *in situ* techniques such as air sparging or biotreatment. These measures could be implemented after a cap has been installed. Care would have to be taken to protect the integrity of the existing cap.

This alternative would not require any significant coordination with environmental

agencies with the exception of some coordination with the CTDEP Water Bureau regarding the discharge of clean upgradient groundwater to the wetlands and the CTDEP and EPA Waste Management Offices regarding solid waste facility closure standards.

There may be some delays due to the capacity of off-site incineration facilities to manage bulk soils. No problems are expected in contracting services, since this alternative constitutes a relatively simple construction project, with the exception of the environmental concerns. No specialized equipment or materials are required. However, workers must have environmental experience and must have completed requirements stipulated by OSHA 1910.120. Many vendors are established to have acquired sufficient experience to complete this alternative, and a competitive bid would be expected.

4.5.8 Alternative 2L-4 Cost

An estimate of the cost of this alternative was performed and is presented in Table 4-11. The total cost of this alternative is estimated to be as follows:

Total capital cost:	$3,332,000
Total O&M cost:	1,774,000
Total cost (present worth):	$5,106,000

A sensitivity analysis was performed to determine what effect changes in unit costs or quantities have on total costs. In particular, costs for which these parameters are uncertain were examined. The results in total price due to changes in key parameters are shown as follows.

Parameter	Base value	Sensitivity Range	Change in Total Cost
Cap Unit Cost and Cap Area	$3.50/sf and 566,280 sf	$2.50/sf & 392,040 sf to $5.00/sf & 566,280 sf	-25% to 21%
Disposal Unit Cost	$800/ton	$600/ton to $1,200/ton	-2% to 4%
Vol. Contaminated Soil	300 cy	250 cy to 450 cy	-1% to 4%

If all of the above values vary to the low and high end of the range simultaneously, the total cost would range from -28% to 32%, or $3,656,000 to $6,731,000.

4.6 Alternative 2L-5: Off-Site RCRA Landfill

4.6.1 Alternative 2L-5 Description

Alternative 2L-5 includes the removal and off-site disposal (i.e., RCRA landfill) of all contaminated soil hot spots. The soil removal/disposal would be followed by the placement of an impervious cover over the entire area where wastes have been disposed. All surficial soil containing PCBs greater than 10 ppm and deeper accessible soils (i.e., up to 10 feet deep) containing PCBs greater than 50 ppm would be excavated and disposed off site in a RCRA or

TABLE 4-11
DETAILED ALTERNATIVE COST ESTIMATE
AREA A LANDFILL - CONTAMINATED SOILS
ALTERNATIVE 2L-4, OFF-SITE INCINERATION LANDFILL

INPUT VARIABLES/ASSUMPTIONS	
Discount Rate (%) =	10%
Average # of years O & M =	30
Total volume insitu soil (cy) =	300
Total volume water (gal) =	0
Density of soil (ton/cy) =	1.50
Avg concentration of residual (%)=	1%
Moisture of soil (%) =	15%
# of recovery wells =	0
average pumping rate per well (gpm) =	0
surface area of containment barrier (sf) =	566280

CATEGORY/DESCRIPTION	COMMENTS	CAPITAL COSTS QUANTITY	UNITS	UNIT COST	TOTAL	OPERATION & MAINTENANCE COSTS QUANT/YR	UNITS	UNIT COST	YRS	PW TOTAL
SOIL/SEDIMENT										
Limited action - no action, access restriction	Deed Restrictions	1	LS	1000	$1,000				30	$0
	Fencing	0	LF	13.00	$0	2500	LF	1.30	30.00	$33,887
Containment - horizontal barrier, vertical barrier	Surface Cap	566280	SF	3.50	$1,981,980	566280	SF	0.0125	30	$73,807
surface water control	Site Grading and Storm Water Mgmt.	2600	LF	60.00	$156,000	2600	LF	0.30	30	$8,133
Removal - excavation	Backhoe	300	CY	8.00	$2,400				30	$0
Above ground Treatment - onsite - physical/chemical	Air stripping	0	TON	50.00	$0				30	$0
Disposal - offsite - incineration	TSCA Incinerator	450	TON	800.00	$360,000				30	$0
	Includes transportation and treatment				$0				30	$0
Groundwater monitoring					$0	1	LS	125000.00	30	$1,303,364
Subsurface drainage trench		1800	LF	40.00	$72,000				30	$0
Gas venting trench		2225	LF	15.00	$33,375				30	$0
Insitu Treatment - biological, physical/chemical					$0				30	$0
Above ground Treatment - biological, physical/chemical thermal					$0				30	$0
Disposal - onsite/offsite					$0				30	$0
					$0				30	$0
INTERMEDIATE										
Residual Treatment/Disposal - onsite/offsite - biological, physical/chemical, thermal					$0				30	$0
Dewatering - filter press, centrifuge, drying bed, pumping					$0				30	$0
Trucking - onsite, offsite					$0				30	$0
Onsite containment (wastewater/soil) - lagoon, modu-tank, eq tank, berm, liner					$0				30	$0
Backfill - procure, place	Dozer -- Includes 150cy to facilitate site grading.	450	CY	10	$4,500				30	$0
					$0				30	$0
SUBTOTAL 1					$2,611,255					$1,419,192
OTHER										
Site Prep - office, utilities		1	LS	1000	$1,000					
Mob/Demob - process equipment,	0 % of subtotal 1				$0					
Mob/Demob - construction equipment, workers		1	LS	2000	$2,000					
Treatability study	0 % of subtotal 1				$0					
Site Restoration - grading, seeding		1	LS	1000	$1,000					
Other - health & safety, decon, project management, sampling & testing, travel & expenses		1	LS	50000	$50,000					
SUBTOTAL					$2,665,255					$1,419,192
SUBTOTAL 2 (CAPITAL + O&M)										
Engineering Administration	10 % of Subtotal 2				$266,526					$141,919
Contingencies	15 % of Subtotal 2				$399,788					$212,879
TOTAL					$3,331,569					$1,773,990

TOTAL COST ESTIMATE OF THIS ALTERNATIVE INCLUDING CAPITAL AND O&M COSTS **$5,105,558**

PRESENT WORTH TOTAL (INCLUDES YEAR ZERO) = ((QUANT/YR*UNIT COST)*(1-((1+DISCOUNT RATE)^-(YRS)))/DISCOUNT RATE)+(QUANT/YR*UNIT COST)

TSCA landfill, depending upon PCB concentration. Materials containing greater than 50 ppm PCB may only be disposed in a TSCA landfill. Accessible soils are those soils that a person can potentially be exposed to and, as defined in subsection 3.2, are those soils from the ground surface to a depth of 10 feet. The excavation areas are located adjacent to the bituminous concrete pad. These areas which consist of a total of 300 cubic yards and the limits of the cover are shown in Figure 4-2. After completion of the initial excavation, excavation limits would be sampled and analyzed to confirm that target cleanup levels were met. If target levels were not met in any area sampled, excavation would be continued until excavation samples confirmed that target cleanup levels were met or for bottom samples until a depth of 10 feet is reached.

The cap, which would cover thirteen acres of the site, is the same cap described in Alternative 2L-3 and would require the same post-closure care.

4.6.2 Alternative 2L-5 Overall Protection of Human Health and the Environment

Short-term exposure to contaminated soil under this alternative would be of potential concern, since removal, grading, and transport would cause dermal and incidental ingestion of soils exposure, as well as exposure to fugitive dust particulates and volatiles. These short-term exposures could be mitigated through the use of protective clothing, through measures to reduce fugitive dust emissions, and other conditions specified by an on-site health and safety plan.

In the long term, removal and disposal of surface and subsurface soils off site would permanently eliminate exposures to accessible contaminated soils since all of these soils would be removed, thereby meeting risk-based remedial action objectives. Given that accessible soils would be removed to an off-site location under this scenario, potential migration of contaminants from these soils through runoff or leaching would occur only in the short-term during implementation of the remedial action.

Installation of the impervious cap in the long term would effectively eliminate human exposure to any unidentified isolated hot spots or to inaccessible soils. There are no future construction projects proposed for the Area A Landfill site, and if there were to be any future construction, it is unlikely that excavation would go to the depth of inaccessible soils (which would be 11 to 12 feet below grade after the cap is installed). As previously discussed, institutional controls and O&M procedures to be followed by the Area A Landfill would prevent unauthorized construction activities. Installation of a cap does not eliminate the possibility that contaminants in the saturated zone may leach to groundwater, or that organic compounds may migrate both laterally as well as vertically.

Current conditions pose little ecological risk, and this low risk would not be altered by the off-site incineration alternative.

4.6.3 Alternative 2L-5 Compliance with ARARs

ARARs and TBCs and potential ARARs and TBCs for the Area A Landfill site are listed and evaluated in subsection 2.2.2. This subsection further evaluates the ability of this Off-Site RCRA Landfill alternative to comply with the ARARs and TBCs previously identified.

Tables 4-12 through 4-14 list the requirements applicable to each ARAR and TBC identified, indicate whether a requirement is applicable, relevant, and appropriate, or TBC, provide a synopsis of the ARAR or TBC, and describe the actions to be taken for the Alternative 2L-5 to comply with each listed ARAR or TBC.

By taking the actions described in Tables 4-12 to 4-14, this alternative will comply with all ARARs and TBCs. There should be no difficulties in taking the actions described. To ensure that wetland ARARs are achieved, the Navy is undertaking an analysis to identify the cap configuration that minimizes impacts to the wetland and procedures that will minimize indirect impacts to the wetland.

4.6.4 Alternative 2L-5 Long-Term Effectiveness and Permanence

Through complete removal of accessible contaminated soil, the magnitude of risk would be low and below the values for target cleanup levels. Once placed in the off-site landfill, the risks associated with the contaminated soils would be low because they would be properly contained and monitored. Contaminated soils remaining on site would consist of inaccessible soils (i.e., below 10 feet in depth), which contain contaminant concentrations above target cleanup levels and accessible soils (i.e., above 10 feet deep) containing contaminant levels below target cleanup levels. A five-year review would be required with this alternative, since not all hazardous substances are being removed.

The adequacy and reliability of the cap portion of this alternative is evaluated in subsection 4.4.4. The off-site landfill technology, which is a form of containment, is fully expected to meet all performance specifications. RCRA landfills consist of multilayered containment cells which must conform to strict RCRA standards for construction, operation, and maintenance.

The only operation and maintenance in this Off-Site RCRA Landfill alternative is for the cap; this is discussed in subsection 4.4.4. This alternative could be implemented relatively quickly in approximately 13 months.

4.6.5 Alternative 2L-5 Reduction of Toxicity, Mobility, or Volume

This alternative effectively would eliminate the principal threats posed by this site which are risks to human health due to direct contact and off-site migration of contaminants via erosion and infiltration. In addition, future workers involved in subsurface construction would be protected from risks because accessible soils containing concentrations above target cleanup levels would be removed. Such activities are unlikely to occur since O&M procedures to be followed at the Area A Landfill site, along with institutional controls, would protect the cap by preventing unauthorized excavation operations or other activities which could jeopardize the integrity of the cap. Future construction activities could involve disturbing contaminated soils; however, no future construction projects are planned for the Area A Landfill.

TABLE 4-12
NAVAL SUBMARINE BASE - NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
CHEMICAL-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
N/A	**Federal** EPA Human Health Assessment Cancer Slope Factors (CSFs)	TBC	CSFs are developed by EPA for health effects assessments or evaluation by the Human Health Assessment Group (HHAG).	These values present the most up to date cancer risk potency information. CSFs were used to compute the individual cancer risk resulting from exposure to contaminants.
N/A	**Federal** EPA Reference Doses (RfDs)	TBC	RfDs are dose levels developed by EPA for use in the characterization of risks due to non-carcinogens in various media.	RfDs are typically employed to characterize risks of groundwater contaminant exposure (for ingestion pathways).
STATE				
Soil	**State** Proposed Connecticut Cleanup Standard Regulations (CGS § 22a-133k)	TBC	These regulations are being adopted under the statutory authority provided by CGS § 22a-133k. They will provide specific numeric cleanup criteria for a wide variety of contaminants in soil. Separate criteria will be established for threats to human health and environmental receptors posed by direct contact with contaminants.	The Soil Cleanup Standards will be considered in the design of the proposed remedy.
Water	**State** Water Quality Standards (CGS § 22a-426)	Applicable	Connecticut's Water Quality Standards were adopted under this statute. They establish specific numeric criteria, and anti-degradation policies for groundwater and surface water.	Remedial activities will be undertaken in a manner that is consistent with the antidegradation policy in the Water Quality Standards. If any remedial activities occur that are regulated under these provisions, the use of engineering controls and best management practices may be required to prevent or minimize adverse impacts to the waters of the State.
Water	**State** Water Pollution Control (RCSA §§ 22a-430-1 to 8)	Applicable	These rules establish criteria for water and stormwater discharge to surface water, groundwater and POTWs.	The proposed alternative includes collection and discharge of upgradient surface and groundwater. Any discharges will meet the substantive requirements of these regulations, including treatment if necessary.

TABLE 4-13
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
Waste	**Federal** RCRA - General requirements (40 CFR Part 264 Subpart A)	Relevant and Appropriate	Establishes general requirements for owners and operators of hazardous waste treatment, storage, and disposal facilities.	The cap and associated systems will be designed to meet these requirements.
Waste	**Federal** RCRA - Preparedness and Prevention (40 CFR Part 264 Subpart C)	Relevant and Appropriate	Establishes requirements for minimizing the possibility of fire, explosion, or release of hazardous material.	The cap and associated systems will be designed to meet these requirements.
Waste	**Federal** RCRA - Contingency Plan and Emergency Procedures (40 CFR Part 264 Subpart D).	Relevant and Appropriate	Establishes contingency plan requirements in the event of fire, explosion, or release from a facility.	The interim remedy will meet the substantive requirements specified in these regulations through the preparation and implementation of appropriate plans and procedures.
Waste	**Federal** RCRA - Releases from Solid Waste Management Units (40 CFR Part 264 Subpart F	Relevant and Appropriate	Regulates releases from Solid Waste Management Units (SWMUs).	The interim remedy will meet the substantive requirements specified in these regulations.
Waste	**Federal** RCRA - Closure and Post-Closure Requirements (40 CFR Part 264 Subpart G).	Relevant and Appropriate	Details general requirements for closure and post-closure of hazardous waste facilities.	The cap and associated systems will be designed to meet these requirements.
Waste	**Federal** EPA Technical Guidance - Final Covers on Hazardous Waste Landfills and Surface Impoundments, EPA/530-SW-89-047.	TBC	Presents technical specifications for the design of multi-layer covers at landfills where hazardous wastes were disposed.	The cap and associated systems will be designed to meet these design specifications.
Waste	**Federal** PCB regulation under TSCA (40 Part CFR 761)	Applicable	These standards govern the storage of PCB items.	The management of PCB items during implementation of the remedy will be conducted in accordance with these standards.

TABLE 4-13 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Waste	State Hazardous Waste Management: Generator & Handler Requirements - General Standards, Listing, & Identification (RCSA §§ 22a-449(c)100-101)	Applicable	These sections establish standards for listing and identification of hazardous waste. The standards of 40 CFR Parts 260 to 261 are incorporated by reference. Chromium is not exempted from listing as a hazardous waste.	Hazardous waste determinations will be performed and the wastes will be managed in accordance with requirements of these regulations, if necessary.
Waste	State Hazardous Waste Management: Generator Standards (RCSA §§ 22a-449(c)102)	Applicable	This section establishes standards for various classes of generators. The standards of 40 CFR Part 262 are incorporated by reference. Storage requirements given at 40 CFR § 265.15 are also included. The selected remedy calls for off-site management of hazardous waste. However, these provisions would be applicable if hazardous waste is generated on the site as part of the remedy.	Any hazardous waste generated through excavation or other activities will be managed in accordance with the substantive requirements of these regulations.
Waste	State Hazardous Waste Management: TSDF Standards (RCSA § 22a-449(c)104)	Relevant and Appropriate	This section establishes standards for treatment, storage, and disposal of hazardous waste, and establishes standards for closure, post-closure, and groundwater monitoring. The standards of 40 CFR Part 264 are incorporated by reference. Underground injection of hazardous wastes, and placement of free liquids in landfills are prohibited.	The proposed remedial action does not include any on-site treatment, storage, or disposal of hazardous waste. The proposed cap design will comply with the closure requirements of this regulation. The proposed remedial action includes groundwater monitoring.

TABLE 4-13 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
Waste	State Hazardous Waste Management: Interim Status Facilities and Groundwater Monitoring Requirements, Closure and Post-Closure Requirements (RCSA § 22a-449(c)105)	Relevant and Appropriate	This section establishes interim status standards for treatment, storage, and disposal of hazardous waste, and establishes standards for closure, post-closure, and groundwater monitoring. The standards of 40 CFR Part 265 are incorporated by reference. The Commissioner may require groundwater monitoring based on site specific considerations.	The proposed remedial action does not include any on-site treatment, storage, or disposal of hazardous waste. The proposed cap design will comply with the closure requirements of this regulation. The proposed remedial action includes groundwater monitoring.
Waste	State Solid Waste Management (RCSA §§ 22a-209-1 to 15)	Applicable	Establishes standards for closure of solid waste disposal areas.	These portions of the regulations that are more stringent than Federal RCRA Subtitle D regulations will be met.
Waste	State Safe Storage of Oil and Chemical Liquids (RCSA §§ 29-337-1 to 3)	Applicable	These rules govern the storage of hazardous materials, including flammable liquids and other chemicals.	Storage of oil and other waste materials will be conducted in accordance with the requirements of these regulations.
FEDERAL				
Air	Federal Clean Air Act - National Emission Standards for Hazardous Air Pollutants (NESHAPs), 40 CFR Part 61.	Relevant and Appropriate	Establishes emission levels for eight listed hazardous air pollutants emitted from particular types of facilities.	The gas collection and treatment system will be designed to attain the NESHAP numerical standards for potential landfill gases, including benzene and vinyl chloride.
Air	Federal Clean Air Act - Non-methane organic compounds (NMOCs) (Proposed rule - 56 FR 24468, to be codified at 40 CFR Part 60 Subpart WWW).	TBC	Regulations would require NMOC-specific gas collection and control systems, monitoring, and gas generation estimates. The proposed rule would also establish a performance standard for NMOCs emissions from municipal solid waste landfills.	The proposed regulations will be considered in the design of the landfill gas collection and treatment system.

TABLE 4-13 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Air	State Air Pollution Control - Control of Organic Compound Emissions (RCSA § 22a-174-20)	Applicable	Subsection (f) sets standards for emission of organic compounds. Incineration of organohalocarbons is prohibited under subsection (f)(6)(A).	The landfill gas collection and treatment system will be designed to comply with the substantive requirements of this regulation.
Air	State Air Pollution Control - Control of Odors (RCSA § 22a-174-23)	Applicable	This section prohibits emission of any substance that constitutes a nuisance because of objectionable odor. Several compounds are deemed to constitute a nuisance if they exceed specific concentrations.	Site remediation activities will be planned to control the release of objectionable odors from the site so that the activities comply with the substantive requirements of this regulation.
Air	State Air Pollution Control - Control of Hazardous Air Pollutants (RCSA § 22a-174-29)	Applicable	This section establishes testing requirements and allowable stack concentrations for many specific substances.	Direct discharges to the air from the landfill gas collection and treatment system will be designed to meet the substantive requirements of these regulations so that the numeric criteria are not exceeded.
Air	State Air Pollution Control - Control of Particulate Emissions (RCSA § 22a-174-18)	Applicable	This subsection sets specific standards for particulate emissions. Specific standards that may apply particularly to the landfill include Fugitive Dust (18b), and Incineration (18c). Gas flares are regulated as incinerators.	Any activities involving excavation, landfill cap construction, or landfill gas flaring will be designed to meet with the substantive requirements of these regulations so that the numeric criteria are not exceeded.

TABLE 4-13 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
Air	State Air Pollution Control - Stationary Sources (RCSA § 22a-174-3)	Applicable	This regulation requires stationary sources of emissions to meet specified standards. Pollution abatement controls may be required. Specific standards are listed for many pollutants. Any landfill with potential emissions of any particular air pollutant including methane exceeding 5 tons per year may require an active gas collection systems with emissions controls under subsection 3(a)(1)(K).	Any landfill gas collection and treatment system required as part of the remedial action will be designed to meet with the substantive requirements of this regulations.
Air	State Air Pollution Control - Sulfur Compound Emissions (RCSA § 22a-174-19)	Applicable	This section regulates emission of sulfur compounds including sulfur dioxide and hydrogen sulfide. Subsection 19(a)(8) contains specific standards for sulfur compound emissions by gas flares.	Any landfill gas collection and treatment system will be designed to meet with the substantive requirements of this regulation.
Air	State Control of Noise Regulations (RCSA §§ 22a-69-1 to 7.4)	Applicable	These regulations establish allowable noise levels.	Noise levels from construction activities are exempt from these requirements. The remedial action shall be designed and constructed so that any noise emitted after construction will meet the substantive requirements of these regulations.
FEDERAL				
Water	Federal National Pollution Discharge Elimination System (NPDES) (40 CFR Parts 122-125)	Applicable	These standards govern the discharge of water into surface waters.	Collection and discharge of groundwater, including treatment if necessary, will be conducted in accordance with these requirements.

TABLE 4-13 (continued)
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
ACTION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
STATE				
Water	State Water Pollution Control (CGS § 22a-430)	Applicable	This section prohibits discharge to the waters of the State without meeting the substantive requirements of the State's Water Quality Standards. This section establishes requirements for many categories of discharges, including stormwater.	The proposed remedy may create stormwater runoff that may require treatment under CGS § 22a-430b. Any discharges, including stormwater, will meet the substantive requirements of this section, including treatment if necessary.
Water	State Connecticut Water Diversion Policy Act (CGS §§ 22a-365 to 378)	Applicable	These rules regulate many diversions of the waters of the State. Several broad categories are exempt, including any diversion of less than 50,000 gallons per day and any discharge permitted under CGS § 22a-430. Under Section 22a-373, the Commissioner may impose limitations and conditions including monitoring, schedule of diversion, etc. Under CGS § 22a-378, the Commissioner may temporarily suspend such requirements if a water supply emergency has been declared.	Any non-exempt diversion will be carried out in accordance with the substantive requirements of these statutes. The Navy will coordinate with the Connecticut Department of Environmental Protection to identify any such requirements and ensure that they are met.

TABLE 4-14
NAVAL SUBMARINE BASE-NEW LONDON SUPERFUND SITE
AREA A LANDFILL - ALTERNATIVE 2L-5
RCRA SUBTITLE C CAP WITH PCB HOT SPOT EXCAVATION/OFF-SITE DISPOSAL
LOCATION-SPECIFIC ARARs AND TBCs

Medium	Requirements	Status	Synopsis of Requirement	Action to be taken to Attain ARAR
FEDERAL				
Wetlands	**Federal** Executive Order on Protection of Wetlands (E.O. 11990, 40 CFR Part 6, App. A).	Applicable	Requires federal agencies to avoid impacts associated with the destruction or loss of wetlands, minimize potential harm, preserve and enhance wetlands, and avoid support of new construction in wetlands if a practicable alternative exists.	The landfill cap will be designed to minimize impacts to the adjacent wetlands. To the extent necessary, wetlands restoration and/or replication will be undertaken.
Wetlands	**Federal** Clean Water Act § 404 - Dredge and Fill Activities (40 CFR Part 230; 33 CFR Parts 320-328).	Applicable	Requires that for dredging or filling of wetlands: no practicable alternatives exist; the activity will not cause a violation of state water quality standards or significant degradation of the water; and adverse effects will be minimized.	The landfill cap will be designed to meet these standards and minimize impacts to the adjacent wetlands. To the extent necessary, wetlands restoration and/or replication will be undertaken.
STATE				
Surface Water and Wetlands	**State** - Inland Wetlands and Watercourses Regulations (RCSA §§ 22a-39-1 through 15).	Applicable	Regulates any operation within or use of a wetland or watercourse involving removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetland or watercourse.	The landfill cap and the dredging of waste materials will be designed to minimize impacts to the Area A Wetland. To the extent necessary, wetlands restoration and/or replication will be undertaken.
Surface Water and Wetlands	**State** - Inland Wetlands and Watercourses Act - General Requirements (CGS § 22a-45a)	TBC	This section governs minor activities including installation of water quality monitoring equipment such as staff gauges, water recording and water quality testing devices, and survey activities, including excavation of test pits and core sampling. The Commissioner may require implementation of best management practices. The Department is currently drafting these requirements, and expects to issue them before the final remedy is selected for this site.	Once regulations are adopted, any wells, test borings, soil sampling, or other similar activities will be conducted in accordance with the substantive requirements of these regulations, if any.

Since this alternative does not include treatment technologies, the contaminant mass or volume would not be destroyed or treated. Therefore, the toxicity and volume of the contaminated soils would remain unchanged. The mobility of contaminants would be reduced by the cap because erosion and infiltration would be prevented. Leaching of remaining contaminants from soils located above the water table due to infiltrating precipitation would be prevented. Wastes disposed in the off-site RCRA landfill would be contained and no longer be mobile.

The only process options used on site in this alternative to reduce hazards are containment technologies; therefore, treatment is not a principal element of this alternative.

4.6.6 Alternative 2L-5 Short-Term Effectiveness

No risks to the community would exist as a direct result of the implementation of this Off-Site RCRA Landfill alternative with the exception of the increased traffic due to the 15± trailer dump truck loads needed to transport the soil to an off-site landfill. This small increase in traffic should not be noticeable, since the Subase is along major traffic routes. Potential exposure of local residents and other than Subase personnel to the release of fugitive dusts from excavation and grading activities would be unlikely to occur because procedures would be implemented during construction to minimize fugitive dusts, air monitoring would be performed, and the distance to the nearest residential receptors is adequately long. Fugitive dust control procedures will consist of adding a dust suppressant to any very dry materials and providing a tarp over all transport vehicle containers. Routes and schedules will be detailed in the design documents for the selected alternative. The design documents will be made available for public review and comment.

Certain risks would always exist as part of any construction project. Improper or careless operations of equipment or failure to comply with construction safety codes could prove dangerous to workers. Improper handling of contaminated soils could result in increased risk for the worker. Potential exposure routes include ingestion and direct contact. All of these and other health and safety-related concerns would be discussed in the site-specific HASP, which is included as part of this alternative. All workers would be required to complete the OSHA 1910.120 40-hour hazardous materials course and participate in a health-monitoring program. The overall design of this alternative would include procedures to minimize any inherent risks, including a PPE program and decontamination program, air-monitoring fugitive dust control procedures, and frequent safety briefings.

This alternative contains some potential environmental impacts. Since soils are to be excavated and handled aboveground and surficial soils require grading, fugitive dust and erosion are potential concerns. Fugitive dusts can be minimized by use of dust suppressants, and erosion of soils would be minimized by the proper implementation of a soil and erosion control plan which would be required as part of this alternative.

This alternative can be completed in a short-time period (i.e., less than 13 months) and would be completely effective in meeting remedial action objectives after it is completed.

4.6.7 Alternative 2L-5 Implementability

No difficulties or uncertainties are expected in implementing this Off-Site RCRA Landfill alternative. This alternative involves only construction equipment, materials, and standard procedures. Technical problems are unlikely to occur and unlikely to cause scheduling delays.

Potential future remedial actions include measures to control contaminated groundwater. Potential process options include extraction wells, vertical barriers, and *in situ* techniques such as air sparging or biotreatment. These measures could be implemented after a cap has been installed. Care would have to be taken to protect the integrity of the existing cap.

Alternative 2L-5 would not require any significant coordination with environmental agencies with the exception of some coordination with the CTDEP Water Bureau regarding the discharge of clean upgradient groundwater to the wetlands, and with the CTDEP and EPA Waste Management Offices regarding solid waste closure requirements.

There is adequate capacity at existing off-site RCRA landfill facilities to manage all of the soils generated. No problems are expected in contracting services, since this alternative constitutes a relatively simple construction project, with the exception of the environmental concerns. No specialized equipment or materials are required. However, workers must have environmental experience and must have completed requirements stipulated by OSHA 1910.120. Many vendors are established and have acquired sufficient experience to complete this alternative, a competitive bid would be expected.

4.6.8 Alternative 2L-5 Cost

An estimate of the cost of this Off-Site RCRA Landfill alternative is presented in Table 4-15. The total cost of this alternative is estimated to be as follows:

Total capital cost:	$3,050,000
Total O&M cost:	1,774,000
Total cost (estimated present worth):	$4,824,000

A sensitivity analysis was performed to determine what effect changes in unit costs or quantities have on total costs. In particular, costs for which these parameters are uncertain were examined. The results in total price due to changes in key parameters are shown as follows.

Parameter	Base value	Sensitivity Range	Change in Total Cost
Cap Unit Cost and Cap Area	$3.50/sf and 566,280 sf	$2.50/sf & 392,090 sf to $5.00/sf & 566,280 sf	-26 to 22%
Disposal Unit Cost	$300/ton	$250/ton to $350/ton	-0.6% to 0.6%
Vol. Contaminated Soil	300 cy	250 cy to 450 cy	-0.6% to 1.8%

TABLE 4-15
DETAILED ALTERNATIVE COST ESTIMATE
AREA A LANDFILL - CONTAMINATED SOILS
ALTERNATIVE 2L-5, OFF-SITE RCRA LANDFILL

INPUT VARIABLES/ASSUMPTIONS	
Discount Rate (%) =	10%
Average # of years O & M =	30
Total volume insitu soil (cy) =	300
Total volume water (gal) =	0
Density of soil (ton/cy) =	1.50
Avg concentration of residual (%)=	1%
Moisture of soil (%) =	15%
# of recovery wells =	0
average pumping rate per well (gpm) =	0
surface area of containment barrier (sf) =	566280

		CAPITAL COSTS				OPERATION & MAINTENANCE COSTS				
CATEGORY/DESCRIPTION	COMMENTS	QUANTITY	UNITS	UNIT COST	TOTAL	QUANT/YR	UNITS	UNIT COST	YRS	PW TOTAL
SOIL/SEDIMENT										
Limited action - no action, access restriction	Deed Restrictions	1	LS	1000	$1,000				30	$0
	Fencing	0	LF	13.00	$0	2500	LF	1.30	30.00	$33,887
Containment - horizontal barrier, vertical barrier	Surface Cap	566280	SF	3.50	$1,981,980	566280	SF	0.0125	30	$73,807
surface water control	Site Grading and Storm Water Mgmt.	2600	LF	60.00	$156,000	2600	LF	0.30	30	$8,133
Removal - excavation	Backhoe	300	CY	8.00	$2,400				30	$0
Disposal - offsite - RCRA chemical landfill	Includes transportation, disposal and	450	TON	300.00	$135,000				30	$0
	stabilization				$0				30	$0
Groundwater monitoring					$0				30	$0
Subsurface drainage trench		1800	LF	40.00	$72,000				30	$0
Gas venting trench		2225	LF	15.00	$33,375				30	$0
Groundwater monitoring					$0	1	LS	125000.00	30	$1,303,364
Above ground Treatment - biological, physical/chemical thermal					$0				30	$0
Disposal - onsite/offsite					$0				30	$0
					$0				30	$0
INTERMEDIATE										
Residual Treatment/Disposal - onsite/offsite - biological, physical/chemical, thermal					$0				30	$0
Dewatering - filter press, centrifuge, drying bed, pumping					$0				30	$0
Trucking - onsite, offsite					$0				30	$0
Onsite containment (wastewater/soil) - lagoon, modu-tank, eq tank, berm, liner					$0				30	$0
Backfill - procure, place	Dozer	450	CY	10	$4,500				30	$0
					$0				30	$0
SUBTOTAL 1					$2,386,255					$1,419,192
OTHER										
Site Prep - office, utilities		1	LS	1000	$1,000					
Mob/Demob - process equipment,	0 % of subtotal 1				$0					
Mob/Demob - construction equipment, workers		1	LS	2000	$2,000					
Treatability study	0 % of subtotal 1				$0					
Site Restoration - grading, seeding		1	LS	1000	$1,000					
Other - health & safety, decon, project management, sampling & testing, travel & expenses		1	LS	50000	$50,000					
SUBTOTAL					$2,440,255					$1,419,192
SUBTOTAL 2 (CAPITAL + O&M)										
Engineering Administration	10 % of Subtotal 2				$244,026					$141,919
Contingencies	15 % of Subtotal 2				$366,038					$212,879
TOTAL					$3,050,319					$1,773,990

TOTAL COST ESTIMATE OF THIS ALTERNATIVE INCLUDING CAPITAL AND O&M COSTS **$4,824,308**

PRESENT WORTH TOTAL (INCLUDES YEAR ZERO) = ((QUANT/YR*UNIT COST)*(1-(1+DISCOUNT RATE)^-(YRS)))/DISCOUNT RATE)+(QUANT/YR*UNIT COST)

If all of the above values vary to the low and high end of the range simultaneously, the total cost would range from -28% to 25%, or $3,492,000 to $6,014,000.

5.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

In this section, the four alternatives on which a detailed analysis was conducted are evaluated in comparison to each other and with respect to each of the nine evaluation criteria. The purpose of comparative analysis is therefore to identify the relative advantages and disadvantages of each alternative. For this reason, the analysis focuses on the differences or distinctions among the alternatives rather than discussing commonalities in detail. This "differentiated" approach allows for a clearer evaluation of the unique advantages/disadvantages of each alternative, rather than emphasizing elements that do not affect the final selection of a preferred alternative. Table 5-1 provides a brief comparison of the four alternatives based on the nine screening criteria. Each criterion is discussed in greater detail in the following subsections.

5.1 Overall Protection of Human Health and the Environment

Alternative 2L-1, No Action, provides the least protection of human health and the environment because it does not provide any protection. Protection provided by the other three alternatives are similar, since the cap portion is a major component of all three alternatives. The greatest overall protection is provided by Alternative 2L-4, Off-Site Incineration, due to the complete elimination of the source areas and ultimate destruction of contaminants. Alternative 2L-5, Off-Site RCRA Landfill, provides equal overall protection on site; however, ultimately the contaminated soils would be contained in the off-site landfill rather than being destroyed by incineration. Alternative 2L-3, Cap, does not remove nor treat the PCB hot spots, thereby providing somewhat less protection.

5.2 Compliance with ARARs

Alternative 2L-1, No Action, does not comply with ARARs concerning closure of hazardous waste disposal areas. The other three alternatives fully comply with ARARs. It should be noted again that this FFS, which addresses contaminated soils at the Area A Landfill site, was not developed to address groundwater or surface water. However, Alternative 2L-3, Cap, Alternative 2L-4, Off-Site Incineration, and Alternative 2L-5, Off-Site RCRA Landfill, all of which include a cap, would minimize the migration of residual contaminants from the unsaturated zone to groundwater. Alternative 2L-4, Off-Site Incineration, and Alternative 2L-5, Off-Site RCRA Landfill, also remove/treat PCB hot spots which would further reduce the potential for contaminant migration to groundwater and surface water. These two alternatives (2L-4 and 2L-5) are equally effective in this respect. Overall, there will be improvements to groundwater quality. However, these improvements may be limited due to the contamination which would remain in the saturated zone. Again, there were no remedial response objectives for groundwater at the Area A Landfill site within the scope of this FFS.

TABLE 5-1
COMPARATIVE ANALYSIS SUMMARY
AREA A LANDFILL

Assessment Factors	Alternative 2L-1 No Action	Alternative 2L-3 Cap	Alternative 2L-4 Off-Site Incineration	Alternative 2L-5 Off-Site RCRA Landfill
1. Overall Protection of Human Health and the Environment	No significant reduction in risk.	Eliminates risk due to direct contact and ingestion/inhalation. Prevents erosion and infiltration.	Eliminates risk due to direct contact and ingestion/inhalation and by removing hot spots protects future utility construction workers. Prevents erosion and infiltration. Eliminates some contaminated material.	Eliminates risk due to direct contact and ingestion/inhalation and by removing hot spots protects future utility construction workers. Prevents erosion and infiltration. Eliminates some contaminated material.
2. Compliance with ARARs	The following ARARs are not met: - Federal and state RCRA hazardous waste disposal area closure standards ARARs for ground and surface water quality are not within the scope of this interim remedial action. This alternative does not improve water quality.	This alternative meets all ARARs. ARARs for ground and surface water quality are not within the scope of this interim remedial action. This alternative would improve water quality to the extent that infiltration is prevented.	This alternative meets all ARARs. ARARs for ground and surface water quality are not within the scope of this interim remedial action. This alternative would improve groundwater quality to the extent that some contaminated soils are removed and infiltration is prevented.	This alternative meets all ARARs. ARARs for ground and surface water quality are not within the scope of this interim remedial action. This alternative would improve groundwater quality to the extent that some contaminated soils are removed and infiltration is prevented.
3. Long-Term Effectiveness and Permanence • Magnitude of Residual Risk	No reduction in constituent concentrations in any media.	By preventing direct contact, risks to human health are prevented except for risks to potential future construction workers which are low.	By preventing direct contact, human health risks due to direct contact are eliminated and risks to future utility/construction workers are reduced to very low levels by removal of contaminated PCB hot spots.	By preventing direct contact, human health risks due to direct contact are eliminated and risks to future utility/construction workers are reduced to very low levels by removal of contaminated PCB hot spots.
• Adequacy and Reliability of Controls	No controls over remaining contamination.	Controls considered reliable and adequate, however if utility/ construction activities took place without adequate protection there would be potential health risks.	Controls considered reliable and adequate. Contaminated soil hot spots are removed thus long-term protection will be provided in these areas.	Controls considered reliable and adequate. Contaminated soil hot spots are removed thus long-term protection will be provided in these areas.
4. Reduction of Toxicity Mobility, or Volume	No reduction of toxicity, mobility or volume.	No reduction in toxicity or volume. Contaminants in unsaturated zone will be less mobile due to the reduced infiltration.	No reduction in toxicity or volume for the majority of landfill soils. Contaminants in the unsaturated zone will be less mobile due to the reduced infiltration. Soil hot spots will be eliminated, thereby reducing the total volume of contaminated materials on site. Ultimately, these soil hot spots will be incinerated, thereby destroying the PCBs which will result in a net reduction in toxicity.	No reduction in toxicity or volume for the majority of landfill soils. Contaminants in the unsaturated zone will be less mobile due to the reduced infiltration. Soil hot spots will be eliminated, thereby reducing the total volume of contaminated materials on site. Ultimately, these soil hot spots will be landfilled, therefore there is no net reduction in toxicity. However, mobility will be reduced at the off-site RCRA landfill.

TABLE 5-1 (continued)
COMPARATIVE ANALYSIS SUMMARY
AREA A LANDFILL

Assessment Factors	Alternative 2L-1 No Action	Alternative 2L-3 Cap	Alternative 2L-4 Off-Site Incineration	Alternative 2L-5 Off-Site RCRA Landfill
5. Short-Term Effectiveness • Time until protection is achieved	Not applicable.	Cap placed within 12 months.	Soils excavated and removed within 14 months.	Soils excavated and removed within 13 months.
• Protection of community during remedial action	Risks to community not increased, however, contaminants still have potential to migrate off site.	Potential for windblown dust during grading activities. Protection provided by use of dust suppressants.	Potential for windblown dust during grading and excavation activities. Protection provided by use of dust suppressants. Small potential for spills during transport.	Potential for windblown dust during grading and excavation activities. Protection provided by use of dust suppressants. Small potential for spills during transport.
• Protection of workers during remedial action	Not applicable.	Protection from ingestion, direct contact, and inhalation of soil provided by proper health and safety procedures.	Protection from ingestion, direct contact, and inhalations of soil provided by proper health and safety procedures.	Protection from ingestion, direct contact, and inhalations of soil provided by proper health and safety procedures.
6. Implementability • Technical feasibility	No activities to implement.	Cover installation easy to implement.	Cover installation and removal activities easy to implement.	Cover installation and removal activities easy to implement.
• Administrative feasibility	No approval necessary.	Some coordination required with hazardous waste agencies to ensure that cap and closure meet relevant and appropriate requirements and with water discharge agencies to ensure that the groundwater discharge to the wetlands meets substantive requirements.	Some coordination required with hazardous waste agencies to ensure that cap and closure meet relevant and appropriate requirements and with water discharge agencies to ensure that the groundwater discharge to the wetlands meets substantive requirements. Approvals required for disposition of PCB hot spots in the off-site incineration. No difficulties are anticipated.	Some coordination required with hazardous waste agencies to ensure that cap and closure meet relevant and appropriate requirements and with water discharge agencies to ensure that the groundwater discharge to the wetlands meets substantive requirements. Approvals required for disposition of PCB hot spots in the off-site landfill. No difficulties are anticipated.
• Availability of services and materials	No services or material required.	Contractors and materials are locally available.	Contractors and materials are locally available. Off-site incineration capacity is available. Temporary capacity shortfalls are possible.	Contractors and materials are locally available. Adequate off-site landfill capacity is available.
7. Cost • Capital cost	$0	$2,834,000	$3,332,000	$3,050,000
• O&M (Present Worth) Costs	$0	$1,774,000	$1,774,000	$1,774,000
• Total Cost	$0	$4,608,000	$5,106,000	$4,824,000
8. State Acceptance	To be determined following state review.	To be determined following state review.	To be determined following state review.	To be determined following state review.
9. Community Acceptance	To be determined based on public comment.	To be determined based on public comment.	To be determined based on public comment.	To be determined based on public comment.

5.3 Long-Term Effectiveness and Permanence

Alternative 2L-1, No Action, is not effective in meeting this criterion. The other alternatives are effective in the long-term in that they include a cap which would provide long-term protection from risks to human health and minimize the post-closure escape of hazardous substances. A permanent solution on site regarding PCB hot spots is provided by Alternative 2L-4, Off-Site Incineration, and Alternative 2L-5, Off-Site RCRA Landfill. Alternatives 2L-4 and 2L-5 provide a permanent solution on site; however, the contaminated materials are ultimately landfilled in Alternative 2L-5, whereas in Alternative 2L-4 contaminants are ultimately destroyed by incineration. Although the contaminants are destroyed by incineration in alternative 2L-4, the treated soil or ash will ultimately be disposed in a secure landfill.

The containment and long-term monitoring provided for PCB hot spots by the off-site RCRA landfill is probably superior to the containment that would be provided on site in comparing alternatives 2L-3 and 2L-5.

5.4 Reduction of Toxicity, Mobility, or Volume

Alternative 2L-1, No Action, does nothing with respect to the reduction of toxicity, mobility, or volume. The other three alternatives reduce the mobility of contaminants in the unsaturated zone due to their common impervious cover. Alternative 2L-4, Off-Site Incineration, and Alternative 2L-5, Off-Site RCRA Landfill, substantially reduce the toxicity, mobility, and volume of on-site PCB hot spots by removing them. Ultimately, however, in Alternative 2L-5, Off-Site RCRA Landfill, there is no net reduction in toxicity or volume since these materials would be disposed in an off-site RCRA landfill. There is a reduction in mobility because materials would be contained in the off-site RCRA landfill. Alternative 2L-4, Off-Site Incineration, permanently destroys the organic contaminants in the source materials. However, the treated soils or ash are still disposed in a secure landfill.

5.5 Short-Term Effectiveness

This criterion is not applicable to Alternative 2L-1, No Action. All of the other alternatives can provide protection in a relatively short time. All of the other alternatives (excluding the No Action alternative) present potential short-term risks to the community due to windblown dust and to workers due to exposure to contaminants. However, these risks can be controlled easily by use of dust suppressants and the implementation of a health and safety plan. In these regards, Alternatives 2L-4 and 2L-5 present slightly more risk than Alternative 2L-3 due to a greater amount of material handling. In addition, Alternatives 2L-4 and 2L-5 present a small risk due to spillage of materials during shipment to the off-site landfill or incinerator.

5.6 Implementability

Alternatives 2L-1, No Action; Alternative 2L-3, Cap; Alternative 2L-4, Off-Site Incineration; and Alternative 2L-5, Off-Site RCRA Landfill, are all relatively easy to implement

with no difficulties anticipated. Alternative 2L-4, Off-Site Incineration, may be somewhat more difficult to implement due to the capacity of off-site incinerators to handle bulk soils.

5.7 Cost

Costs range from $0 for Alternative 2L-1, No Action, to a high of $2,064,000 for Alternative 2L-4, Off-Site Incineration. The most uncertainty regarding costs is also associated with Alternative 2L-4, Off-Site Incineration, as vendor costs vary more than for land disposal. The costs for Alternatives 2L-3, Cap, and Alternative 2L-5, Off-Site RCRA Landfill, can be estimated with greater certainty. The total estimated present worth of Alternative 2L-3, Cap, and Alternative 2L-5, Off-Site RCRA Landfill, relative to Alternative 2L-4, Off-Site Incineration (the highest), are as follows:

Alternative	Cost	Relative % Difference Compared to Alternative 2L-4: Off-Site Incineration
2L-4: Off-Site Incineration	$5,106,000	0%
2L-5: Off-Site Landfill	$4,824,000	6%
2L-3: Cap	$4,608,000	10%

5.8 State Acceptance

The State Acceptance criteria will be addressed in the Record of Decision (ROD) associated with this FFS.

5.9 Community Acceptance

The Community Acceptance criteria will also be addressed in the ROD associated with this FFS.

5.10 Summary

In comparing the four alternatives, two of them provide superior overall protection of human health and the environment, namely Alternative 2L-4, Off-Site Incineration, and Alternative 2L-5, Off-Site RCRA Landfill. The primary advantage offered by Alternative 2L-4, Off-Site Incineration, is that it removes and permanently destroys the organic contamination in the soils. Alternative 2L-5, Off-Site RCRA Landfill, is slightly easier to implement, is somewhat more cost-effective, and provides the same human health risk protection on site.

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APPENDIX A

PHASE I DATA FOR AREA A LANDFILL

PREFACE TO APPENDIX A

This appendix contains copies of sections of the final Phase I RI (Atlantic, 1992) containing analytical results for soils and groundwater and borings logs for Area A Landfill. References to table numbers and figures, therefore refer to tables and figures in the Phase I RI not the Focused Feasibility Study for Area A Landfill.

LABORATORY ANALYTICAL DATA QUALIFIERS	
Organic Data Qualifier Flags	
ND	None Detected.
J	The "J" flag indicates an estimated value due to validation requirements or when the data indicates the presence of a compound that meets identification criteria, but the quantitated value is less then the CRQL.
B	The "B" flag indicates that the analyte was found in the associated blank as well as in the sample.
D	The "D" flag indicates that the sample was diluted due to high concentrations.
E	The "E" flag indicates compound concentrations that exceed the calibration range of the GC/MS instrument.
X or Y	The "X" or "Y" flag indicates that the compound values have been edited on a laboratory data system.
R	The "R" flag indicates that the result is rejected based on validation guidelines.
Inorganic Data Qualifier Flags	
ND	None Detected.
J	The "J" flag indicates an estimated value due to laboratory or data validation requirements.
B	The "B" flag indicates that the reported value is less than the CRDL, but greater than the IDL (Instrument Detection Limit).
R	The "R" flag indicates that the result is rejected based on validation guidelines.

TABLE 4-20
AREA A LANDFILL
SUMMARY OF SURFACE SOIL ANALYTICAL DATA (ORGANICS)

PARAMETER	TBC DIRECT[1] EXPOSURE INDUSTRIAL	TBC POLLUTANT MOBILITY GA	SAMPLE ID:	2LSS1	2LSS2
TCL VOLATILE ORGANICS (ppb)					
Methylene Chloride	760,000	100		ND	3 J
2-Butanone	1,000,000	8,000		ND	2 J
Trichloroethene	520,000	100		ND	2 J
Tetrachloroethene	110,000	100		ND	4 J
Chlorobenzene	1,000,000	2,000		4500	43 J
Ethylbenzene	1,000,000	2,600		14000	2 J
Xylene (total)	1,000,000	1,400		75000 Y	4 JY
Total Volatile Organics				93500	60
TCL SEMI-VOLATILE ORGANICS (ppb)					
Noncarcinogenic PAH					
Phenanthrene	2,500,000	4,000		66 J	ND
Fluoranthene	2,500,000	5,600		160 J	ND
Pyrene	2,500,000	4,000		110 J	1100 J
Total Noncarcinogenic PAH				336	1100
Probable Carcinogenic PAH					
Benzo(a)anthracene	7,800	660		130 J	ND
Chrysene	--	--		160 J	ND
Benzo(b)fluoranthene	7,800	660		220 J	ND
Benzo(k)fluoranthene	7,800	660		96 JY	ND
Total Probable Carcinogenic PAH				606	
TCL PESTCIDES/PCBs (ppb)					
44'DDT	500 (USEPA)			71 XJ	2300 DJ
Endrin Ketone				ND	570 D
Aroclor 1260	10,000(USEPA)/2,000(CTDEP)			350 XJ	12000 DX
TCLP PESTCIDES (ppb)					
TCLP Pesticides	--			ND	ND

NOTES:

[1] CTDEP Direct Exposure Criteria for Soil: Industrial/Commercial Criteria Draft December 1994.

[2] CTDEP Pollutant Mobility Criteria for Soil: GA Mobility Criteria.

a) ARARs/TBC indicates applicable or relevant and appropriate requirements; TBC indicates to be considered values (refer to Section 4.2 for further explanation). Shaded numbers exceed TBC values.

b) Assigned letters adjacent to numerical values are data qualifiers. Refer to Section 2.11 for further explanation.

c) ppb indicates a concentration of parts per billion; ppm is parts per million.

d) ND means not detected, less than detection limit. Refer to Section 2.2 for further explanation. NA indicates not analyzed.

e) Only the parameters detected are listed above, all others were not detected.

TABLE 4-21
AREA A LANDFILL
SUMMARY OF SURFACE SOIL ANALYTICAL DATA (INORGANICS)

PARAMETER	BACKGROUND	SAMPLE ID:	2LSS1	2LSS2
TAL INORGANICS (ppm)				
Aluminum	17,600		6160	5910
Antimony	2.05		ND R	ND R
Arsenic	3.6		2 B	1.1 B
Barium	57.2		56.4	53.7
Beryllium	0.72		1.5 J	0.53 BJ
Cadmium	0.24		4.4	3.9
Calcium	499		1900	1610
Chromium	21.5		21.2	15.6
Cobalt	8		8.1 B	5.6 B
Copper	25.6		120	56.7 J
Iron	17200		12800	11800
Lead	17.5		85.7	36.2
Magnesium	3650		2160	1990
Manganese	188		151	136
Mercury	0.05		ND	ND
Nickel	10		29.8	26.7
Potassium	2580		935 BJ	1050 BJ
Selenium	0.8		0.47 BJ	0.36 BJ
Silver	0.385		ND	ND
Sodium	41		204 J	170 BJ
Thallium	0.29		ND BJ	ND
Vanadium	35.1		19.7	23.9
Zinc	31.3		299	128
Boron	5.8		ND	ND
Cyanide	--		ND	ND
TCLP METALS (ppm)				
PARAMETER	TBC			
Arsenic	0.05		ND	ND
Barium	1		0.37 J	0.27 J
Cadmium	0.005		0.037	0.0077
Chromium	0.05		ND	ND
Lead	0.015		ND	ND
Mercury	0.002		ND	ND
Selenium	0.036		0.006 J	0.002 J
Silver	0.036		ND R	ND R

NOTES:

1) ARARs/TBC indicates applicable or relevant and appropriate requirements; TBC indicates to be considered values (refer to Sections 4.2 and 4.3 for further explanation). Shaded numbers exceed TBC or background values.

2) Assigned letters adjacent to numerical values are data qualifiers. Refer to Section 2.11 for further explanation.

3) ppb indicates a concentration of parts per billion; ppm is parts per million.

4) ND means not detected, less than detection limit. Refer to Section 2.2 for further explanation. NA indicates not analyzed.

TABLE 4-22
AREA A LANDFILL
SUMMARY OF SUBSURFACE SOIL ANALYTICAL DATA (ORGANICS)

PARAMETER	TBC DIRECT EXPOSURE INDUSTRIAL	TBC POLLUTANT MOBILITY GA	SAMPLE ID: DEPTH (ft):	2LMW7S 7-10	2LMW8S 6-10	2LMW9S 0-4	2LMW9S 2-8	2LMW13S 2-4	2LMW13S 6-8	2LMW14S 5-7	2LMW17S 0-2	2LMW17S 4-8	2LMW18S 0-2	2LMW18S 2-6	2LTB2 2-8
TCL VOLATILE ORGANICS (ppb)															
Methylene Chloride	76,000	100		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1 J	ND
Acetone	1,000,000	14,000		ND	ND	ND	ND	96 B	70 B	ND	ND	ND	ND	58 B	250 J
Carbon Disulfide	--	--		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5 J	ND
Trichloroethene	520,000	100		ND	ND	ND	ND	ND	ND	2 J	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	100,000	10		ND	ND	ND	ND	ND	ND	11	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone	--	--		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12	ND
1,1,2,2 Tetrachloroethane	29,000	10		ND	ND	ND	ND	ND	ND	22	ND	ND	ND	ND	ND
Toluene	1,000,000	8,700		ND	11 BJ	ND	ND	ND	ND	ND	ND	ND	ND	ND	6 J
Ethylbenzene	1,000,000	2,600		ND	ND	ND	ND	ND	ND	ND	ND	29	ND	15	68 J
Xylene (total)	1,000,000	1,400		ND	ND	ND	ND	ND	ND	ND	4 J	200 Y	ND	180 Y	690 JY
Total Volatile Organics					11			96	70	35	4	229		271	1014
TCL SEMI-VOLATILE ORGANICS (ppb)															
Noncarcinogenic PAH															
Naphthalene	2,500,000	5,600		ND	120 J	ND	ND	ND	ND	ND	ND	ND	ND	360 J	ND
2-Methylnaphthalene	--	--		ND	53 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	1300 J
Acenaphthene	--	--		ND	50 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluorene	2,500,000	5,600		ND	130 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	2,500,000	4,000		140 J	680	390 J	380 J	ND	ND	ND	ND	ND	76 J	780 J	860 J
Anthracene	2,500,000	40,000		ND	260 J	ND	ND	ND	ND	ND	ND	ND	ND	230 J	ND
Fluoranthene	2,500,000	56,000		170 J	780	670 J	600 J	ND	ND	ND	49 J	ND	120 J	940 J	ND
Pyrene	2,500,000	4,000		200 J	550	970 J	680 J	ND	ND	ND	57 J	ND	140 J	820 J	ND
Total Noncarcinogenic PAH				510	2623	2030	1660				106		336	3130	2160
Probable Carcinogenic PAH															
Benzo(a)anthracene	7,800	660		99 J	290 J	570 J	490 J	ND	ND	ND	ND	ND	97 J	370 J	ND
Chrysene	--	--		100 J	380 J	460 J	460 J	ND	ND	ND	37 J	ND	120 J	350 J	ND
Benzo(b)fluoranthene	7,800	660		70 JY	260 JY	ND	280 JY	ND	ND	ND	ND	ND	130 JY	ND	ND
Benzo(k)fluoranthene	7,800	660		120 JY	210 JY	ND	560 JY	ND	ND	ND	57 JY	ND	84 JY	ND	ND
Benzo(a)pyrene	780	660		ND	250 J	ND	ND	ND	ND	ND	46 J	ND	ND	310 J	ND
Benzo(g,h,i)perylene	--	--		ND	ND	ND	ND	ND	ND	ND	44 J	ND	ND	ND	ND
Total Probable Carcinogenic PAH				389	1390	1030	1790				184		431	1030	

TABLE 4-22 (continued)
AREA A LANDFILL
SUMMARY OF SUBSURFACE SOIL ANALYTICAL DATA (ORGANICS)

PARAMETER	TBC DIRECT EXPOSURE INDUSTRIAL	TBC POLLUTANT MOBILITY GA	SAMPLE ID: / DEPTH (ft):	2LMW7S 7-10	2LMW8S 6-10	2LMW9S 0-4	2LMW9S 2-8	2LMW13S 2-4	2LMW13S 6-8	2LMW14S 5-7	2LMW17S 0-2	2LMW17S 4-8	2LMW18S 0-2	2LMW18S 2-6	2LTB2 2-8
Phthalates															
bis(2-ethylhexyl)phthalate	410,000	660		ND	990	ND	1900 B	ND	ND	78 J	ND	ND	390	1500 J	ND
Di-n-butylphthalate	1,000,000	14,000		76 J	ND	ND	ND	ND	ND	ND	61 J	ND	ND	ND	ND
Other Semi-Volatile Organics															
Dibenzofuran	--			ND	83 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCL PESTICIDES/PCBs (ppb)															
4,4'-DDE	--			16 JX	ND	ND	ND	ND	ND	ND	ND	ND	ND	24 XJ	ND
4,4'-DDD	--			190 X	190 XJ	ND	ND	ND	ND	ND	ND	ND	ND	24 XJ	ND
4,4'-DDT	500			47 JX	ND	ND	ND	ND	ND	ND	ND	ND	21 XJ	83 XJ	ND
TCLP PESTICIDES (ppb)															
TCLP Pesticides	--			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

NOTES:

1) ARARs/TBC indicates applicable or relevant and appropriate requirements; TBC indicates to be considered values (refer to Section 4.2 for further explanation). Shaded numbers exceed TBC values.

2) Assigned letters adjacent to numerical values are data qualifiers. Refer to Section 2.11 for further explanation.

3) ppb indicates a concentration of parts per billion; ppm is parts per million.

4) ND means not detected, less than detection limit. Refer to Section 2.2 for further explanation. NA indicates not analyzed.

5) Only the parameters detected are listed above, all others were not detected.

TABLE 4-23
AREA A LANDFILL
SUMMARY OF SUBSURFACE SOIL ANALYTICAL DATA (INORGANICS)

PARAMETER	BACK-GROUND	SAMPLE ID: DEPTH (ft):	2LMW7S 7-10	2LMW8S 6-10	2LMW9S 0-4	2LMW9S 2-8	2LMW13S 2-4	2LMW13S 6-8	2LMW14S 5-7	2LMW17S 0-2	2LMW17S 4-8	2LMW18S 0-2	2LMW18S 2-6	2LTB2 2-8
TAL INORGANICS (ppm)														
Aluminum	17,600		4450	9680 J	7020	6470	12700	15100	13300 J	8710	6740	6670	7790	7470
Antimony	2.05		ND J	ND R	ND	ND J	ND J	ND J	ND R	ND J	ND J	ND J	ND J	ND J
Arsenic	3.6		1.2 B	8 J	2.2	1.9 B	3.9	3.3	4.6 J	1.8 B	2.7	3.7 J	1.9 JB	4.5
Barium	57.2		25.4 B	42.5 JB	62.3	47.2	43.5 B	47.2 B	18.4 JB	57.5	32.8 B	49	116	75.4
Beryllium	0.72		0.25 B	0.53 JB	3	1.2	0.54 B	0.62 B	0.54 JB	0.42 B	0.46 B	0.65 B	3.9	0.4 B
Cadmium	0.24		2.3	12.1 J	4.5	4.3	4.3	4.9	3.7 J	3.3	6.9	2.7	6.2	3.5
Calcium	499		2140	5800 J	1990	1650	1170 J	1410 J	856 JB	1320	971 B	1690 J	3680 J	1750
Chromium	21.5		8.8 J	40.2 J	15.7 J	19.6 J	19.8 J	22.7 J	18.9 J	14.4 J	17.3 J	16.2	31.2	17.5 J
Cobalt	8		4.3 B	8.5 JB	23.8	14.9	6.8 B	7.2 B	5.7 JB	6.5 B	ND	6.6 B	20.5	5.9 B
Copper	25.6		14.1 J	30 J	378	210	15.8 J	18.2 J	12.4 J	31.2 J	45.5 J	103 J	507 J	69.5 J
Iron	17,200		8370	49700 J	15200	12300	12600	13700	11500 J	10900	8260	9890 J	20000 J	12500
Lead	17.5		7.6 J	32.9 J	118 J	114 J	5.9 J	5.5 J	6.8 J	18.1 J	25.3 J	95.8 J	277 J	170 J
Magnesium	3,650		2550	5020 J	2970	2660	3410	3900	2460 J	3440	1740	2250 J	2310 J	2980
Manganese	188		109 J	332 J	228	241 J	133 J	157 J	74 J	144 J	101 J	132 J	288 J	149 J
Mercury	0.05		ND	ND	ND	ND	ND	ND	ND	ND	3.6	ND	0.47	ND
Nickel	10		9.6 J	24.9 J	76.2 J	44.6 J	13.2 J	14.2 J	12.4 J	15.6 J	12.4 J	36.3 J	159 J	15.4 J
Potassium	2,580		902 JB	2370 J	1120 J	782 JB	1420 J	1340 J	549 JB	1770 J	861 JB	1250	1230 B	2150 J
Selenium	0.8		ND	0.77 JB	ND	ND	ND	ND	ND J	ND	ND	ND	ND	ND
Silver	0.385		ND J	ND R	ND	ND J	3.1 J	ND	ND R	ND J	ND J	ND	ND	ND J
Sodium	41		220 JB	600 JB	306 JB	273 JB	115 JB	152 JB	110 JB	210 JB	211 JB	108 JB	427 JB	268 JB
Thallium	0.29		ND	ND J	ND	ND	ND	ND	ND J	ND	ND	ND	ND	ND
Vanadium	35.1		16.2	30.6 J	19.6	17.4	28.3	33	24.9 J	24.4	13.9	36.2	24.5	20.7
Zinc	31.3		30 J	229 J	1480 J	902 J	45.5 J	50 J	27.5 J	75.6 J	93.8 J	349 J	2640 J	149 J
Boron	5.8		41 R	1882 R	45 JR	52 R	ND R	56 JR	50 R	43 R	45 R	50 R	130 R	44 R
Cyanide	--		ND	ND J	ND	ND	ND	ND	ND J	ND	ND	ND	ND	ND
TCLP METALS (ppm)														
PARAMETER	**TBC**													
Arsenic	0.05		0.21 J	0.008	ND	0.3 J	0.2	0.19	0.004	0.18 J	0.19 J	0.19 J	ND	0.26 J
Barium	1		0.3 J	0.14 J	0.29 J	0.32 J	0.23	0.22	0.16 J	0.35 J	0.34 J	0.25	0.3	0.34 J
Cadmium	0.005		0.005 J	ND	0.019 J	0.034 J	ND	ND	ND	0.0089 J	0.065 J	ND	0.018	0.031 J
Chromium	0.05		ND	0.012 J	ND	0.035 J	ND	ND	ND	0.01 J	0.014 J	ND	ND	0.029 J
Lead	0.015		ND	0.007 J	0.17 J	0.84 J	ND	ND	0.004 J	ND	ND	0.22 J	0.3 J	0.56 J
Mercury	0.002		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	0.036		0.1 J	ND	ND	0.23 J	0.11 J	0.12 J	0.003	ND	ND	ND	ND	0.14 J
Silver	0.036		ND	0.01 J	ND	0.042 J	ND J	ND J	0.01 J	ND	ND	ND J	ND J	0.011 J

NOTES:

1) ARARs/TBC indicates applicable or relevant and appropriate requirements; TBC indicates to be considered values (refer to Section 4.2 for further explanation). Shaded numbers exceed TBC or background values.

2) Assigned letters adjacent to numerical values are data qualifiers. Refer to Section 2.11 for further explanation.

3) ppb indicates a concentration of parts per billion; ppm is parts per million.

4) ND means not detected, less than detection limit. Refer to Section 2.2 for further explanation.

TABLE 4-24
AREA A WETLANDS
SUMMARY OF SUBSURFACE SOIL ANALYTICAL DATA (ORGANICS)

PARAMETER	TBC DIRECT EXPOSURE INDUSTRIAL	TBC POLLUTANT MOBILITY GA	SAMPLE ID: DEPTH (ft):	2WMW2S 0-2	2WMW3S 10-12	2WMW3S 16-18	2WMW4S 0-2	2WMW5S 0-2	2WMW5S 4-6	2WMW5S 10-12	2WMW5S 13	2WMW6S 2-4	2WTB1 8-10	2WTB1 10-12
TCL VOLATILE ORGANICS (ppb)														
Methylene Chloride	760,000	100		ND	ND	ND	ND	ND J	2 J	ND	ND	ND	ND	ND
Acetone	1,000,000	14,000		ND	ND	70	ND	ND J	130	300 J	230	74	78 B	93 B
Carbon Disulfide	--	--		ND	ND	37	ND	ND J	23 X	32 X	4 J	15	13 J	17 J
2-Butanone	1,000,000	8,000		ND	ND	ND	ND	ND J	ND	71 J	40	ND	ND	ND
Trichloroethene	520,000	100		ND	ND	ND	ND	ND J	ND	ND	ND	ND	ND	ND
Tetrachloroethene	110,000	100		ND	ND	ND	ND	3 J	ND	ND	ND	3 J	ND	ND
Benzene	200,000	20		ND	ND	ND	ND	ND J	ND	ND	3 JX	ND	ND	ND
Total Volatile Organics						107		3	155	403	277	92	91	110
TCL SEMI-VOLATILE ORGANICS (ppb)														
Noncarcinogenic PAH														
Acenapthylene	2,500,000	8,400		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	2,500,000	4,000		120	ND	ND	ND	130 J	ND	ND	ND	ND	ND	ND
Anthracene	2,500,000	40,000		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	2,500,000	56,000		160	ND	3 J	ND	180 J	90 J	120 J	ND	460 J	ND	ND
Pyrene	2,500,000	4,000		150	ND	8 J	ND	320 J	83 J	120 J	ND	360 J	ND	69 J
Total Noncarcinogenic PAH				430		11		630	173	240		820		69
Probable Carcinogenic PAH														
Benzo(a)anthracene	7,800	660		83 J	ND	ND	ND	160 J	120 J	ND	ND	370 J	ND	ND
Chrysene	--	--		110 J	ND	ND	ND	230 J	60 J	ND	ND	330 J	ND	ND
Benzo(b)fluoranthene	7,800	660		74 JY	ND	ND	ND	180 JY	110 JY	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	7,800	660		71 JY	ND	ND	ND	120 JY	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	780	660		81 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	--	--		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Probable Carcinogenic PAH				419				690	290			700		
Phthalates														
bis(2-ethylhexyl)phthalate	410,000	660		ND	ND	ND	35 J	790	ND	290 J	1500	ND	120 J	130 J
Other Semi-Volatile Organics														
Benzoic Acid	--			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCL PESTICIDES/PCBs (ppb)														
4,4'DDE	--	--		ND	ND	ND	ND	ND	ND	ND	ND J	ND J	ND J	ND
4,4'DDD	--	--		ND	ND	ND	ND	ND	ND	ND	ND J	ND J	ND J	ND
4,4'DDT	500 (EPA)			ND	ND	ND	ND	ND	ND	ND	ND J	ND J	ND J	ND
PCB Aroclor-1260	2,000			ND	ND	ND	50 JX	ND	ND	ND	ND J	ND J	ND J	ND
TCLP PESTICIDES (ppb)														
TCLP Pesticides	--			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4-24 (continued)
AREA A WETLANDS
SUMMARY OF SUBSURFACE SOIL ANALYTICAL DATA (ORGANICS)

PARAMETER	TBC DIRECT EXPOSURE INDUSTRIAL	TBC POLLUTANT MOBILITY GA	SAMPLE ID: DEPTH (ft):	2WTB1 15-17	2WTB1 20-22	2WTB2 0-2	2WTB2 4-6	2WTB2 10-12	2WTB2 15-17	2WTB2 20-22	2WTB3 4-6	2WTB3 10-12	2WTB3 15-17	2WTB3 20-22
TCL VOLATILE ORGANICS (ppb)														
Methylene Chloride	460,000	100		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	1,000,000	14,000		27 B	66 J	ND	89 B	71 B	ND	98 B	ND	350 BE	ND	ND
Carbon Disulfide	--			37 J	25 J	ND	42	32	4 J	33	23	15	16	9
2-Butanone	1,000,000	8,000		ND	ND	ND	ND	16 J	10 J	20 J	ND	17 BJ	12 JX	ND
Trichloroethene	520,000	100		ND	12 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	110,000	100		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	200,000	20		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Volatile Organics				64	103		131	119	14	151	23	382	28	9
TCL SEMI-VOLATILE ORGANICS (ppb)														
Noncarcinogenic PAH														
Acenapthylene	2,500,000	8,460		ND	ND	ND	ND	ND J	ND	ND	ND	ND	ND	ND
Phenanthrene	2,500,000	4,000		ND	85 J	ND	ND	ND J	69 J	ND	85 J	120 J	ND	67 J
Anthracene	2,500,000	40,000		ND	ND	ND	ND	ND J	ND	ND	ND	ND	ND	ND
Fluoranthene	2,500,000	56,000		81 J	170 J	460 J	ND	ND J	110 J	72 J	130 J	170 J	68 J	120 J
Pyrene	2,500,000	4,000		120 J	270 J	380 BJ	70 BJ	ND J	130 BJ	84 BJ	250 J	370 J	99 J	190 J
Total Noncarcinogenic PAH				201	525	840	70		309	156	465	660	167	377
Probable Carcinogenic PAH														
Benzo(a)anthracene	7,800	660		ND	130 J	400 J	ND	ND J	83 J	64 J	120 J	170 J	ND	ND
Chrysene	--			ND	140 J	ND	ND	ND J	81 J	62 J	150 J	220 J	ND	ND
Benzo(b)fluoranthene	7,800	660		ND	110 JY	ND	ND	ND J	90 JY	ND	ND	190 JY	ND	ND
Benzo(k)fluoranthene	7,800	660		ND	130 JY	ND	ND	ND J	89 JY	80 JY	ND	130 JY	ND	ND
Benzo(a)pyrene	780	660		ND	ND	ND	ND	ND J	ND	ND	ND	180 J	ND	ND
Indeno(1,2,3-cd)pyrene	--			ND	ND	ND	ND	ND J	ND	ND	ND	ND	ND	ND
Total Probable Carcinogenic PAH					510	400			343	206	270	890		
Phthalates														
bis(2-ethylhexyl)phthalate	410,000	660		180 J	ND	ND	ND	130 J	130 BJ	1700 B	510 J	280 J	210 J	ND
Other Semi-Volatile Organics														
Benzoic Acid	--			ND	ND	ND	ND	ND J	ND	ND	ND	ND	ND	ND
TCL PESTICIDES/PCBs (ppb)														
4,4'DDE	--			ND J	ND J	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'DDD	--			ND J	ND J	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'DDT	500			ND J	ND J	ND	ND	ND	ND	ND	ND	ND	ND	ND
PCB Aroclor-1260	2,000			ND J	ND J	370 JX	ND	ND	ND	ND	ND	ND	ND	ND
TCLP PESTICIDES (ppb)														
TCLP Pesticides				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4-24 (continued)
AREA A WETLANDS
SUMMARY OF SUBSURFACE SOIL ANALYTICAL DATA (ORGANICS)

PARAMETER	TBC DIRECT EXPOSURE INDUSTRIAL	TBC POLLUTANT MOBILITY GA	SAMPLE ID:	2WTB4	2WTB6	2WTB6	2WTB6	2WTB6	2WTB7	2WTB7	2WTB7	2WTB8	2WTB8	2WTB8
			DEPTH (ft):	0-2	0-2	4-6	15-17	20-22	0-2	4-6	10-12	1-3	6-8	10-12
TCL VOLATILE ORGANICS (ppb)														
Methylene Chloride	760,000	100		ND	ND	ND	ND	ND	ND	ND	ND	4 J	ND	ND
Acetone	1,000,000	14,000		ND	540 BE	310 B	50 B	63	ND	320 EJ	ND	850 E	50	56 B
Carbon Disulfide	--			ND	6 J	6 J	10 J	27	ND	2 J	ND	8 J	15	14
2-Butanone	1,000,000	8,000		ND	87 B	ND	13 JX	ND	ND	70 J	ND	310	ND	14 BJ
Trichloroethene	520,000	100		4 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	110,000	100		ND	ND	ND	ND	ND	ND	ND	ND	7 J	ND	ND
Benzene	200,000	20		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Volatile Organics				4	633	316	73	90		392		1172	65	84
TCL SEMI-VOLATILE ORGANICS (ppb)														
Noncarcinogenic PAH														
Acenapthylene	2,500,000	5,700		77 J	ND	ND	ND	ND	ND	ND	ND	120 J	ND	ND
Phenanthrene	2,500,000	4,000		270 J	160 J	ND	76 J	ND	ND	62 J	ND	340 J	ND	ND
Anthracene	2,500,000	40,000		52 J	ND	ND	ND	ND	ND	ND	ND	79 J	ND	ND
Fluoranthene	2,500,000	56,000		310 J	300 J	ND	150 J	87 J	72 J	100 J	ND	600 J	110 J	120 J
Pyrene	2,500,000	4,000		460 J	270 J	60 J	180 BJ	84 BJ	98 J	140 J	ND	570 J	120 J	160 J
Total Noncarcinogenic PAH				1169	730	60	406	171	170	302		1709	230	280
Probable Carcinogenic PAH														
Benzo(a)anthracene	7,800	660		220 J	200 J	ND	120 J	67 J	ND	ND	ND	370 J	ND	ND
Chrysene	--			320 J	250 J	ND	110 J	81 J	ND	110 J	ND	600 J	ND	ND
Benzo(b)fluoranthene	7,800	660		220 JY	210 JY	ND	93 JY	ND	ND	140 JY	ND	550 JY	ND	ND
Benzo(k)fluoranthene	78,000	660		310 JY	250 JY	ND	170 JY	96 JY	ND	67 JY	ND	390 JY	ND	ND
Benzo(a)pyrene	780	660		230 J	190 J	ND	150 J	ND	ND	ND	ND	390 J	ND	ND
Indeno(1,2,3-cd)pyrene	--			ND	ND	ND	ND	ND	ND	ND	ND	270 J	ND	ND
Total Probable Carcinogenic PAH				1300	1100		643	244		317		2570		
Phthalates														
bis(2-ethylhexyl)phthalate	410,000	660		280 J	350 J	100 J	ND	73 BJ	ND	ND	ND	1300	130 J	500 J
Other Semi-Volatile Organics														
Benzoic Acid	--			160 J	130 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCL PESTICIDES/PCBs (ppb)														
4,4'DDE	--			32 XJ	ND J	ND J	ND	ND	ND	ND	ND	ND	ND	ND
4,4'DDD	--			ND J	69 XJ	ND J	ND	ND	ND	ND	ND	ND	ND	ND
4,4'DDT	500			ND J	ND R	ND J	ND	ND	ND	ND	ND	ND	ND	ND
PCB Aroclor-1260	2,000			ND J	ND J	ND J	ND	ND	ND	ND	ND	ND	ND	ND
TCLP PESTICIDES (ppb)														
TCLP Pesticides				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

NOTES:

1) ARARs/TBC indicates applicable or relevant and appropriate requirements; TBC indicates to be considered values (refer to Section 4.2 for further explanation). Shaded numbers exceed TBC values.
2) Assigned letters adjacent to numerical values are data qualifiers. Refer to Section 2.11 for further explanation.
3) ppb indicates a concentration of parts per billion; ppm is parts per million.
4) ND means not detected, less than detection limit. Refer to Section 2.2 for further explanation. NA indicates not analyzed.
5) Only the parameters detected are listed above, all others were not detected.

TABL -25
AREA A WETLANDS
SUMMARY OF SUBSURFACE SOIL ANALYTICAL DATA (INORGANICS)

PARAMETER	BACK-GROUND	SAMPLE ID: DEPTH (ft):	2WMW2S 0-2	2WMW3S 10-12	2WMW3S 16-18	2WMW4S 0-2	2WMW5S 0-2	2WMW5S 4-6	2WMW5S 10-12	2WMW5S 13	2WMW6S 2-4	2WTB1 8-10	2WTB1 10-12
TAL INORGANICS (ppm)													
Aluminum	17,600		13000	8300	16300	4810	11200 J	11700 J	14300 J	10500 J	14100	14500 J	12600 J
Antimony	2.05		ND J	ND J	ND	ND R	ND	ND	ND	ND	ND R	ND	ND
Arsenic	3.6		2.5	2.5	7.8	0.77 B	7 J	6.4 J	7.6 J	2.3 JB	7.7 J	6.8	9.1
Barium	57.2		53.3	58.4	49.3 B	27.4 B	45.7 B	37.9 B	48.4 B	31.4 JB	45.6 BJ	43.7 B	40.8 B
Beryllium	0.72		0.55 B	0.4 B	0.92 B	ND	1.2 JB	1.6 JB	1.9 J	1.2 JB	0.57 BJ	0.52 BJ	0.5 BJ
Cadmium	0.24		6.9	4.1	8.5	1.2	4.7	5.4	6.6	2.7	4.5 J	ND	ND
Calcium	499		1170 J	1630 J	3500 J	758 BJ	1230 JB	4180 J	3680 J	1190 JB	1450 BJ	5740	12900
Chromium	21.5		20.5 J	15.9 J	37.9 J	5.9 J	57.1	34.6	56.5	22.7	51 J	41.8	39
Cobalt	8		8.5 B	7 B	9.7 B	4.5 B	7.3 B	9.4 B	12.2 B	10.3 B	7 BJ	10.9 B	10.6 B
Copper	25.6		26.1 J	20.4 J	17.8 J	6.7 J	38.5	15.7	36	11.6	31.1 J	18.3 J	19.5 J
Iron	17,200		14200	11400	26800	6540	21500	21600	26100	10800	28000 J	26800	26100
Lead	17.5		16.3 J	4.8 J	10.3 J	3.6 J	38.5	12	34.4 J	7	298	13.2 J	13.6 J
Magnesium	3,650		4170	3560	7430	1660 J	5520	7370	7670	2910 J	5070	7740	7380
Manganese	188		195 J	190 J	311	121	160 J	287	365	202	176 J	312 J	305 J
Mercury	0.05		ND	ND	ND	ND	0.22	ND	0.19	ND	0.41 J	ND	ND
Nickel	10		25.3 J	15.8 J	31.3 J	4.4 B	14.7	21	26.9	8.8 B	16.1 J	22.1	19.8
Potassium	2,580		2130 J	2670 J	4280 J	1170	3180	3360	3670	1400	3010	4050	3830
Selenium	0.8		ND	ND	ND	ND J	0.7 B	ND	ND	ND	0.7 BJ	0.86 B	ND
Silver	0.385		ND	ND	ND	ND J	ND	ND	ND	ND	ND R	ND	ND
Sodium	41		118 JB	252 JB	5260	152 BJ	957 JB	4470 J	3090 J	1340 J	169 BJ	4750	4410
Thallium	0.29		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	35.1		33.2	21	43.3	9.8 B	48.9 J	50.1 J	59.7 J	30.5 J	42.4	39.9 J	37.6 J
Zinc	31.3		125 J	37.7 J	99.8 J	19.6 J	54.6 J	60.6 J	93.9 J	38.5 J	59.7 J	71 J	70.3 J
Boron	5.8		71 R	ND	2600 R	ND	530 JR	2200 R	2600 R	250 R	703 R	2720 R	2820 R
Cyanide	--		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCLP METALS (ppm)													
PARAMETER	TBC												
Arsenic	0.05		0.22	0.21	0.23	ND	ND	0.0087	0.0024	ND	ND	0.0099	0.0096
Barium	1		0.36	0.33	0.078	0.083	ND	0.051	0.12	0.093	ND	0.12	0.12
Cadmium	0.005		0.0063	ND	ND	ND	ND	ND	ND	0.016	ND	ND	ND
Chromium	0.05		ND	ND	ND	ND	0.04 J	0.038 J	0.038 J	0.063 J	ND	0.05 J	0.047 J
Lead	0.015		ND	ND	ND	ND	ND	0.0024 J	ND	0.0056 J	1.5	ND	ND
Mercury	0.002		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	0.036		0.16 J	ND	0.16 J	ND	0.0036 J	0.0045 J	0.0043 J	0.0051 J	ND	ND	ND
Silver	0.036		0.0092 J	ND J	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4-25 (continued)
AREA A WETLANDS
SUMMARY OF SUBSURFACE SOIL ANALYTICAL DATA (INORGANICS)

PARAMETER	BACK-GROUND	SAMPLE ID: DEPTH (ft):	2WTB1 15-17	2WTB1 20-22	2WTB2 0-2	2WTB2 4-6	2WTB2 10-12	2WTB2 15-17	2WTB2 20-22	2WTB3 4-6	2WTB3 10-12	2WTB3 15-17	2WTB3 20-22
TAL INORGANICS (ppm)													
Aluminum	17,600		13100 J	10600 J	14100 J	13800 J	14100 J	11800 J	11800 J	16600 J	20600 J	16800 J	12500 J
Antimony	2.05		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	3.6		7.9	6.1	6.7 J	7.1 J	ND	6.8 J	6.3 B	10.3 J	3.9 J	6.3 J	11.5 J
Barium	57.2		40 B	35.9 B	52.1 B	43.3 B	44.1 B	40.4 B	37.7 B	47.9 B	44.7 B	50.9 B	39.3 B
Beryllium	0.72		0.44 JB	0.36 BJ	1.8 J	1.9 J	1.9 J	1.6 BJ	1.6	1.8 JB	1.5 JB	1.7 JB	1.5 JB
Cadmium	0.24		ND	ND	6.9	6.5	6.4	5.5 J	5.5	6.5 J	6.1 J	6.6 J	5.4 J
Calcium	499		6540	5000	3300 J	4620	5090	5660	4900	4550	3620	5050	6790
Chromium	21.5		38.6	38.9	41.2	40.9	39.3	39.5	36.7	60.6	59.5	43	40.1
Cobalt	8		10 B	8.6 B	11.1 B	10.4 B	10.8 B	9.8 B	8.7 B	10 B	9.4 B	10.5 B	8.8 B
Copper	25.6		17 J	22 J	20.2	19.1	15.8	20.9	17.7	39.9	36.8	21.1	29.9
Iron	17,200		24500	21400	27200	24500	25800	22300	21700	24600	21000	24400	20500
Lead	17.5		14.7 J	18.3 J	11.2 J	11.8 J	10.2	14.3 J	12.9	15.3 J	33.7	15.8 J	17.2 J
Magnesium	3,650		7470	6600	7230	8660	8970	7790	7850	8520	7620	8580	7470
Manganese	188		286 J	241 J	306	327	343	282	283	316	262	333	264
Mercury	0.05		ND	ND	ND	ND	ND	ND	ND	1.1	0.23 J	ND	ND
Nickel	10		19.9	10.3 B	25.9	26	25.2	21.6	21.5	28.6	24.3	26.3	32.1
Potassium	2,580		3860	3340	3530	4010	4150	3520	3490	3850 J	3690 J	4490	3320 J
Selenium	0.8		0.78 B	0.83 B	ND	0.81 B	0.75 B	ND	ND	ND	ND	ND	ND
Silver	0.385		ND	ND	ND	4	ND	ND	ND	ND	31.8	3.1 B	ND
Sodium	41		7380	7530	2040 J	6700 J	9970 J	8540 J	8520 J	8920	9690	9390	9210
Thallium	0.29		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	35.1		36.7 J	33.3 J	57.9 J	54.7 J	58.7 J	50.3 J	51.1 J	56.8 J	49.8 J	57.5 J	46.3 J
Zinc	31.3		61.6 J	62.1 J	75.5 J	70.7 J	69.8 J	66.7 J	65.3 J	95.9 J	91.8 J	67.8 J	66.8 J
Boron	5.8		2460 R	2240 R	1600 R	2400 R	2700 R	2100 R	2000 R	2600 R	2300 R	2300 R	2200 R
Cyanide	--		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCLP METALS (ppm)													
PARAMETER	TBC												
Arsenic	0.05		0.012	0.0081	ND	ND	0.0064	0.01	0.012	0.22 J	0.35 J	0.41 J	0.26 J
Barium	1		0.13	0.097	0.67 J	0.14	0.12	0.14	0.13	ND	ND	0.046	ND
Cadmium	0.005		0.014 J	ND	0.023	0.015	0.014	0.015	0.014	ND	ND	ND	0.01
Chromium	0.05		0.049 J	0.043 J	0.075 J	0.077 J	0.045 J	0.079 J	0.066 J	ND	ND	ND	ND
Lead	0.015		ND	ND	ND	ND	0.0022 J	0.0099 J	ND	ND J	ND J	ND J	ND J
Mercury	0.002		ND	ND	ND	ND	ND	ND	ND	0.0006	0.00031	ND	ND
Selenium	0.036		ND	ND	0.0093 J	ND	0.0043 J	0.0056 J	ND	ND	0.15 J	0.23 J	0.17 J
Silver	0.036		ND	ND	ND	0.068	ND	ND	ND	0.13 J	0.38 J	0.011 J	0.0081 J

TABLE 4-2. ontinued)
AREA A WETLANDS
SUMMARY OF SUBSURFACE SOIL ANALYTICAL DATA (INORGANICS)

PARAMETER	BACK-GROUND	SAMPLE ID: DEPTH (ft):	2WTB4 0-2	2WTB6 0-2	2WTB6 4-6	2WTB6 15-17	2WTB6 20-22	2WTB7 0-2	2WTB7 4-6	2WTB7 10-12	2WTB8 1-3	2WTB8 6-8	2WTB8 10-12
TAL INORGANICS (ppm)													
Aluminum	17,600		15300 J	16800 J	12500 J	12000 J	10500 J	13900 J	14700 J	11900 J	17900 J	13300 J	26000 J
Antimony	2.05		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	3.6		8.7	8.4	8.5	7.1 J	6.7 J	7.2 J	5.9 J	7.8 J	6.8 J	5.2 J	2.2 J
Barium	57.2		61.3	60.7 B	39.2 B	41.5 B	37.3 B	49.3 B	43 B	38.7 B	93.8	42.4 B	78.8
Beryllium	0.72		ND	0.73 JB	0.44 JB	1.7 JB	1.6 JB	1.5 JB	1.6 JB	1.7 JB	1.8 JB	1.7 JB	1.9 J
Cadmium	0.24		ND	1.9 JB	ND	5.9 J	5	4.5	5.3	5.3	6.7 J	5.7 J	3.3 J
Calcium	499		1250 B	1660 B	4980	4820	6380	1590 JB	4380	6930	2360	6290	2130
Chromium	21.5		89	101	37.7	44.9	37.8	72.7	43.7	35.3	102	43.7	39.7
Cobalt	8		8.5 B	9.4 B	10.5 B	8.8 B	9 B	7.6 B	9 B	9 B	9.2 B	10 B	ND
Copper	25.6		47.6 J	64.1 J	16.7 J	25.9	21.2	35.4	24	15.4	55	24.5	10.2
Iron	17,200		30800	27100	24600	21600	20800	20200	21900	23600	27900	23100	8200
Lead	17.5		128 J	44 J	15.7 J	22.5	16.6	49.5 J	21.3	13.3	83.7	22.4	16 J
Magnesium	3,650		6130	6540	7210	7860	7550	6580	7690	7750	7840	7660	3400 J
Manganese	188		188 J	202 J	288 J	276	271	189	267	310	233	300	142
Mercury	0.05		0.69 J	ND	ND	ND	ND	0.38	ND	ND	0.67 J	ND	ND
Nickel	10		16.7	20.2	20	22.6	20.7	16.8	21	21.2	26.9	23.5	13.7
Potassium	2,580		4320	3680	3730	3590	3320	2680	3390	3470	4040 J	3410 J	2120 J
Selenium	0.8		1.2 B	1.5 B	0.75 B	0.79 B	0.74 B	ND	ND	ND	0.93 BJ	ND	0.72 JB
Silver	0.385		ND	ND	ND	3.7	ND	ND	ND	ND	4.5	6.6	ND
Sodium	41		232 JB	1570 JB	6240	9010 J	8810 J	1310 BJ	5650 J	4920 J	3150	5250	2380 J
Thallium	0.29		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	35.1		50.5 J	52 J	36 J	51.7 J	49.4 J	56.9 J	53 J	54 J	75 J	53.9 J	41.8 J
Zinc	31.3		60.8 J	74.9 J	64.8 J	69.6 J	61.5 J	59.5 J	66.2 J	61.7 J	62.9 J	71.5 J	44.8 J
Boron	5.8		672 R	563 JR	2440 R	2000 R	2100 R	170 JR	1700 R	2400 R	330 R	2200 R	160 R
Cyanide	--		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCLP METALS (ppm)													
PARAMETER	**TBC**												
Arsenic	0.05		ND	0.006	0.009	ND	0.012	ND	0.007	0.005	0.17 J	0.23 J	0.21 J
Barium	1		0.075 J	0.12	0.11	0.12	0.14	0.13 J	0.043	0.044	0.21	0.24	0.052
Cadmium	0.005		ND	0.016 J	0.014 J	0.016	0.015	0.015	0.014	0.016	ND	ND	0.008
Chromium	0.05		0.047 J	0.054 J	0.053 J	0.065 J	0.075 J	0.043 J	0.039 J	0.04 J	ND	ND	ND
Lead	0.015		ND	0.018 J	ND	ND	ND	ND	0.017 J	0.019 J	ND J	ND J	ND J
Mercury	0.002		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	0.036		ND	ND	ND	ND	ND	0.004 J	0.006 J	0.005 J	ND	ND	0.13 J
Silver	0.036		ND	0.07 J	ND	0.067	ND	ND	ND	ND	ND J	0.092 J	0.11 J

NOTES:

1) ARARs/TBC indicates applicable or relevant and appropriate requirements; TBC indicates to be considered values (refer to Sections 4.2 and 4.3 for further explanation). Shaded numbers exceed TBC or background values.

2) Assigned letters adjacent to numerical values are data qualifiers. Refer to Section 2.11 for further explanation.

3) ppb indicates a concentration of parts per billion; ppm is parts per million.

4) ND means not detected, less than detection limit. Refer to Section 2.2 for further explanation. NA indicates not analyzed.

TABLE 4-26
AREA A WETLANDS
SUMMARY OF SEDIMENT ANALYTICAL DATA (ORGANICS)

PARAMETER	TBC DIRECT EXPOSURE INDUSTRIAL	TBC POLLUTANT MOBILITY GA	SAMPLE ID:	2WSD1	2WSD2	2WSD3	2WSD4	2WSD5	2WSD6	2WSD7	2WSD8	2WSD9
TCL VOLATILE ORGANICS (ppb)												
Methylene Chloride	760,000	100		ND	ND	ND	10 J	3 J	10 J	ND	2 J	5 J
Acetone	1,000,000	14,000		210	130	230	ND	ND	240	720	190	ND
Carbon Disulfide	--			11	16	18 J	ND	ND	9 J	ND	15	ND
2-Butanone	1,000,000	8,000		140 J	100	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	520,000	100		ND	ND	ND	11 J	3 J	ND	ND	ND	6 J
Tetrachloroethene	110,000	100		ND	ND	ND	16 J	4 J	10 J	ND	ND	11 J
Total Volatile Organics				361	246	248	37	10	269	720	207	22
TCL SEMI-VOLATILE ORGANICS (ppb)												
Noncarcinogenic PAH												
Fluorene	2,500,000	5,600		ND	ND	ND	ND	ND	ND	ND	ND	1000 J
Phenanthrene	2,500,000	4,000		ND	ND	ND	ND	ND	ND	ND	440 J	36000
Anthracene	2,500,000	40,000		ND	ND	ND	ND	ND	ND	ND	ND	2400 J
Fluoranthene	2,500,000	56,000		970 J	ND	390 J	410 J	ND	ND	470 J	1300 J	80000
Pyrene	2,500,000	4,000		1300 J	ND	670 J	460 J	ND	470 J	610 J	1500 J	42000 J
Total Noncarcinogenic PAH				2270		1060	870		470	1080	3240	161400
Probable Carcinogenic PAH												
Benzo(a)anthracene	7,800	660		670 J	ND	ND	ND	ND	ND	ND	ND	27000
Chrysene	--			630 J	ND	ND	ND	ND	ND	ND	610 J	42000
Benzo(b)fluoranthene	7,800	660		380 JY	ND	ND	ND	ND	ND	ND	420 JY	55000 Y
Benzo(k)fluoranthene	78,000	660		480 JY	ND	ND	ND	ND	ND	ND	670 JY	45000 Y
Benzo(a)pyrene	780	660		ND	ND	ND	ND	ND	ND	ND	ND	35000
Indeno(1,2,3-cd)pyrene	--			ND	ND	ND	ND	ND	ND	ND	ND	23000
Benzo(g,h,i)perylene	--			ND	ND	ND	ND	ND	ND	ND	ND	23000
Total Probable Carcinogenic PAH				2160							1700	250000
Other Semi-Volatile Organics												
Benzoic Acid	--			ND	ND	ND	ND	ND	ND	780 J	ND	ND
Dibenzofuran	--			ND	ND	ND	ND	ND	ND	ND	ND	1000 J
TCL PESTICIDES/PCBs (ppb)												
44'DDE	--			36 XJ	40 XJ	ND J	ND J	ND J	ND J	ND J	ND J	ND J
44'DDD	--			140 XJ	ND J	ND J	ND J	ND J	ND J	ND J	ND J	ND J
44'DDT	500 (EPA)			ND J	ND J	57 XJ	ND J	ND J	ND J	ND J	ND J	ND J
TCLP PESTICIDES (ppb)												
TCLP Pesticides	--			ND	ND	ND	ND	ND	ND	ND	ND	ND

NOTES:

1) ARARs/TBC indicates applicable or relevant and appropriate requirements; TBC indicates to be considered values (refer to Section 4.2 for further explanation). Shaded numbers exceed TBC values.

2) Assigned letters adjacent to numerical values are data qualifiers. Refer to Section 2.11 for further explanation.

3) ppb indicates a concentration of parts per billion; ppm is parts per million.

4) ND means not detected, less than detection limit. Refer to Section 2.2 for further explanation. NA indicates not analyzed.

5) Only the parameters detected are listed above, all others were not detected.

TABLE 4-27
AREA A WETLANDS
SUMMARY OF SEDIMENT ANALYTICAL DATA (INORGANICS)

PARAMETER	BACKGROUND	SAMPLE ID:	2WSD1	2WSD2	2WSD3	2WSD4	2WSD5	2WSD6	2WSD7	2WSD8	2WSD9
TAL INORGANICS (ppm)											
Aluminum	17,600		18900	22200	18800	16600	14200	19300	17800	18300	20800
Antimony	2.05		ND R	ND R	ND R	ND R	ND R	ND R	ND R	ND R	ND R
Arsenic	3.6		9.2 J	9.5 J	9.5 J	10 J	8.5 J	10.5 J	13.9 J	8.1 J	11.8 J
Barium	57.2		55.6 B	64.6 B	56.6 B	56 B	53.6 B	59.9 B	59.7 B	64 B	72.8 B
Beryllium	0.72		0.91 B	1.1 B	0.88 B	0.44 B	0.39 B	0.81 B	0.51 B	0.84 B	0.85 B
Cadmium	0.24		4.2	4.8	5.3	3.8	3.7	3.5	3.5	5	6.1
Calcium	499		4670	4930	4220	1480 B	1090 BJ	2090	1830 B	6800	2160
Chromium	21.5		57.1	48.9	92.6	73.9	71.7	93.5	69.3	95.7	63.7
Cobalt	8		10.8 B	11.9 B	11.1 B	7.3 B	6.8 B	8.4 B	7.6 B	10.2 B	8.6 B
Copper	25.6		33 J	30.5 J	69.5 J	44.8 J	52.2 J	51.3 J	34.6 J	71.5	39.6 J
Iron	17,200		28100	31700	29700	26700	28300	22900	24100	25500	44000
Lead	17.5		51	21.3 J	46.1	56.8	48.1	69	37.8	69.2	241 J
Magnesium	3,650		7630	7870	7990	5950	5550	6700	6060	7300	5880
Manganese	188		352	365	341	193	166	210	193	278	357
Mercury	0.05		ND J	ND J	0.31 J	0.25 J	0.35 J	0.32 J	0.42 J	0.48 J	0.24 J
Nickel	10		26	28.2	27	17.8	16.7	19.9	17.6	24.2	21.2
Potassium	2,580		4390	4920	4280	4560	4160	3980	3790	4070	3310
Selenium	0.8		0.89 B	1.6 B	1.3 B	0.79 B	0.98 B	1.1 B	1.6 B	1.2 B	1.3 B
Silver	0.385		ND J	ND J	ND J	ND J	ND J	ND J	ND J	ND J	ND J
Sodium	41		3510	3290	6090	383 BJ	291 BJ	1150 BJ	464 BJ	6650	321 BJ
Thallium	0.29		ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	35.1		44.5	49.3	45.5	45.4	44.6	49.3	44.8	41	55.9
Zinc	31.3		90.6	126	127	63.2 J	58.1 J	57.6 J	51.5 J	124	109
Boron	5.8		4100 R	4000 R	4400 R	1200 R	1300 R	730 R	450 R	3600 R	490 R
Cyanide	--		ND	ND	ND	ND	ND	ND	ND	ND	3.2
TCLP METALS (ppm)											
PARAMETER	**TBC**										
Arsenic	0.05		ND	ND	ND	ND	ND	ND	ND	ND	ND
Barium	1		0.059	0.039	0.025	ND	ND	0.027	0.029	0.053	0.14
Cadmium	0.005		0.0023	0.0036	ND	0.0029	ND	ND	0.0036	ND	0.011
Chromium	0.05		0.007	0.035	0.0073	0.01	0.0073	0.013	0.01	0.019	0.01
Lead	0.015		ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	0.002		ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	0.036		ND	ND	ND	ND	ND	ND	ND	0.11	ND
Silver	0.036		0.007 J	0.012 J	ND R	ND R	0.0081 J	ND R	0.016 J	0.013 J	ND R

NOTES:

1) ARARs/TBC indicates applicable or relevant and appropriate requirements; TBC indicates to be considered values (refer to Sections 4.2 and 4.3 for further explanation). Shaded numbers exceed TBC or background values.

2) Assigned letters adjacent to numerical values are data qualifiers. Refer to Section 2.11 for further explanation.

3) ppb indicates a concentration of parts per billion; ppm is parts per million.

4) ND means not detected, less than detection limit. Refer to Section 2.2 for further explanation. NA indicates not analyzed.

TABLE 4-32
AREA A WETLANDS AND LANDFILL
SUMMARY OF GROUND WATER ANALYTICAL DATA (ORGANICS)

PARAMETER	ARARs/TBC	SAMPLE ID:	2LMW7S	2LMW7D	2LMW8S	2LMW8D	2LMW9S	2LMW9D	2LMW13D	2LMW14D	2LMW17S	2LMW17D
TCL VOLATILE ORGANICS (ppb)												
1,2 Dichloroethene	70 TBC	CTDEP	ND	ND	ND	ND	ND	ND	1 J	ND	ND	ND
Trichloroethene	5 ARAR	MCL	ND	ND	ND	ND	ND	ND	10	ND	ND	ND
Benzene	5 ARAR/1 TBC	MCL/CTDEP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.5 TBC	CTDEP	ND	ND	ND	ND	ND	ND	140	ND	ND	1 J
Chlorobenzene	100 TBC	CTDEP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	700 ARAR	MCL	ND	ND	2 J	ND	ND	ND	ND	ND	ND	ND
Xylene (total)	530 TBC/1000 ARAR	CTDEP/MCL	ND	ND	2 JY	ND	ND	ND	ND	ND	ND	ND
Total Volatile Organics					4				151			1
TCL SEMI-VOLATILE ORGANICS (ppb)												
Noncarcinogenic PAH												
Naphthalene	280 TBC	CTDEP	ND	ND	3 J	ND	6 J	ND	ND	ND	ND	ND
2-Methylnaphthalene	--		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Noncarcinogenic PAH					3		6					
Phthalates												
bis(2-ethylhexyl)phthalate	6 ARAR/2 TBC	MCL/CTDEP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Other Semi-Volatile Organics												
2-Chlorophenol	36 TBC	CTDEP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	600 ARAR	MCL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	75 ARAR/1.5TBC	MCL/CTDEP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	600 ARAR	MCL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methylphenol	--		ND	ND	ND	ND	7 J	ND	ND	ND	ND	ND
2,4-Dimethylphenol	--		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzoic Acid	--		ND	ND	ND	ND	4 J	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	70 ARAR	MCL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCL PESTICIDES/PCBs (ppb)												
Aroclor 1254	0.5 ARAR	MCL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 4-32 (continued)
AREA A WETLANDS AND LANDFILL
SUMMARY OF GROUND WATER ANALYTICAL DATA (ORGANICS)

PARAMETER	ARARs/TBC	SAMPLE ID:	2LMW18S	2LMW18D	2WMW1D	2WMW2D	2WMW3S	2WMW3D	2WMW4D	2WMW5S	2WMW6S	2WMW6D
TCL VOLATILE ORGANICS (ppb)												
1,2 Dichloroethene	70 TBC	MCL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	5 ARAR	MCL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	5 ARAR 1 TBC	MCL/CTDEP	10 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.5 TBC	CTDEP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	100 TBC	CTDEP	220	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	700 ARAR	PMCL	120	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene (total)	530 TBC/1000 ARAR	CTDEP/MCL	840 Y	ND	ND	ND	ND	ND	ND	1 JY	ND	ND
Total Volatile Organics			1190							1		
		TCL SEMI-VOLATILE ORGANICS (ppb)										
Noncarcinogenic PAH												
Naphthalene	280 TBC	CTDEP	15 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	--		3 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Noncarcinogenic PAH			18									
Phthalates												
bis(2-ethylhexyl)phthalate	6 ARAR/2 TBC	MCL/CTDEP	4 J	6 J	ND	ND	ND	ND	2 J	ND	ND	13
Other Semi-Volatile Organics												
2-Chlorophenol	36 TBC	CTDEP	4 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	600 ARAR	MCL	25 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	75 ARAR/1.5 TBC	MCL/CTDEP	99 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	600 ARAR	MCL	10 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methylphenol	--		15 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	--		19 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzoic Acid	--		ND	ND	ND	ND	ND	12 J	ND	ND	ND	ND
1,2,4-Trichlorobenzene	70 ARAR	MCL	67 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCL PESTICIDES/PCBs (ppb)												
Aroclor 1254	0.5 ARAR	MCL	150 X	ND	ND	ND	ND	ND	ND	ND	ND	ND

NOTES:

1) ARARs/TBC indicates applicable or relevant and appropriate requirements; TBC indicates to be considered values (refer to Section 4.2 for further explanation). Shaded numbers exceed ARAR/TBC values.

2) Assigned letters adjacent to numerical values are data qualifiers. Refer to Section 2.11 for further explanation.

3) ppb indicates a concentration of parts per billion; ppm is parts per million.

4) ND means not detected, less than detection limit. Refer to Section 2.2 for further explanation. NA indicates not analyzed.

5) Only the parameters detected are listed above, all others were not detected.

6) The acronym adjacent to the ARAR/TBC value indicates the source of the value. Refer to Table 4-2 or glossary for further explanation.

TABLE 4-33
AREA A WETLANDS AND LANDFILL
SUMMARY OF GROUND WATER ANALYTICAL DATA (INORGANICS AND RADIOLOGICAL)

PARAMETER	ARARs/TBC	SAMPLE ID:	2LMW7S	2LMW7D	2LMW8S	2LMW8D	2LMW9S	2LMW9D	2LMW13D	2LMW14D	2LMW17S	2LMW17D
TAL INORGANICS (ppb)												
Aluminum	200 TBC	SMCL	ND	ND	ND	ND	ND	ND	ND	35.8 B	54.3 B	ND
Antimony	6 ARAR	MCL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	50 ARAR	MCL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Barium	2000 ARAR/1000TBC	MCL/CTDEP	25 B	57.4 B	33.4 B	ND	112 B	62.9 B	33.4 B	32.9 B	18.5 B	31 B
Beryllium	2 TBC	CTDEP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5 ARAR	MCL	ND	3.8 BJ	3.8 B	ND	ND	ND	44.8 J	ND	ND	ND
Calcium	--		26000	13900	14100	33400	34700	24400	36100	18200	14300	18300
Chromium	100 ARAR/50TBC	MCL/CTDEP	11.5 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	--		5.3 B	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	1300 ARAR/250TBC	MCL/CTDEP	ND	6.1 BJ	7.1 BJ	6.2 BJ	ND	10.5 BJ	ND	15.1 BJ	ND	ND
Iron	300 TBC	SMCL	13600	28100	8360	41.9 BJ	13100	7580	3760 J	28.1 BJ	8620	13200
Lead	15 ARAR	MCL	8.5 J	ND J	3 B	3.8 B	ND J	ND J	ND	4.4 BJ	7.1 J	ND J
Magnesium	--		36200	4040 B	2440 B	2210 B	4040 B	29300	4510 B	2120 B	2970 B	3210 B
Manganese	50 TBC	SMCL	280	216	544	57.5 J	412	1030	408	595	323	286
Mercury	2 ARAR	MCL	ND J	ND	ND	ND	ND J	ND	ND	ND	ND J	ND
Nickel	100 TBC	CTDEP	16.8 BJ	21.1 BJ	ND	ND	22.6 BJ	23.1 BJ	21.7 BJ	ND	17.6 BJ	18.4 BJ
Potassium			16400	3290 B	3560 BJ	1420 BJ	4710 B	11800	1950 B	5830 J	1300 B	960 B
Selenium	50 ARAR/36TBC	MCL/CTDEP	2.9 B	ND	1 BJ	1 BJ	2.2 B	1.5 B	ND	ND	ND	ND
Silver	36	CTDEP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	28000 TBC	Notif. Level	365000	89200	12600	11400	160000	287000	26500	26500	10700	10600
Thallium	2 ARAR	MCL	ND R	ND	ND	ND	ND R	ND	ND	ND	ND R	ND
Vanadium	50 TBC	CTDEP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	2000 TBC	CTDEP	10.5 BJ	11 BJ	13.2 BJ	ND J	14.2 BJ	10.2 BJ	10.8 BJ	18.6 BJ	15.9 BJ	8.7 BJ
Boron	600 TBC	USEPA HA	1200 R	2100 R	1200 R	1200 R	1100 R	1300 R	5400 R	2500 R	1700 R	2300 R
Cyanide	200 ARAR/140TBC	MCL/CTDEP	ND J	ND	ND	ND J	ND J	ND	ND	ND J	ND J	ND
RADIOLOGICAL CONSTITUENTS (pCi/L)												
Gross Alpha	5	Screening Level	11	1.3	1.2	0	0.5	14.7	17.9	1.5	3.3	2.9
Gross Beta	50	Screening Level	20.9	6.6	3.7	2.9	6	18.8	24.1	11.6	1.8	4

TABLE 4-33 (continued)
AREA A WETLANDS AND LANDFILL
SUMMARY OF GROUND WATER ANALYTICAL DATA (INORGANICS AND RADIOLOGICAL)

PARAMETER	ARARs/TBC	SAMPLE ID:	2LMW18S	2LMW18D	2WMW1D	2WMW2D	2WMW3S	2WMW3D	2WMW4D	2WMW5S	2WMW6S	2WMW6D
TAL INORGANICS (ppb)												
Aluminum	200 TBC	SMCL	51.1 B	ND	ND	139 B	39.6 B	ND	ND	ND	2060	71.7 B
Antimony	6 ARAR	MCL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	50 ARAR	MCL	4.2 B	ND	ND	ND	7.6 B	ND	ND	ND	ND	ND
Barium	2000 ARAR/1000TBC	MCL/CTDEP	711	66.3 B	16 B	39 B	396	613	70.1 B	167 B	38 B	26.2 B
Beryllium	2 TBC	CTDEP	ND	ND	ND	ND	ND	ND	ND	ND	1 B	ND
Cadmium	5 ARAR	MCL	29.1	7.2	ND	ND	10.6	7.7 J	ND J	6.4	ND	ND
Calcium	--		54600	21000	9330	7530	67300	72200	28700	52300	18700	40500
Chromium	100 ARAR/50TBC	MCL/CTDEP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	--		11.4 B	ND	ND	ND	ND	ND	ND	12.1 B	14.3 B	ND
Copper	1300 ARAR/250TBC	MCL/CTDEP	ND	5.4 BJ	ND	ND	6.2 BJ	ND	ND	7.9 BJ	ND	5.5 BJ
Iron	300 TBC	SMCL	192000	36800	85.1 BJ	256 J	75400	62600	65.2 BJ	44800	3140	2310
Lead	15 ARAR	MCL	ND	ND	2.2 BJ	22.4 J	ND	ND J	ND R	ND	2.5 BJ	2 B
Magnesium	--		65900	4340 B	1400 B	1700 B	126000	108000	2850 B	50800	4350 B	8830
Manganese	50 TBC	SMCL	580	863	2.3 B	27.4	3200	3630	31.1	8130	648	673
Mercury	2 ARAR	MCL	ND	ND	ND	ND	ND	ND	ND J	ND	ND J	ND
Nickel	100 TBC	CTDEP	29.5 B	ND	23.4 BJ	20.6 BJ	ND	18.9 BJ	18.6 BJ	ND	39.7 BJ	ND
Potassium			47100	4350 BJ	1120 B	715 B	37100 BJ	26400	1170 B	17300 J	5510	8330 J
Selenium	50 ARAR/36TBC	MCL/CTDEP	2.9 BJ	ND	ND	ND	2.3 BJ	3.6 B	ND J	2.2 BJ	ND	ND
Silver	36	CTDEP	ND	ND	ND	ND	ND	ND	ND J	ND	ND	ND
Sodium	28000 TBC	Notif. Level	777000	27400	28900	40500	1360000	1140000	9020 J	654000	31200	94700
Thallium	2 ARAR	MCL	ND	ND	ND	ND	ND	ND	ND R	ND	ND R	ND
Vanadium	50 TBC	CTDEP	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	2000 TBC	CTDEP	600	12 BJ	20.2 J	62.1 J	15.3 BJ	16.1 BJ	15 BJ	12.4 BJ	136	21.1 J
Boron	600 TBC	USEPA HA	1000 R	2400 R	1300 R	1300 R	970 R	1500 R	1400 R	1600 R	7500 R	8100 R
Cyanide	200 ARAR/140TBC	MCL/CTDEP	ND	ND	ND J	ND J	ND	ND	ND J	ND	ND J	ND J
RADIOLOGICAL CONSTITUENTS (pCi/L)												
Gross Alpha	5	Screening Level	0	0	0	4.7	0	42.2	10.1	0	2.8	4.6
Gross Beta	50	Screening Level	56.3	3.7	2.5	3.8	40.2	51	4.4	15.8	4.4	12.4

NOTES:

1) ARARs/TBC indicates applicable or relevant and appropriate requirements; TBC indicates to be considered values (refer to Section 4.2 for further explanation). Shaded numbers exceed ARAR/TBC values.

2) Assigned letters adjacent to numerical values are data qualifiers. Refer to Section 2.11 for further explanation.

3) ppb indicates a concentration of parts per billion; ppm is parts per million.

4) ND means not detected, less than detection limit. Refer to Section 2.2 for further explanation. NA indicates not analyzed.

5) Radiological constituent values have an assigned +/- range due to sample interference.

TABLE 4-34
AREA A DOWNSTREAM AND OBDA
SUMMARY OF GROUND WATER ANALYTICAL DATA (ORGANICS)

PARAMETER	ARARs/TBC	SAMPLE ID:	2DMW10D	2DMW11S	2DMW11D	2DMW15D	2DMW16S	2DMW16D	3MW12S	3MW12D
TCL VOLATILE ORGANICS (ppb)										
1,2-Dichloroethene (total)	70 TBC	WQC	ND	ND	ND	ND	ND	13	ND	ND
Trichloroethene	5 ARAR	MCL	ND	ND	ND	ND	ND	17	ND	ND
1,1,2,2-Tetrachloroethane	0.5 TBC	CTDEP	ND	ND	ND	ND	ND	7	ND	ND
Total Volatile Organics								37		
TCL SEMI-VOLATILE ORGANICS (ppb)										
Phthalates										
bis(2-ethylhexyl)phthalate	2	CTDEP	4 J	ND	ND	ND	ND	ND	ND	ND
TCL PESTICIDES/PCBs (ppb)										
TCL Pesticides/PCBs	--		ND	ND	ND	ND	ND	ND	ND	ND

NOTES:

1) ARARs/TBC indicates applicable or relevant and appropriate requirements; TBC indicates to be considered values (refer to Section 4.2 for further explanation). Shaded numbers exceed ARAR/TBC values.

2) Assigned letters adjacent to numerical values are data qualifiers. Refer to Section 2.11 for further explanation.

3) ppb indicates a concentration of parts per billion; ppm is parts per million.

4) ND means not detected, less than detection limit. Refer to Section 2.2 for further explanation. NA indicates not analyzed.

5) Only the parameters detected are listed above, all others were not detected.

6) The acronym adjacent to the ARAR/TBC value indicates the source of the value. Refer to Table 4-2 or glossary for further explanation.

TABLE 4-35
AREA A DOWNSTREAM AND OBDA
SUMMARY OF GROUND WATER ANALYTICAL DATA (INORGANICS AND RADIOLOGICAL)

PARAMETER	ARARs/TBC	SAMPLE ID:	2DMW10D	2DMW11S	2DMW11D	2DMW15D	2DMW16S	2DMW16D	3MW12S	3MW12D
TAL INORGANICS (ppb)										
Aluminum	200 TBC	SMCL	ND J	ND	ND	44.5 BJ	ND	ND	ND	ND
Antimony	6 ARAR	MCL	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	50 ARAR	MCL	ND	ND	ND	ND	ND	ND	ND	ND
Barium	2000 ARAR/1000TBC	MCL/CTDEP	39.6 B	29.4 B	104 B	31.6 B	17.1 B	97.1 B	39.2 B	44.4 B
Beryllium	2 TBC	CTDEP	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	5 ARAR	MCL	ND	ND	ND	ND	ND	5.1	ND	16 J
Calcium	--		22300 J	41200	42400	7340	32400	196000	64900	69400
Chromium	100 ARAR/50TBC	MCL/CTDEP	ND	ND	ND	ND	ND	ND	ND	ND
Cobalt	--		ND	ND	ND	ND	ND	ND	14.1 B	16 B
Copper	1300 ARAR/250TBC	MCL/CTDEP	ND J	5 BJ	ND	ND	ND	6.3 B	ND	ND
Iron	300 TBC	SMCL	287 J	101 J	16900	83.4 BJ	669 J	11600	1580	7090
Lead	15 ARAR	MCL	ND J	ND	ND J	ND J	ND J	ND J	ND J	ND J
Magnesium	--		8960 J	15600	11400	3400 B	5260	28800	50900	52000
Manganese	50 TBC	SMCL	106 J	1150	2390	49.7	339	2190	6010	6770
Mercury	2 ARAR	MCL	ND	ND J	ND	ND	ND J	ND	ND J	ND
Nickel	100 TBC	CTDEP	20.7 BJ	15.2 BJ	19.2 BJ	19.2 BJ	20.5 BJ	33.4 BJ	19.7 BJ	24.2 BJ
Potassium			5000	7210	7780	4440 B	2520 B	12600	14300	14900
Selenium	50 ARAR/36TBC	MCL/CTDEP	ND	ND	ND	ND	ND	1.8 B	ND	2.5 B
Silver	36	CTDEP	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	28000 TBC	Notif. Level	88800	190000	194000	57200	44500	319000	478000	560000
Thallium	2 ARAR	MCL	ND	ND R	ND	ND	ND R	ND	ND R	ND
Vanadium	50 TBC	CTDEP	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	2000 TBC	CTDEP	8.1 BJ	6.7 BJ	6.1 BJ	4 BJ	22.8 J	23.3 J	14.4 BJ	10.4 BJ
Boron	600 TBC	USEPA HA	6900 JR	7500 R	1600 R	3400 R	2200 R	11000 R	11000 R	11000 R
Cyanide	200 ARAR/140TBC	MCL/CTDEP	ND	ND J	ND	ND	ND J	ND J	ND J	ND
RADIOLOGICAL CONSTITUENTS (pCi/L)										
Gross Alpha	5	Screening Level	3.1	18.5	8.9	2.1	0.2	1.5	25.7	29.3
Gross Beta	50	Screening Level	7.5	7.7	18.3	5.6	5.1	32.8	2.8	34.1

NOTES:

1) ARARs/TBC indicates applicable or relevant and appropriate requirements; TBC indicates to be considered values (refer to Section 4.2 for further explanation). Shaded numbers exceed ARAR/TBC values.

2) Assigned letters adjacent to numerical values are data qualifiers. Refer to Section 2.11 for further explanation.

3) ppb indicates a concentration of parts per billion; ppm is parts per million.

4) ND means not detected, less than detection limit. Refer to Section 2.2 for further explanation. NA indicates not analyzed.

5) Radiological constituent values have an assigned +/- range due to sample interference.

6) The acronym adjacent to the ARAR/TBC value indicates the source of the value. Refer to Table 4-2 or glossary for further explanation.

AREA A

BORING LOG 2W TB 1

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 9/05/90
DATA COMPLETED: 9/05/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 67.5
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 75', PARTLY CLOUDY
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	WOH 1	0	NA	WATER AND ROOTS	0					NA	NA			0.0	
2-4	WOH	0	NA	NO RECOVERY						NA	NA			2.0	
4-6	WOH	0	NA		5					NA	NA				
6-8	WOH	0	NA							NA	NA				
8-10	WOH	30	1.0	Dark grey, SILT and CLAY, trace fine sand, trace shell fragments, wet, DREDGE SPOIL						0	30			8.0	
10-12	WOH	100	1.0		10					0	30			12.0	
				AUGER TO 15.0 feet											
15-17	WOH 1 1 1	100	12.0	Dark grey, SILT and CLAY, trace fine sand, trace shell fragments, wet, DREDGE SPOIL	15					0	30			15.0	
				AUGER TO 20.0 feet										17.0	
20-22		100	17.0	Dark grey, SILT and CLAY, trace fine sand, trace shell fragments, wet, DREDGE SPOIL	20					0	30			20.0	

ATLANTIC

BORING LOG 2W TB 1

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 9/05/90
DATA COMPLETED: 9/05/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 67.5
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 75°, PARTLY CLOUDY
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
20-22					21									22.0	
				AUGER TO 25.0 feet											
25-27		100	8.0	Grading to little clay, little sand	26					0	30			25.0	
				AUGER TO 30.0 feet										27.0	
30-32		100	1.0	Dark grey, SILT, little clay, little sand, trace shell fragments, wet, DREDGE SPOIL	31					0	30			30.0	
				Dark brown, organic SILT and CLAY, trace fine sand, trace roots, TOP SOIL										31.7	
				END BORING AT 32.0 feet										32.0	
					36										
					41										

ATLANTIC

BORING LOG 2W TB 2

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 9/06/90
DATA COMPLETED: 9/06/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 68.2
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 70°, FOGGY
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	WOH 1	100	0.4	Red brown, organic silt, some roots, moist	0	■				1	40	■		0.0	
				Dark grey, SILT and CLAY, trace fine sand, trace shell fragments, wet, DREDGE SPOIL										1.0	
2-4	WOH	100	0.6							1	30				
4-6	WOH	100	1.0		5					1	50	■			
				AUGER TO 10.0 feet										6.0	
10-12	WOH 1 1	100	3.0	Dark grey, SILT and CLAY, trace fine sand, trace shell fragments, wet, DREDGE SPOIL	10					1	50	■		10.0	
				AUGER TO 15.0 feet										12.0	
15-17	WOH 1 1	100	3.00	Dark grey, SILT and CLAY, trace fine sand, trace shell fragments, wet, DREDGE SPOIL	15					1	50	■		15.0	
				AUGER TO 20.0 feet										17.0	
20-22	WOH WOH 1 1	100	19.0	Dark grey, SILT and CLAY, trace fine sand, trace shell fragments, wet, DREDGE SPOIL	20					1	50	■		20.0	

ATLANTIC

BORING LOG 2W TB 2

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 9/06/90
DATA COMPLETED: 9/06/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 68.2
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 70°, FOGGY
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
20-22	WOH WOH 1 1				21									22.0	
				AUGER TO 25.0 feet											
25-27	WOH WOH 2 1	100	7.0	Dark grey, SILT and CLAY, trace fine sand, trace shell fragments, wet, DREDGE SPOIL	26					1	40			25.0	
				AUGER TO 30.0 feet										27.0	
30-32	WOH 3 3	100	1.0	Dark grey, SILT, little clay, little sand, trace shell fragments, wet, DREDGE SPOIL	31					1	40			30.0	
				Dark brown, organic SILT and CLAY, trace fine sand, trace roots, TOP SOIL										31.6	
				Grey, fine SAND and SILT, trace clay, wet,										31.9	
				END BORING AT 32.0 feet										32.0	
					36										
					41										

ATLANTIC

BORING LOG 2W TB 3

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 8/31/90
DATA COMPLETED: 8/31/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 71.9
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 85°, HAZY, HUMID
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	11 11	0	NA	ALL ROOTS AND WATER	0					NA	NA			0.0	
2-4	WOH	0	NA							NA	NA				
4-6	WOH	100	0.6	Grey, SILT and CLAY, trace fine sand, trace shell fragments, wet, DREDGE SPOIL	5					0	30				
				AUGER TO 10.0 feet										6.0	
10-12	WOH	100	14.0	Grey, SILT and CLAY, little fine sand, trace shell fragments, wet, DREDGE SPOIL	10					0	30			10.0	
				AUGER TO 15.0 feet										12.0	
15-17	WOH	100	8.0	Grey, SILT and CLAY, little fine sand, trace shell fragments, wet, DREDGE SPOIL	15					0	30			15.0	
				AUGER TO 20.0 feet										17.0	
20-22	11 11	100	10.0	Grey, SILT and CLAY, little fine sand, trace shell fragments, wet, DREDGE SPOIL	20					0	30			20.0	

ATLANTIC

BORING LOG 2W TB 3

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 8/31/90
DATA COMPLETED: 8/31/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 71.9
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 85°, HAZY, HUMID
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
20-22	11 11				21										
				AUGER TO 25.0 feet										22.0	
25-27	11 10 60	100	NA	Grey, SILT and CLAY, little fine sand, trace shell fragments, wet, DREDGE SPOIL	26					NA	NA			25.0 26.0	
				Dark brown, organic SILT and CLAY, trace fine sand, trace roots, wet, TOP SOIL										26.3	
				Grey, fine SAND and SILT, trace clay, wet,										27.0	
				END BORING AT 27.0 feet											
					31										
					36										
					41										

ATLANTIC

BORING LOG 2W TB 4

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 9/06/90
DATA COMPLETED: 9/06/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 83.5
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 80°, HAZY, HUMID
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	6 100/4	40	0.2	Dark brown, organic SILT and CLAY, trace fine sand, trace roots, damp, TOP SOIL	0	■				0	30	■		0.0	
				Grey, fine SAND and SILT, trace clay, damp										0.3	
				AUGER REFUSAL AT 0.83 feet.										0.83	
					5										
					10										
					15										
					20										

ATLANTIC

BORING LOG 2W TB 6

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 9/06/90
DATA COMPLETED: 9/06/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 70.3
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 80°, HAZY, HUMID
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					0									0.0	
0-2	WOH 1 1	50	0.2	Dark brown, ORGANIC SILT and ROOTS, wet Grey, SILT and CLAY, trace fine sand, trace shell fragments, wet, DREDGE SPOIL						1	30			0.3	
2-4	WOH	100	0.2							1	30				
4-6	WOH	100	7.0	Grey, SILT and CLAY, little fine sand, trace shell fragments, wet, DREDGE SPOIL	5					1	50				
				AUGER TO 10.0 feet										6.0	
10-12	WOH	0	NA	NO RECOVERY	10					NA	NA			10.0	
12-14	WOH 1 1 1	0	NA							NA	NA				
				AUGER TO 15.0 feet										14.0	
15-17	WOH 1	100	5.0	Grey, SILT and CLAY, little fine sand, trace shell fragments, wet, DREDGE SPOIL	15					1	40			15.0	
				AUGER TO 20.0 feet										17.0	
20-22	WOH 1 1 1	100	5.0	Grey, SILT and CLAY, little fine sand, trace shell fragments, wet, DREDGE SPOIL	20					1	40			20.0	

ATLANTIC

BORING LOG 2W TB 6

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 9/06/90
DATA COMPLETED: 9/06/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 70.3
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 80°, HAZY, HUMID
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
20-22	WOH 1 11				21										
				AUGER TO 25.0 feet										22.0	
25-27	22 100/3	40	0.2	Grey, SILT and CLAY, little fine sand, trace shell fragments, wet, DREDGE SPOIL, end of spoon had weathered rock.	26					1	40			25.0 25.7	
				AUGER REFUSAL AT 25.7 feet											
					31										
					36										
					41										

ATLANTIC

BORING LOG 2W TB 7

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 9/05/90
DATA COMPLETED: 9/05/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 77.0
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 65°, PARTLY CLOUDY
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	WOH 11	90	0.2	Dark brown, ORGANIC SILT and ROOTS, moist	0					1	30			0.0	
				Grey brown, SILT and CLAY, trace fine sand, mottled, moist, DREDGE SPOIL										0.4	
2-4	11 11	80	2.0	Grey brown, SILT and CLAY, trace fine sand, trace shell fragments, moist, DREDGE SPOIL						1	30				
4-6	WOH WOH 11	100	1.0	Grey, SILT and CLAY, trace fine sand, trace shell fragments, wet, DREDGE SPOIL	5					1	30				
				AUGER TO 10.0 feet										6.0	
10-12	WOH 1	100	0.2	Grey, SILT and CLAY, trace fine sand, trace shell fragments, wet DREDGE SPOIL	10					1	30			10.0	
				AUGER TO 13.5 feet										12.0	
13.5-15.5	100/2	100	0.2	Grey, SILT and CLAY, trace fine sand, trace shell fragments, wet DREDGE SPOIL						1	30			13.5	
				AUGER REFUSAL AT 13.7 feet	15									13.7	
					20										

ATLANTIC

BORING LOG 2W TB 8

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 8/30/90
DATA COMPLETED: 8/30/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 79.8
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 85°, HAZY, HOT AND HUMID
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	2 1 1 1	0	NA	ROOTS, NO SOIL RECOVERY	0	■				NA	NA	■		0.0 1.0	
2-4	WOH	30	1			■				0	30	■			
4-6	WOH 1 1	0	NA		5	■				NA	NA				
6-8	1 1 WOH WOH	100	2.0	Grey, SILT and CLAY, trace fine sand, trace shell fragments,wet, DREDGE SPOIL		■				0	30	■	⊠	6.0	
	AUGER			AUGER TO 10.0 feet		■								8.0	
10-12	WOH WOH 1 2	100	1.0	Grey, SILT and CLAY, trace fine sand, trace shell fragments,wet, DREDGE SPOIL	10	■				0	30	■	⊠	10.0	
12-14	2 4 8 9	75	0.8	Dark brown, organic SILT and CLAY, trace fine sand, trace roots, TOP SOIL Grey, fine SAND and SILT, trace clay, wet		■				0	30	■	▨ ▨	11.5 11.7 12.0	
				Grey, fine SAND, some silt, wet END OF BORING AT 14.0 feet		■						■		14.0	
					15										
					20										

ATLANTIC

BORING LOG 2W MW 1S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/24/90
DATA COMPLETED: 08/24/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 128.05
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 70°, PARTLY CLOUDY
INSPECTOR: MICHAEL NEJDL AND ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	4 8 11 11	85	0.1	Brown, fine to coarse SAND and GRAVEL, trace silt, damp	0					0	40			0.0	
2-4	11 14 32 100/6	100	0.0	Red-brown, fine SAND and SILT, trace gravel, damp						0	60			2.0	
4-6	100/1	0	NA	AUGER REFUSAL AT 4.0 feet, no water encountered, no well installed	5					NA	NA			4.0	
					10										
					15										
					20										

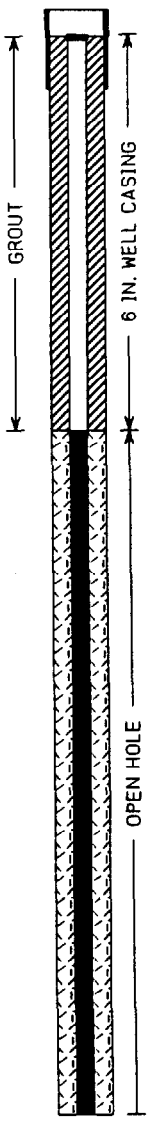
ATLANTIC

BORING LOG 2W MW 1D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/28/90
DATA COMPLETED: 09/06/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 128.05
PROTECTIVE CASING ELEVATION: 127.58
WELL ELEVATION: 127.58
WATER LEVEL: 10.88 (03/21/91)
DATUM: SUBASE
WEATHER: 70°, SUNNY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				NOT SAMPLED	0									0.0	
				BEDROCK										3.00	
					5										
					10										
					15										
					20										



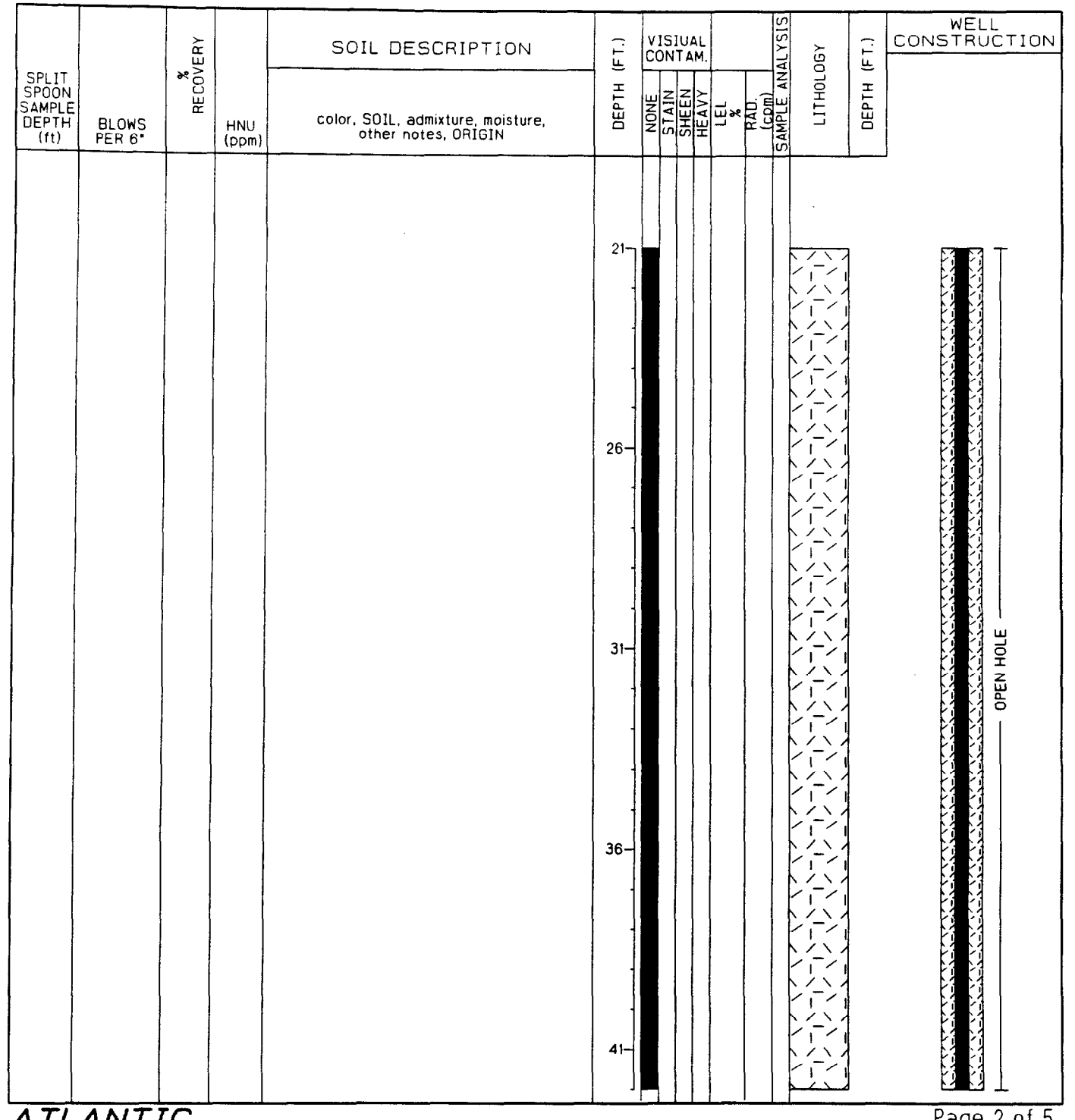
ATLANTIC

BORING LOG 2W MW 1D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/28/90
DATA COMPLETED: 09/06/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 128.05
PROTECTIVE CASING ELEVATION: 127.58
WELL ELEVATION: 127.58
WATER LEVEL: 10.88 (03/21/91)
DATUM: SUBASE
WEATHER: 70°, SUNNY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
					26										
					31										OPEN HOLE
					36										
					41										



ATLANTIC

BORING LOG 2W MW 1D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/28/90
DATA COMPLETED: 09/06/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 128.05
PROTECTIVE CASING ELEVATION: 127.58
WELL ELEVATION: 127.58
WATER LEVEL: 10.88 (03/21/91)
DATUM: SUBASE
WEATHER: 70°, SUNNY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					42										
					47										
					52										OPEN HOLE
					57										
					62										

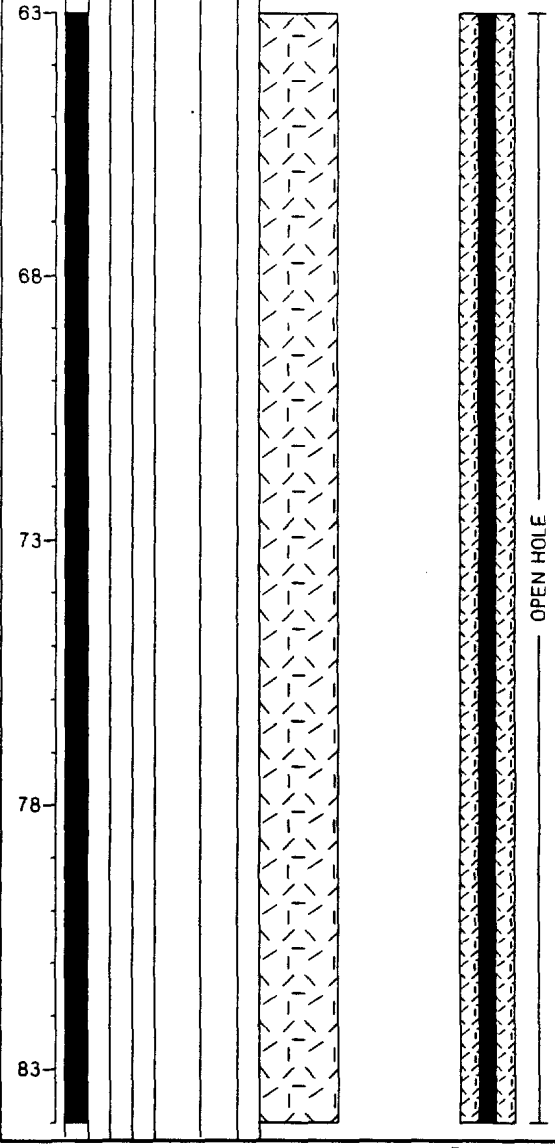
ATLANTIC

BORING LOG 2W MW 1D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/28/90
DATA COMPLETED: 09/06/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 128.05
PROTECTIVE CASING ELEVATION: 127.58
WELL ELEVATION: 127.58
WATER LEVEL: 10.88 (03/21/91)
DATUM: SUBASE
WEATHER: 70°, SUNNY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					63										
					68										
					73										
					78										
					83										



ATLANTIC

BORING LOG 2W MW 1D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/28/90
DATA COMPLETED: 09/06/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 128.05
PROTECTIVE CASING ELEVATION: 127.58
WELL ELEVATION: 127.58
WATER LEVEL: 10.88 (03/21/91)
DATUM: SUBASE
WEATHER: 70°, SUNNY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					84										
					89										OPEN HOLE
					94										
				END OF BORING AT 95.55 feet										95.55	
					99										
					104										

ATLANTIC

BORING LOG 2W MW 2S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/23/90
DATA COMPLETED: 08/23/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 110.45
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 70°, CLOUDY
INSPECTOR: MICHAEL NEJDL AND ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	4 5 9 10	70	0.0	Brown, medium to coarse SAND and GRAVEL, damp, FILL	0					0	60			0.0	
2-4	4 5 3 2	45	0.0	Brown, fine SAND and GRAVEL, trace silt, trace asphalt, damp, FILL						0	60				
4-6	5 64 100/2	50	1.2	Dark brown, fine SAND and SILT, trace asphalt, trace roots, moist, FILL	5					0	40			5.0	
				5.0-11.8 Light to dark grey, fine grained gneiss, quartz, plagioclase, biotite, and potassium feldspar, occasional potassium feldspar rich coarse grained bands. Mamacoke Formation	10										
				11.8-23.0 Light grey to orange pink, fine to medium grained gneiss. Mamacoke Formation	15										
					20										

ATLANTIC

BORING LOG 2W MW 2S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/23/90
DATA COMPLETED: 08/23/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 110.45
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 70°, CLOUDY
INSPECTOR: MICHAEL NEJDL AND ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
				No water encountered, no well installed, end of core at 23.0 ft.										23.0	
					26										
					31										
					36										
					41										

ATLANTIC

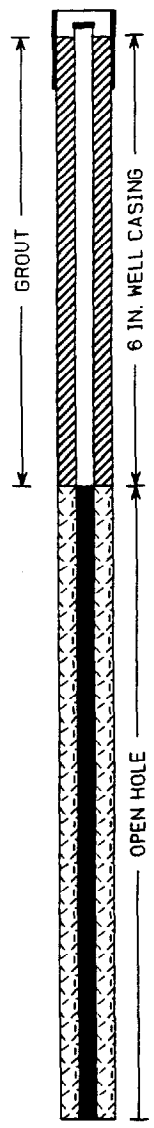
BORING LOG 2W MW 2D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/28/90
DATA COMPLETED: 09/04/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 110.45
PROTECTIVE CASING ELEVATION: 110.22
WELL ELEVATION: 110.22
WATER LEVEL: 22.85 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, FOGGY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
				NOT SAMPLED	0									0.0
				BEDROCK	5									4.00
					10									
					15									
					20									

WELL CONSTRUCTION



ATLANTIC

BORING LOG 2W MW 2D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/28/90
DATA COMPLETED: 09/04/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 110.45
PROTECTIVE CASING ELEVATION: 110.22
WELL ELEVATION: 110.22
WATER LEVEL: 22.85 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, FOGGY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
					26										
					31										OPEN HOLE
					36										
					41										

ATLANTIC

BORING LOG 2W MW 2D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/28/90
DATA COMPLETED: 09/04/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 110.45
PROTECTIVE CASING ELEVATION: 110.22
WELL ELEVATION: 110.22
WATER LEVEL: 22.85 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, FOGGY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				END OF BORING AT 49.93 feet	42, 47, 52, 57, 62									49.93	OPEN HOLE

ATLANTIC

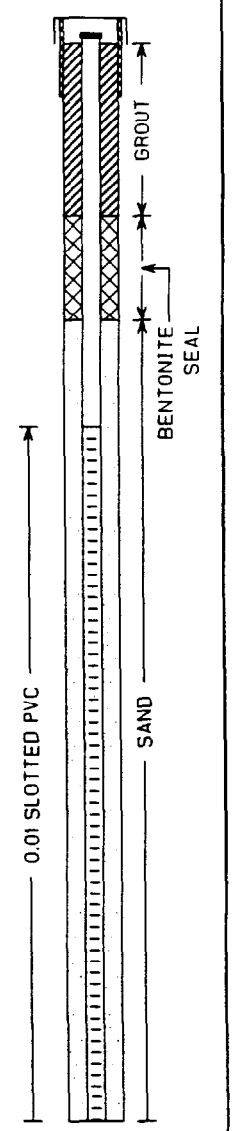
BORING LOG 2W MW 3S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/22/90
DATA COMPLETED: 08/22/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 82.8
PROTECTIVE CASING ELEVATION: 84.50
WELL ELEVATION: 84.37
WATER LEVEL: 73.78 (03/21/91)
DATUM: SUBASE
WEATHER: 60°, LIGHT RAIN
INSPECTOR: MICHAEL NEJDL
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	5 8 7 5	60	0.0	Dark brown, fine SAND and SILT, trace root fragments, damp, TOP SOIL	0					0	50			0.0 0.35
2-4	3 7 7 5	15	0.0	Brown, fine to medium SAND and GRAVEL, damp, grading to wet at 10.0 feet, FILL						0	35			
4-6	7 9 9 8	20	0.0		5					0	40			
6-8	6 5 4 4	10	0.0							0	35			
8-10	2 4 15 24	15	NA							NA	NA			
10-12	13 15 5 4	45	0.0	Brown, coarse SAND and GRAVEL, some silt, wet, FILL	10					0	50			
12-14	3 4 3 4	75	0.0	Red-brown, coarse SAND and GRAVEL, trace silt, wet, FILL						0	30			
14-16	1 1 1 1	65	0.1	Grey, SILT and CLAY, trace shell fragments, wet, DREDGE SPOIL	15					0	50			15.0
16-18	1 1 2 1	100	18.0							0	40			
18-20	2 2 2 2	70	60.0							0	20			
20-22	WOH WOH 1 1	85	75.0	Dark grey, SILT and CLAY, trace shell fragments, wet, heavy oil stain, DREDGE SPOIL	20					0	30			

WELL CONSTRUCTION



ATLANTIC

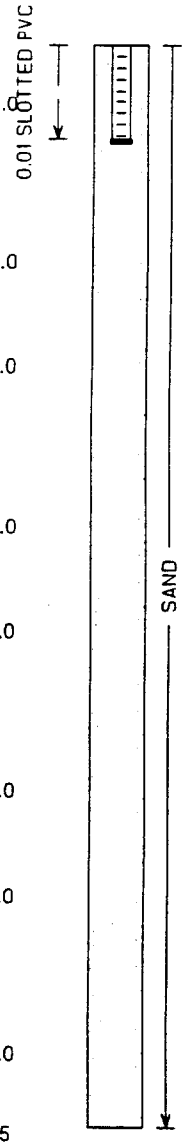
BORING LOG 2W MW 3S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/22/90
DATA COMPLETED: 08/22/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 82.8
PROTECTIVE CASING ELEVATION: 84.50
WELL ELEVATION: 84.37
WATER LEVEL: 73.78 (03/21/91)
DATUM: SUBASE
WEATHER: 60°, LIGHT RAIN
INSPECTOR: MICHAEL NEJDL
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
20-22	WOH WOH 1 1				21				■					22.0
				AUGER TO 25.0 feet										
25-27	WOH WOH 1 1	100	12.0	Dark brown, SILT and CLAY, trace shell fragments, wet, DREDGE SPOIL	26	■				19	40			25.0
				AUGER TO 30.0 feet										27.0
30-32	WOH WOH 1 1	100	35.0	Dark brown, SILT and CLAY, trace shell fragments, wet, DREDGE SPOIL	31	■				0	40			30.0
				AUGER TO 35.0 feet										32.0
35-37	1 1 6 7	100	1.0	Red-brown, fine SAND and SILT, trace roots, wet, TOP SOIL	36	■				0	30			35.0
				AUGER TO 40.0 feet										37.0
40-42	19 17 11 100/3	10	0.7	Brown, fine SAND and SILT, trace gravel, wet,	41	■				0	40			40.0
				AUGER REFUSAL AT 41.5 feet										41.5

WELL CONSTRUCTION



ATLANTIC

BORING LOG 2W MW 3D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/22/90
DATA COMPLETED: 08/28/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 81.68
PROTECTIVE CASING ELEVATION: 81.36
WELL ELEVATION: 81.36
WATER LEVEL: 5.73 (03/21/91)
DATUM: SUBASE
WEATHER: 75', MOSTLY CLEAR
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				FOR OVERBURDEN SOIL DESCRIPTION SEE BORING LOG 2WMW3S	0 5 10 15 20									0.0	GROUT 6 IN. WELL CASING

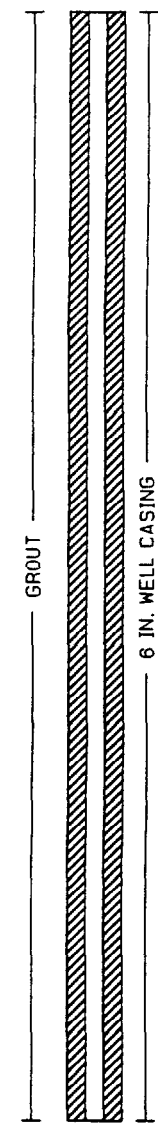
ATLANTIC

BORING LOG 2W MW 3D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/22/90
DATA COMPLETED: 08/28/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 81.68
PROTECTIVE CASING ELEVATION: 81.36
WELL ELEVATION: 81.36
WATER LEVEL: 5.73 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, MOSTLY CLEAR
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
					26										
					31										
					36										
					41										



ATLANTIC

BORING LOG 2W MW 3D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/22/90
DATA COMPLETED: 08/28/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 81.68
PROTECTIVE CASING ELEVATION: 81.36
WELL ELEVATION: 81.36
WATER LEVEL: 5.73 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, MOSTLY CLEAR
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					42 47 52 57 62										GROUT 8 IN. WELL CASING

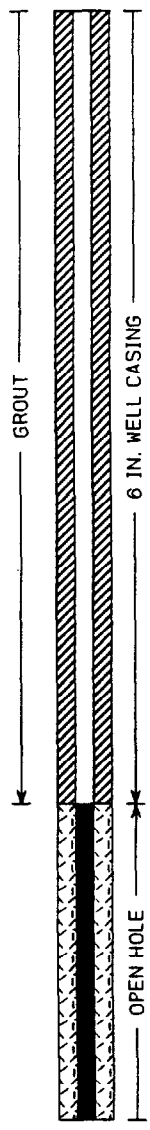
ATLANTIC

BORING LOG 2W MW 3D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/22/90
DATA COMPLETED: 08/28/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 81.68
PROTECTIVE CASING ELEVATION: 81.36
WELL ELEVATION: 81.36
WATER LEVEL: 5.73 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, MOSTLY CLEAR
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					63										
					68										
				BEDROCK	73									73.0	
					78										
					83										

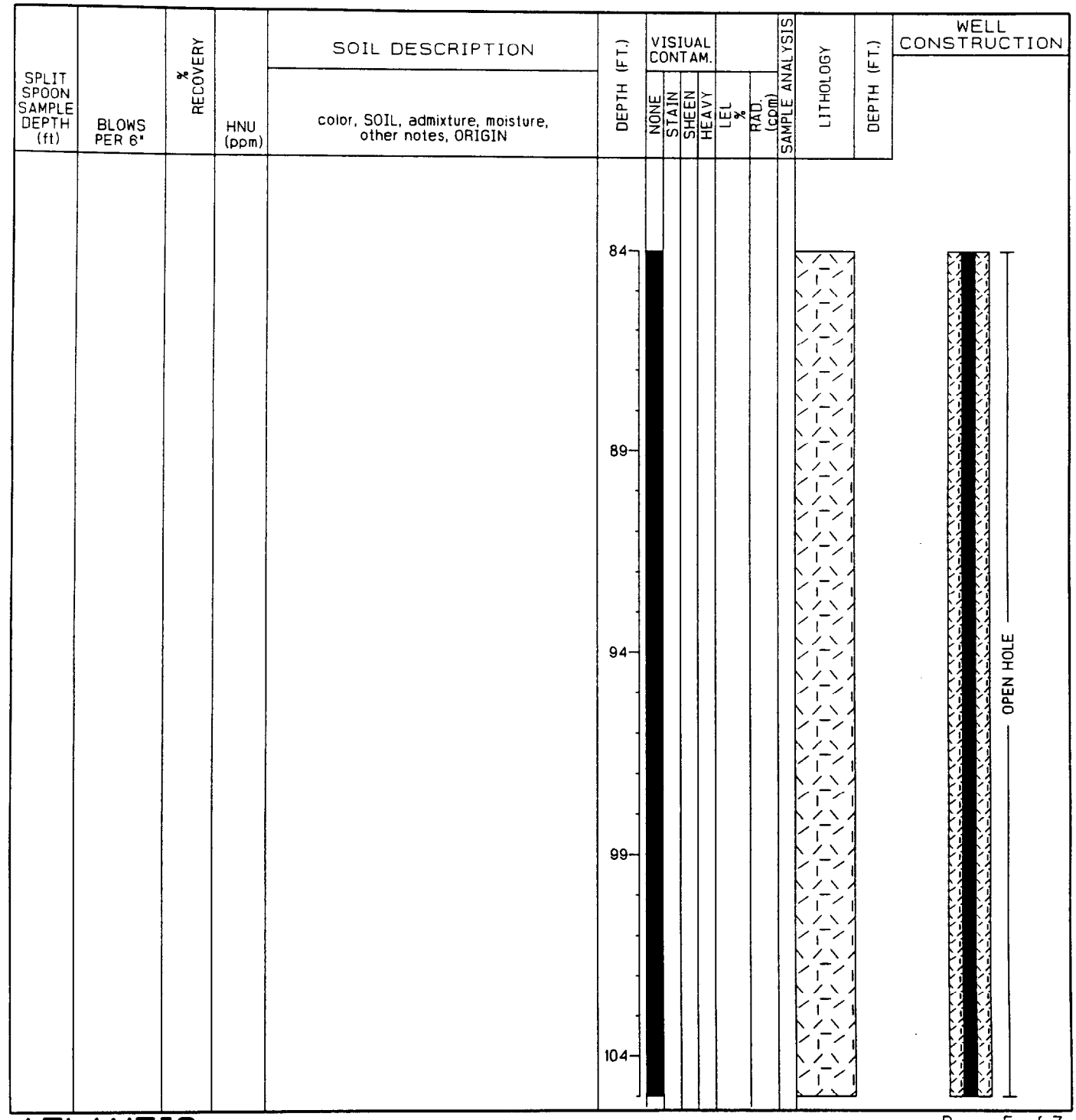


BORING LOG 2W MW 3D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/22/90
DATA COMPLETED: 08/28/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 81.68
PROTECTIVE CASING ELEVATION: 81.36
WELL ELEVATION: 81.36
WATER LEVEL: 5.73 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, MOSTLY CLEAR
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					84										
					89										
					94										OPEN HOLE
					99										
					104										



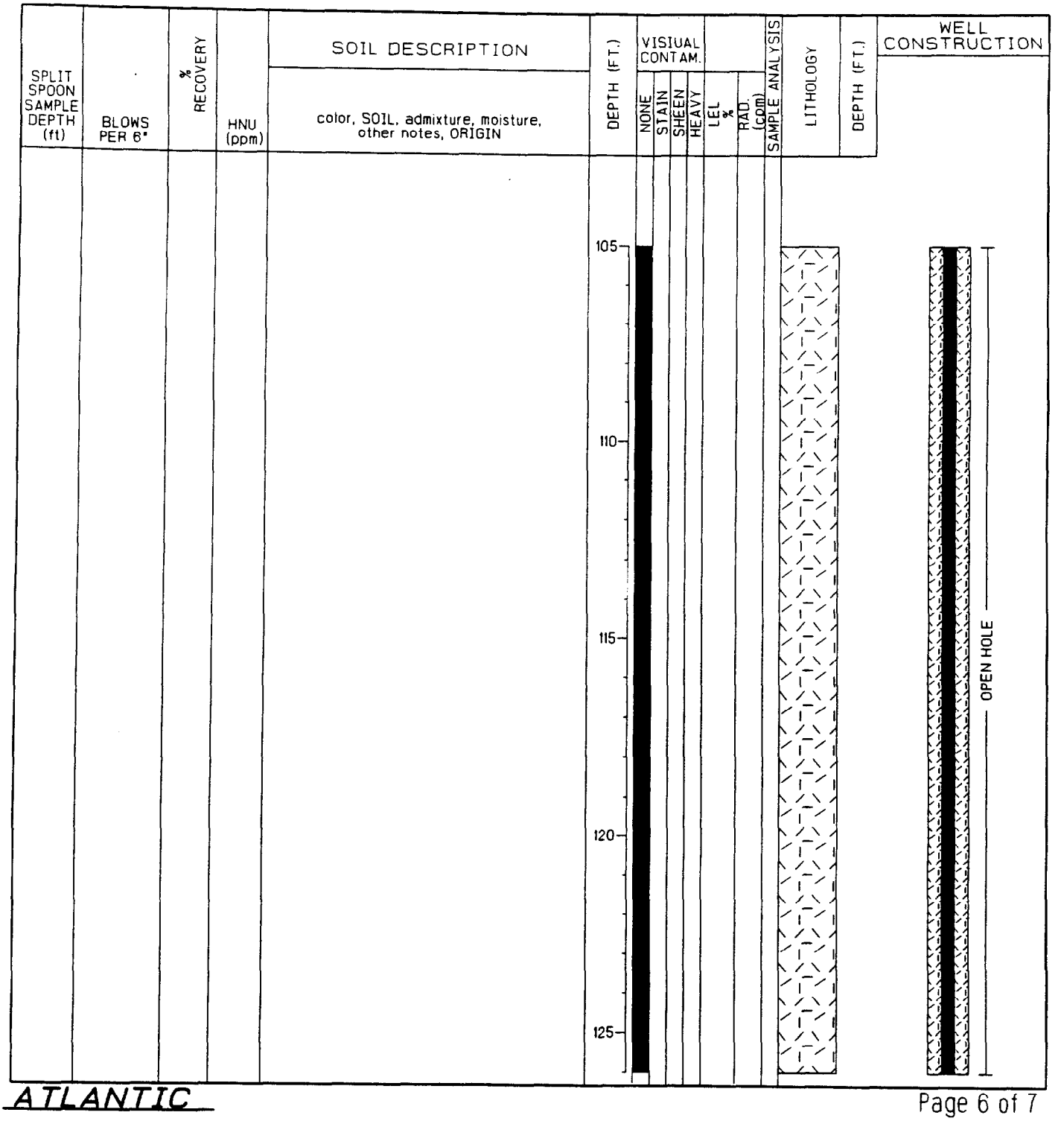
ATLANTIC

BORING LOG 2W MW 3D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/22/90
DATA COMPLETED: 08/28/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 81.68
PROTECTIVE CASING ELEVATION: 81.36
WELL ELEVATION: 81.36
WATER LEVEL: 5.73 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, MOSTLY CLEAR
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					105										
					110										
					115										OPEN HOLE
					120										
					125										



ATLANTIC

BORING LOG 2W MW 3D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 08/22/90
DATA COMPLETED: 08/28/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 81.68
PROTECTIVE CASING ELEVATION: 81.36
WELL ELEVATION: 81.36
WATER LEVEL: 5.73 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, MOSTLY CLEAR
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					126									127.1	OPEN HOLE
				END OF BORING AT 127.12 feet	131										
					136										
					141										
					146										

ATLANTIC

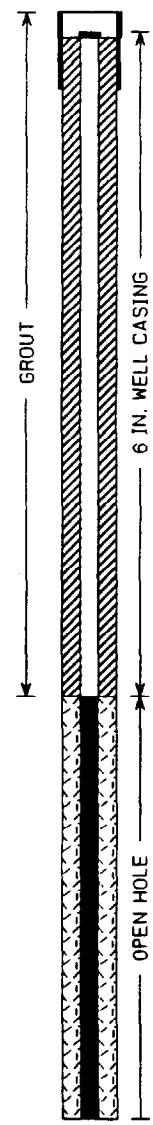
BORING LOG 2W MW 4D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 09/19/90
DATA COMPLETED: 09/27/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 93.07
PROTECTIVE CASING ELEVATION: 92.69
WELL ELEVATION: 92.69
WATER LEVEL: 7.43 (03/21/91)
DATUM: SUBASE
WEATHER: 65°, CLEAR, SUNNY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
				FOR OVERBURDEN SOIL DESCRIPTION SEE BORING LOG 2WMW4S	0									0.0
					5									
				BEDROCK										9.0
					10									
					15									
					20									

WELL CONSTRUCTION



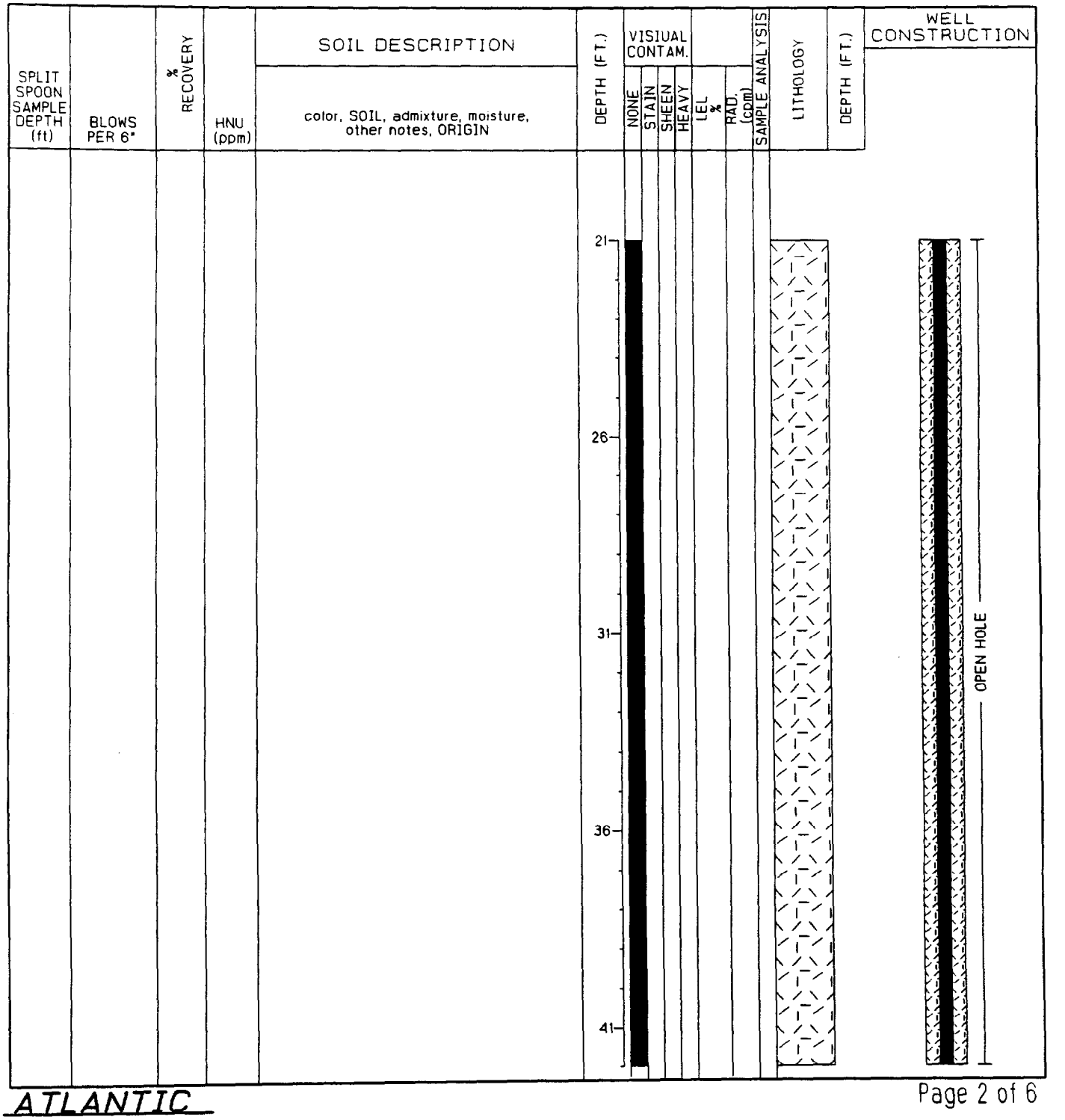
ATLANTIC

BORING LOG 2W MW 4D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 09/19/90
DATA COMPLETED: 09/27/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 93.07
PROTECTIVE CASING ELEVATION: 92.69
WELL ELEVATION: 92.69
WATER LEVEL: 7.43 (03/21/91)
DATUM: SUBASE
WEATHER: 65°, CLEAR, SUNNY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
					26										
					31										
					36										
					41										



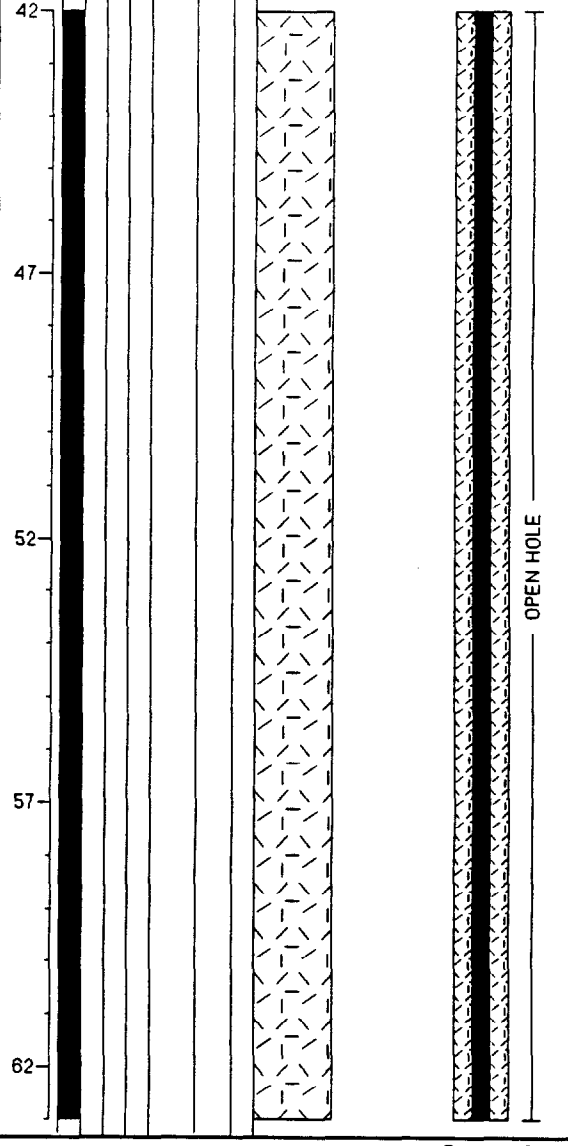
ATLANTIC

BORING LOG 2W MW 4D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 09/19/90
DATA COMPLETED: 09/27/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 93.07
PROTECTIVE CASING ELEVATION: 92.69
WELL ELEVATION: 92.69
WATER LEVEL: 7.43 (03/21/91)
DATUM: SUBASE
WEATHER: 65°, CLEAR, SUNNY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION



ATLANTIC

BORING LOG 2W MW 4D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 09/19/90
DATA COMPLETED: 09/27/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 93.07
PROTECTIVE CASING ELEVATION: 92.69
WELL ELEVATION: 92.69
WATER LEVEL: 7.43 (03/21/91)
DATUM: SUBASE
WEATHER: 65°, CLEAR, SUNNY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					63										
					68										
					73										OPEN HOLE
					78										
					83										

ATLANTIC

BORING LOG 2W MW 4D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 09/19/90
DATA COMPLETED: 09/27/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 93.07
PROTECTIVE CASING ELEVATION: 92.69
WELL ELEVATION: 92.69
WATER LEVEL: 7.43 (03/21/91)
DATUM: SUBASE
WEATHER: 65°, CLEAR, SUNNY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					84										
					89										
					94										OPEN HOLE
					99										
					104										

BORING LOG 2W MW 4D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 09/19/90
DATA COMPLETED: 09/27/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 93.07
PROTECTIVE CASING ELEVATION: 92.69
WELL ELEVATION: 92.69
WATER LEVEL: 7.43 (03/21/91)
DATUM: SUBASE
WEATHER: 65°, CLEAR, SUNNY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					105										
					110										
					115										
				END OF BORING AT 119.38 feet	120									119.4	OPEN HOLE
					125										

ATLANTIC

BORING LOG 2W MW 5S

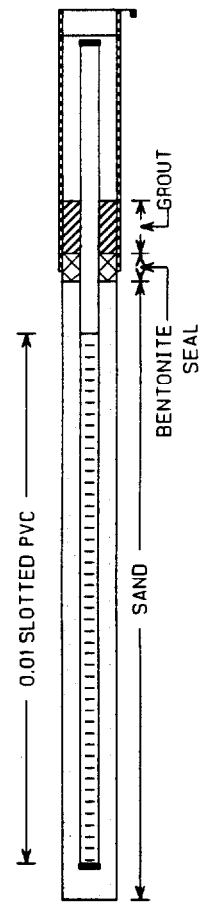
PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 9/4/90
DATA COMPLETED: 9/4/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 73.5
PROTECTIVE CASING ELEVATION: 77.16
WELL ELEVATION: 76.48
WATER LEVEL: 73.80 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, CLEAR SKIES
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	2 2 2 2	100	0.6	Dark brown, organic SILT, trace roots, damp, TOP SOIL. Gray brown, SILT and CLAY, trace fine Sand, mottled, moist, DREDGE SPOIL					0	30			0.0 0.2
2-4	3 2 3 2	100	0.6	Grading to trace shell fragments					0	40			
4-6	1 2 1 2	100	0.6	Grading to wet.					0	60			
				AUGER TO 10.0 feet									6.0
10-12	1 1 2 11	30	0.6	Gray brown, SILT and CLAY, trace fine Sand, mottled, wet, DREDGE SPOIL					0	30			10.0
				AUGER TO 13.0 feet									
13-13.2	100/2"	100	0.6	Gray, fine to coarse SAND, little fine Gravel, little Silt, wet. END OF BORING AT 13.2 feet					0	40			13.0 13.2

DEPTH (FT.): 0, 5, 10, 15, 20

WELL CONSTRUCTION



ATLANTIC

BORING LOG 2W MW 6S

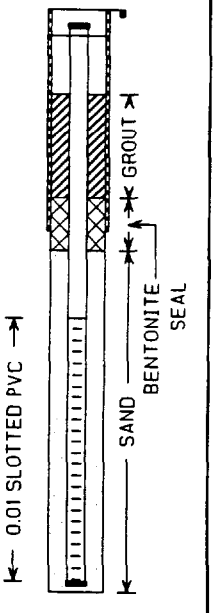
PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 10/03/90
DATA COMPLETED: 10/03/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JOE RAAB
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 83.4
PROTECTIVE CASING ELEVATION: 85.03
WELL ELEVATION: 84.67
WATER LEVEL: 77.04 (03/21/91)
DATUM: SUBASE
WEATHER: 70', CLEAR SKIES
INSPECTOR: ANNA SULLIVAN AND ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	16 16 3 7	75	0.1	Dark brown, organic SILT and CLAY, some sand, trace roots, damp, TOP SOIL					2	50			0.0 / 0.1
				Light brown, fine to coarse SAND, some silt, trace gravel, damp, FILL									1.0
2-4	8 8 9 10	100	0.1	Gray, SILT and CLAY, some fine Sand, moist, mottled, DREDGE SPOIL					2	50			
4-6	7 7 9 11	100	0.1						2	40			
6-8	20 8 8 7	30	0.1	Brown, fine to medium SAND, trace gravel, trace silt, trace wood, wet at 6.6 feet					2	30			5.9
8-10	7 9 32 65	75	0.1	Brown, fine SAND and GRAVEL, trace silt, wet					2	30			8.3
				AUGER REFUSAL AT 9.5 feet									9.5

DEPTH (FT.): 0, 5, 10, 15, 20

WELL CONSTRUCTION



ATLANTIC

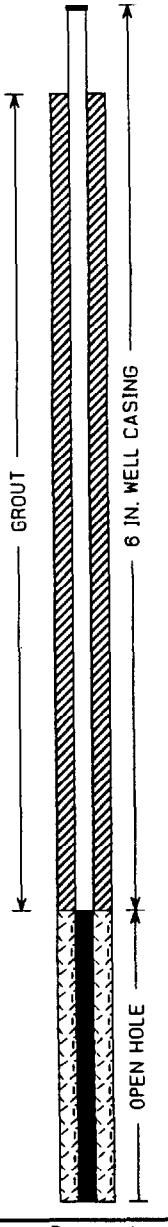
BORING LOG 2W MW 6D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 09/20/90
DATA COMPLETED: 09/21/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 83.2
PROTECTIVE CASING ELEVATION: 84.87
WELL ELEVATION: 84.87
WATER LEVEL: 9.93 (03/21/91)
DATUM: SUBASE
WEATHER: 60°, CLEAR, SUNNY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
				FOR OVERBURDEN SOIL DESCRIPTION SEE BORING LOG 2LMW6S	0									0.0
					5									
					10									10.5
				BEDROCK	15									
					20									

WELL CONSTRUCTION



ATLANTIC

BORING LOG 2W MW 6D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 09/20/90
DATA COMPLETED: 09/21/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 83.2
PROTECTIVE CASING ELEVATION: 84.87
WELL ELEVATION: 84.87
WATER LEVEL: 9.93 (03/21/91)
DATUM: SUBASE
WEATHER: 60°, CLEAR, SUNNY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21 26 31 36 41										OPEN HOLE

ATLANTIC

BORING LOG 2W MW 6D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A WETLAND
DATE STARTED: 09/20/90
DATA COMPLETED: 09/21/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 83.2
PROTECTIVE CASING ELEVATION: 84.87
WELL ELEVATION: 84.87
WATER LEVEL: 9.93 (03/21/91)
DATUM: SUBASE
WEATHER: 60°, CLEAR, SUNNY
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					42										
				END OF BORING AT 46.03 feet										46.0	OPEN HOLE
					47										
					52										
					57										
					62										

ATLANTIC

BORING LOG 2L TB 1

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 9/25/90
DATA COMPLETED: 9/25/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JOE RAAB
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 84.0
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 65°, CLEAR SKIES
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	3 2 4 6	50	0.2	Brown, fine to medium SAND, trace silt, trace gravel, trace asphalt, damp, FILL	0	■				1	30			0.0	
2-4	14 19 9 10	50	0.2			■				1	30			4.0	
4-6	7 6 8 9	0	NA	NO RECOVERY	5	■				NA	NA				
6-8	4 6 7 9	10	0.2	Brown, fine to medium SAND, trace silt, trace gravel, trace plastic, moist, FILL		■				1	40			6.0	
8-10	4 4 4 3	1	0.2	Brown, fine to medium SAND, some silt, wet, FILL		■				1	40				
10-12	2 2 2 2	0	NA	NO RECOVERY	10	■				NA	NA			10.0	
12-14	3 3 4 3	100	0.2	Grey, SILT and CLAY, trace fine sand, trace shell fragments, trace wood fragments, wet, DREDGE SPOIL		■				1	30			12.0	
14-16	2 2 2 4	100	0.2		15	■				1	30				
16-18	2 2 1 1	0	NA	NO RECOVERY		■				NA	NA			16.0	
18-20	2 2 2 2	10	1.0	Grey, SILT and CLAY, trace fine sand, trace shell fragments, trace wood fragments, wet, DREDGE SPOIL		■				1	40			18.0	
				AUGER REFUSAL AT 20.0 feet	20	■								20.0	

ATLANTIC

BORING LOG 2L TB 2

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/16/90
DATA COMPLETED: 08/16/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: SCOTT METCALF
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 84.6
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 85°, CLEAR SKIES
INSPECTOR: MICHAEL NEJDL
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	5 16 16 17	55	2.0	Brown, fine SAND and GRAVEL, damp, FILL	0	■				0.0	60			0.0	
2-4	26 14 8 5	45	21.0	Dark brown, fine SAND and GRAVEL, damp, FILL		■				0.0	60	■			
4-6	16 7 6 5	60	4.0	Grey-brown, fine SAND and GRAVEL, moist, FILL	5	■				0.0	55	■			
6-8	11 8 7 9	35	5.5	Dark brown, medium SAND and GRAVEL, moist, FILL		■				0.0	50	■			
8-10	11 5 6 9	10	2.0	Dark brown, medium SAND, some gravel, moist, FILL		■				0.0	50				
10-12	7 2 1 2	10	3.0	Brown, medium SAND, some gravel, moist, FILL	10	■				0.0	40				
12-14	1 1 1 1	95	1.3	Dark brown, coarse SAND and GRAVEL, wet, FILL; Dark brown, SILT and CLAY, wet, DREDGE SPOIL		■				0.0	60			12.4	
14-16	1 1 1 1	0	NA	NO RECOVERY	15	■				NA	NA			14.0	
16-18	NA	0	NA			■				NA	NA				
18-20	1 1 1 1	5	2.0	Dark brown, SILT and CLAY, some fine sand, wet, oil sheen on water, DREDGE SPOIL				■		0.0	50			18.0	
20-22	1 1 1 1	45	1.0	Grey-brown, SILT and CLAY, wet, DREDGE SPOIL	20	■				NA	NA				

ATLANTIC

BORING LOG 2L TB 2

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/16/90
DATA COMPLETED: 08/16/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: SCOTT METCALF
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 84.6
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 85°, CLEAR SKIES
INSPECTOR: MICHAEL NEJDL
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
20-22	11 11				21										
22-24	1 16 49 100/2	90	0.0	Brown, fine to coarse SAND and GRAVEL, wet						0.0	60			22.0	
				AUGER REFUSAL AT 24.0 feet										24.0	
					26										
					31										
					36										
					41										

ATLANTIC

BORING LOG 2L TB 3

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 9/25/90
DATA COMPLETED: 9/25/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JOE RAAB
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 84.6
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 75', CLEAR SKIES
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	4 7 9 7	80	0.4	Brown, fine to medium SAND, some gravel, trace silt, damp, FILL Dark brown staining at 1.5 to 1.8 feet.	0					1	40			0.0	
2-4	3 5 5 8	30	0.4	Brown, fine to medium SAND, some gravel, trace silt, damp, FILL						1	50				
4-6	4 4 5 9	10	0.4	Brown, fine to medium SAND, some gravel, trace silt, damp, FILL	5					1	30				
6-8	4 3 5 7	5	0.4	Small piece of wood in shoe of spoon.						1	30				
8-10	4 5 2 1	5	0.4	Small flakes of rusted metal, wet at 10.0 feet, FILL						1	30				
10-12	1 2 1 2	0	NA	NO RECOVERY	10					NA	NA			10.0	
12-14	1 1 1 1	75	1.0	Grey, SILT and CLAY, trace fine sand, trace shell fragments, wet, DREDGE SPOIL						1	40			12.0	
14-16	AUGER	NA	NA	AUGER TO 18.0 feet	15					NA	NA			14.0	
16-18	AUGER	NA	NA							NA	NA				
18-20	100/1	NA	NA	REFUSAL AT 18.0 feet						NA	NA			18.0	
					20										

ATLANTIC

BORING LOG 2L TB 4

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 9/20/90
DATA COMPLETED: 9/20/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JOE RAAB
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 88.2
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 60°, PARTLY CLOUDY
INSPECTOR: MICHAEL NEJDL
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS
0-2	19 17 100/2	50	0.4	Brown, medium SAND and GRAVEL, damp, FILL Brown, medium SAND and GRAVEL, blue ash, wood fragments, red brick fragments, damp, FILL					0	50	
2-4	6 12 33 10	70	0.4						0	40	
4-6	7 6 11 4	40	0.7	Brown to blue, fine SAND and ASH, concrete, damp, FILL					0	55	
6-8	7 11 4 4	35	0.7	Dark brown, medium to coarse, SAND and ASH, wood, concrete fragments, wet at 8.0 feet, FILL					0	50	
8-10	13 7 7 6	25	0.9	Dark brown, fine to medium SAND and ASH, wet, FILL					0	50	
10-12	7 5 5 6	10	0.4						0	40	
12-14	1 1 1 1	50	0.4	Grey, SILT and CLAY, trace fine sand, trace shell fragments, wet, DREDGE SPOIL					0	30	
14-16	1 1 1 1	60	0.4						0	50	
				AUGER REFUSAL AT 17.0 feet							
				End of boring at 17.0.							

DEPTH (FT.): 0, 5, 10, 15, 20

LITHOLOGY / DEPTH (FT.): 0.0, 12.5, 16.0, 17.0

WELL CONSTRUCTION

ATLANTIC

BORING LOG 2L TB 5

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 9/21/90
DATA COMPLETED: 9/24/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JOE RAAB
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 88.0
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 60°, CLEAR SKIES
INSPECTOR: MICHAEL NEJDL
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	7 55 22 17	70	0.7	Light brown, medium SAND and GRAVEL, some ash, asphalt, damp, FILL	■				0	50			0.0	
2-4	10 32 100/5	10	1.0	ASPHALT Dark brown, fine to medium SAND, some wood fragments, damp, FILL	■				0	NA				
4-6	7 3 1 1	30	0.4	Dark brown, fine to medium SAND, some wood fragments, damp, FILL	■				0	60				
6-8	6 38 7 4	30	1.0	Dark brown, fine to medium SAND and GRAVEL, wet at 8.0 feet, FILL	■				0	45				
8-10	10 13 4 6	80	1.6	Dark brown, fine SAND and GRAVEL, wet, FILL	■				0	40				
				AUGER REFUSAL AT 10.0 feet									10.0	

DEPTH (FT.): 0, 5, 10, 15, 20

ATLANTIC

BORING LOG 2L TB 6

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/08/90
DATA COMPLETED: 08/08/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 88.4
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 75°, LIGHT RAIN
INSPECTOR: MICHAEL NEJDL
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	15 20 22 29	65	0.4	Brown, fine to medium SAND and GRAVEL, trace glass, trace brick fragments, damp, FILL					0	37.5			0.0	
2-4	NA	60	0.4	Brown, fine to coarse SAND and GRAVEL, damp, FILL					0	40				
				AUGER TO 5.0 feet									4.0	
5-7	14 19 20 30	60	0.4	Brown, fine SAND and SILT, trace gravel, trace ash, moist, FILL					0	60			5.0	
7-9	3 4 4 5	0	NA	NO RECOVERY					NA	NA			7.0	
9-11	3 2 2 3	25	0.4	Brown, fine to coarse SAND, moist, FILL					0	40			9.0	
11-13	2 3 3 4	35	NA	Brown, fine to coarse SAND, some silt, wet, FILL					0	50				
13-15	2 1 1 2	80	NA	Brown, SILT and CLAY, trace fine sand, wet, DREDGE SPOIL					0	40			13.0	
15-17	4 4 3 11	100	NA	Grey-brown, SILT and CLAY, trace fine sand, wet, DREDGE SPOIL					0	40				
17-19	11 25 30 32	100	NA						0	30				
19-21	32 35 55 100/3	90	NA	Brown, coarse SAND and GRAVEL, wet					0	40			19.0	
													21.0	

DEPTH (FT.): 0, 5, 10, 15, 20

ATLANTIC

BORING LOG 2L TB 7

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/07/90
DATA COMPLETED: 08/07/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 87.4
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 75°, CLOUDY WITH SHOWERS
INSPECTOR: ERIK NESS AND FRANCIS DUMONT
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	9 9 9 28	10	0.0	Grey, coarse SAND and GRAVEL, damp, FILL	0					0	40			0.0	
2-4	4 6 7 4	10	0.0	Brown fine SAND, some gravel, trace cardboard, damp, FILL						0	40				
4-6	4 8 3 2	30	0.0	Grey, SILT and CLAY, trace sand, trace gravel, damp, DREDGE SPOIL	5					0	40			4.0	
6-8	4 8 8 8	10	0.0	Grey, fine SAND and SILT, trace gravel, damp, DREDGE SPOIL						0	30				
8-10	4 11 9 9	40	0.0							0	30				
10-12	38 14 14 40	30	0.0	Grey, fine SAND and SILT, moist, DREDGE SPOIL	10					0	30				
12-14	100/3	30	0.0	AUGER REFUSAL AT 12.2 feet						0	40			12.2	
					15										
					20										

ATLANTIC

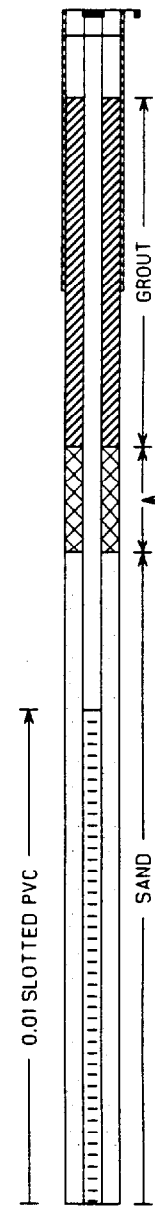
BORING LOG 2L MW 7S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/07/90
DATA COMPLETED: 08/07/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 82.8
PROTECTIVE CASING ELEVATION: 84.50
WELL ELEVATION: 84.37
WATER LEVEL: 74.47 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, LIGHT RAIN
INSPECTOR: ERIK NESS AND FRANCIS DUMONT
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	5 7 7 10	20	0.0	Brown, coarse SAND and GRAVEL, damp, FILL	0					0	40			0.0
2-4	9 8 8 5	20	0.0	Grey-brown, fine to medium SAND, some gravel, damp, FILL						0	40			
4-6	1 2 6 3	10	0.0		5					0	40			
6-8	6 8 3 3	10	0.0	Grey-brown, fine to medium SAND, some gravel, trace wood fragments, damp, FILL						0	35			
8-10	5 2 2 2	10	0.0	Grey-brown, fine to medium SAND, some gravel, damp, FILL						0	40			
10-12	3 5 1 8	25	0.0	Brown, medium to coarse SAND and GRAVEL, trace wood fragments, moist, FILL	10					0	40			
12-14	3 2 1 2	90	0.0	Dark grey, medium to coarse SAND, some gravel, moist, FILL						0	40			
14-16	3 2 1 2	5	0.0	Dark brown, fine to medium SAND, some silt, wet, FILL	15					0	40			
16-18	1 2 1 1	5	0.0	Dark grey, SILT and CLAY, some sand, wet, DREDGE SPOIL						0	40			16.0
18-20	1 1 1 2	50	0.0	Dark grey, SILT and CLAY, trace plastic, wet, DREDGE SPOIL						0	40			
20-22	WOH WOH 1 2	80	0.0	Dark grey, SILT and CLAY, trace shell fragments, wet, DREDGE SPOIL	20					0	40			

WELL CONSTRUCTION



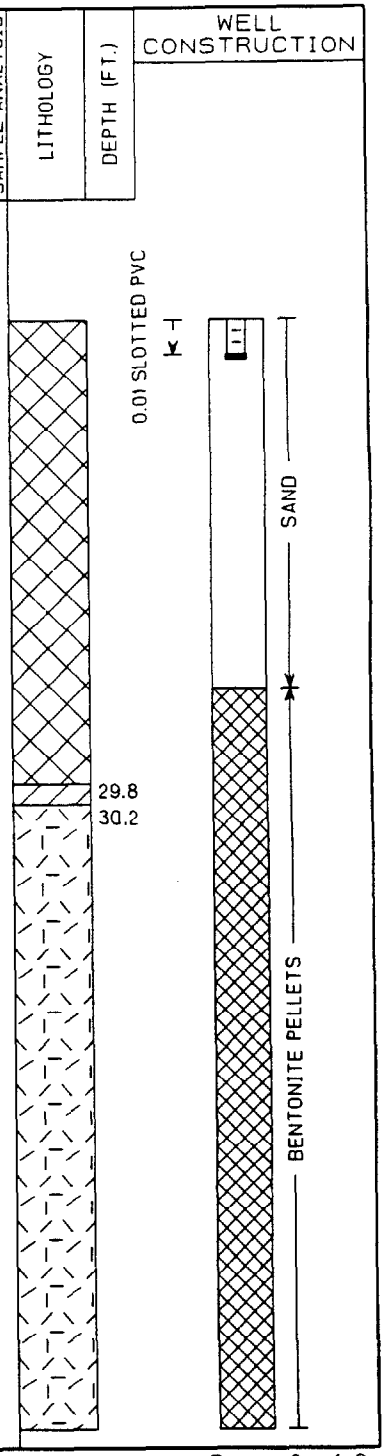
ATLANTIC

BORING LOG 2L MW 7S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/07/90
DATA COMPLETED: 08/07/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 82.8
PROTECTIVE CASING ELEVATION: 84.50
WELL ELEVATION: 84.37
WATER LEVEL: 74.47 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, LIGHT RAIN
INSPECTOR: ERIK NESS AND FRANCIS DUMONT
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD (cpm)	SAMPLE ANALYSIS
20-22	WOH WOH 1 2				21							
22-24	1 2 1 1	50	0.0							0	40	
24-26	WOH WOH 1 1	100	0.0							0	40	
26-28	1 1 1 2	100	0.0		26					0	40	
28-30	4 5 8 12	100	0.0							0	40	
30-32	100/3	50	0.0	Light brown, medium to coarse SAND, little silt, wet 30.2-36.6 Light grey to orange pink, quartz, potassium feldspar, plagioclase, biotite, granitic gneiss. Mamacoke Formation	31					0	40	
				36.6-44.8 White to light grey-orange pink, medium grained, quartz, plagioclase, potassium feldspar, biotite, granitic gneiss. Mamacoke Formation	36 41							



ATLANTIC

BORING LOG 2L MW 7S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/07/90
DATA COMPLETED: 08/07/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 82.8
PROTECTIVE CASING ELEVATION: 84.50
WELL ELEVATION: 84.37
WATER LEVEL: 74.47 (03/21/91)
DATUM: SUBASE
WEATHER: 75', LIGHT RAIN
INSPECTOR: ERIK NESS AND FRANCIS DUMONT
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				44.8-50.0 Grading to biotite rich fine grained bands, and orange-pink to grey fine to medium grained bands of primarily quartz, potassium feldspar and plagioclase.	42 47 52 57 62									50.0	BENTONITE PELLETS

ATLANTIC

BORING LOG 2L MW 7D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/15/90
DATA COMPLETED: 08/09/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILL METHOD: AIR ROTARY
SAMPL METHOD:

GROUND ELEVATION: 83.1
PROTECTIVE CASING ELEVATION: 85.16
WELL ELEVATION: 85.16
WATER LEVEL: 79.76 (03/21/91)
DATUM: SUBASE
WEATHER: 85°, MOSTLY SUNNY, HUMID
INSPECTOR: LYNN METCALF AND ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				FOR OVERBURDEN SOIL DESCRIPTION SEE BORING LOG 2LMW7S	0 5 10 15 20									0.0	GROUT 6 IN. WELL CASING

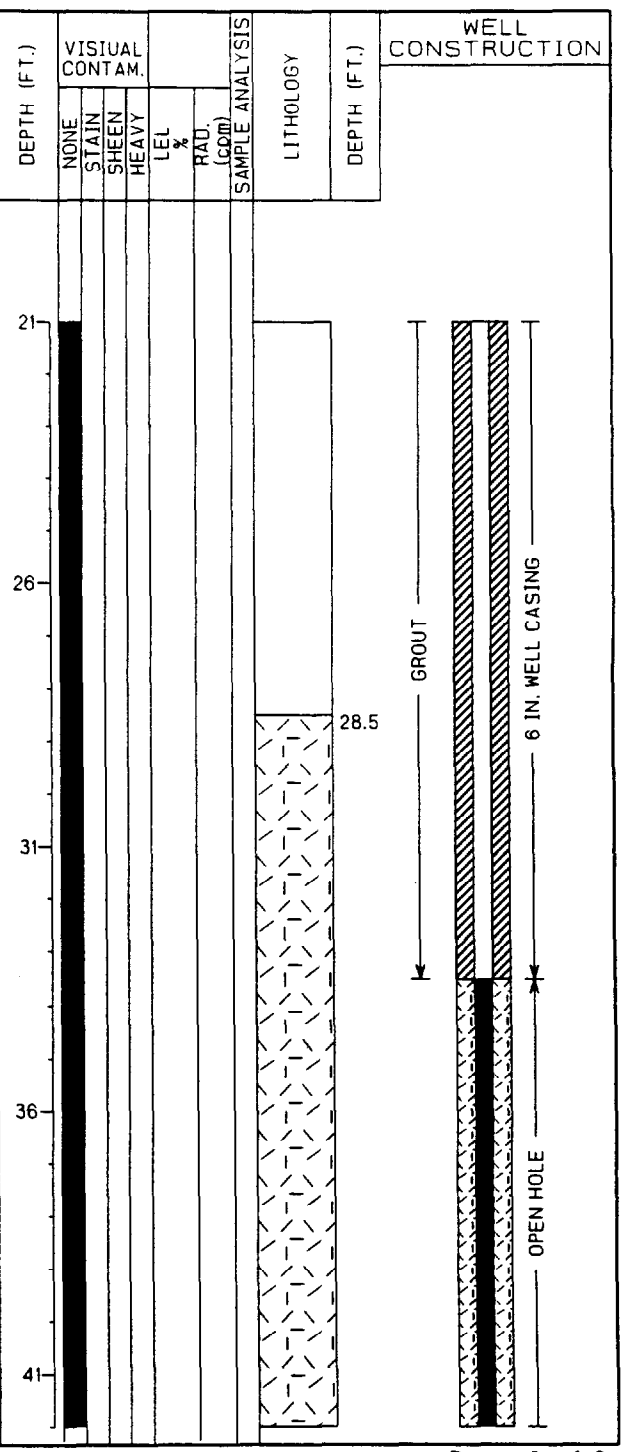
ATLANTIC

BORING LOG 2L MW 7D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/15/90
DATA COMPLETED: 08/09/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 83.1
PROTECTIVE CASING ELEVATION: 85.16
WELL ELEVATION: 85.16
WATER LEVEL: 79.76 (03/21/91)
DATUM: SUBASE
WEATHER: 85°, MOSTLY SUNNY, HUMID
INSPECTOR: LYNN METCALF AND ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				BEDROCK	21, 26, 31, 36, 41									28.5	GROUT; 6 IN. WELL CASING; OPEN HOLE



ATLANTIC

BORING LOG 2L MW 7D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/15/90
DATA COMPLETED: 08/09/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 83.1
PROTECTIVE CASING ELEVATION: 85.16
WELL ELEVATION: 85.16
WATER LEVEL: 79.76 (03/21/91)
DATUM: SUBASE
WEATHER: 85°, MOSTLY SUNNY, HUMID
INSPECTOR: LYNN METCALF AND ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					42										
				END OF BORING AT 43.59 feet	47									43.59	OPEN HOLE
					52										
					57										
					62										

ATLANTIC

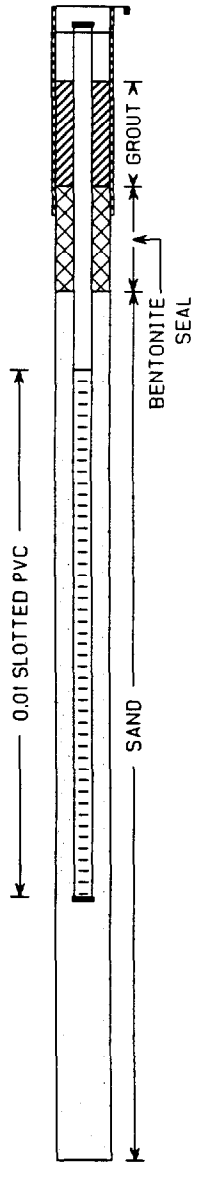
BORING LOG 2L MW 8S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/02/90
DATA COMPLETED: 08/03/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: SCOTT METCALF
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 86.40
PROTECTIVE CASING ELEVATION: 87.85
WELL ELEVATION: 87.45
WATER LEVEL: 86.74 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, MOSTLY SUNNY
INSPECTOR: MICHAEL NEJDL
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	3 2 45 14	30	NA	Brown, fine SAND, some gravel, damp, FILL	0					0	60			0.0
2-4	2 1 1 2	10	NA							0	40			
4-6	7 6 6 4	40	NA	Dark brown, fine to medium SAND, trace brick fragments, trace paper, damp, FILL	5					0	40			
6-8	3 5 7 7	70	NA	Dark brown, coarse SAND, some gravel, trace paper, oil sheen, wet, FILL						0	40			
8-10	6 5 5 6	65	NA	Dark grey, SILT and CLAY, trace wood, oil stain, wet, FILL						0	30			
10-12	5 5 6 7	75	NA	Red-brown, fine SAND and SILT, trace gravel, wet	10					0	30			10.0
12-14	10 20 22 24	65	NA	Brown, fine SAND and SILT, trace gravel, wet						0	40			
14-16	15 18 22 29	40	NA	Brown, SAND and GRAVEL, some silt, wet	15					0	40			14.0
16-18	24 38 63 80	100	NA	Brown, coarse SAND and SILT, wet						0	50			16.0
18-20	90 100/2	50	NA	Brown, coarse SAND and GRAVEL, wet						0	30			18.0
				AUGER REFUSAL AT 20.5 feet	20									20.0

WELL CONSTRUCTION



ATLANTIC

BORING LOG 2L MW 8D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 09/06/90
DATA COMPLETED: 09/12/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 87.1
PROTECTIVE CASING ELEVATION: 89.33
WELL ELEVATION: 89.33
WATER LEVEL: 0.0 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY SUNNY, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				FOR OVERBURDEN SOIL DESCRIPTION SEE BORING LOG 2LMW8S	0									0.0	GROUT, 6 IN. WELL CASING
					5										
					10										
					15										
					20										

ATLANTIC

BORING LOG 2L MW 8D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 09/06/90
DATA COMPLETED: 09/12/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 87.1
PROTECTIVE CASING ELEVATION: 89.33
WELL ELEVATION: 89.33
WATER LEVEL: 0.0 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY SUNNY, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
					26										
					31										
					36										
					41										
				BEDROCK										41.5	

GROUT

6 IN. WELL CASING

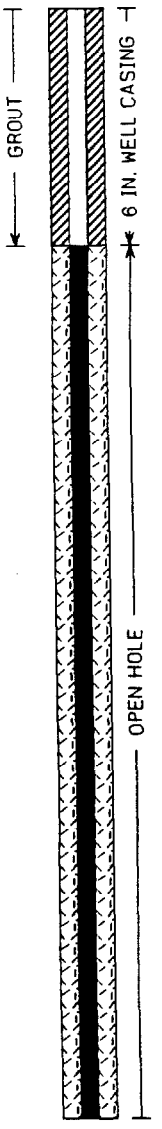
ATLANTIC

BORING LOG 2L MW 8D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 09/06/90
DATA COMPLETED: 09/12/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 87.1
PROTECTIVE CASING ELEVATION: 89.33
WELL ELEVATION: 89.33
WATER LEVEL: 0.0 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY SUNNY, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					42										
					47										
					52										
					57										
					62										



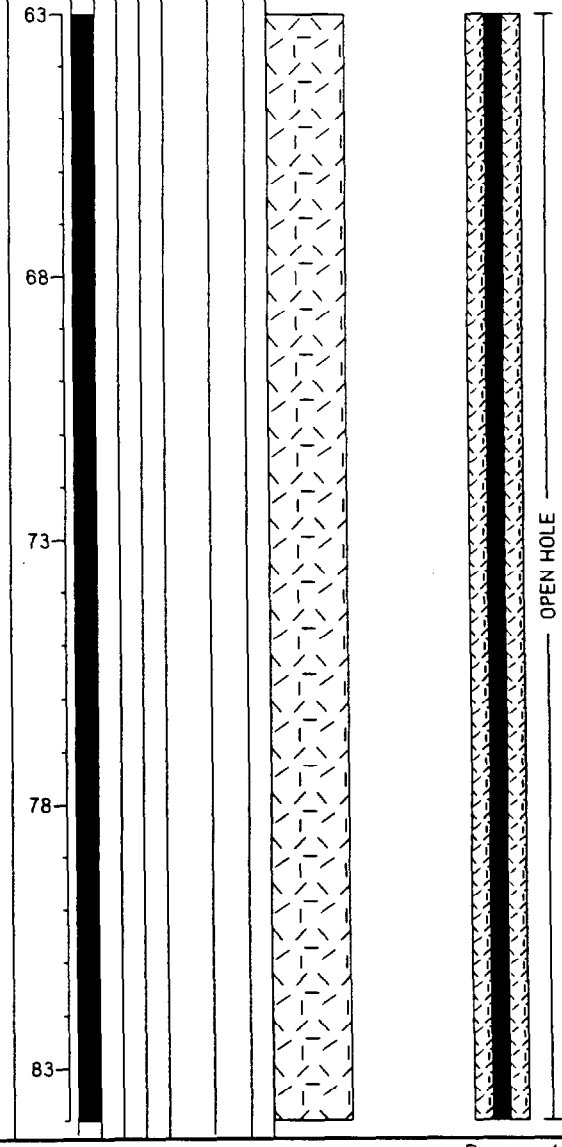
ATLANTIC

BORING LOG 2L MW 8D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 09/06/90
DATA COMPLETED: 09/12/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 87.1
PROTECTIVE CASING ELEVATION: 89.33
WELL ELEVATION: 89.33
WATER LEVEL: 0.0 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY SUNNY, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION



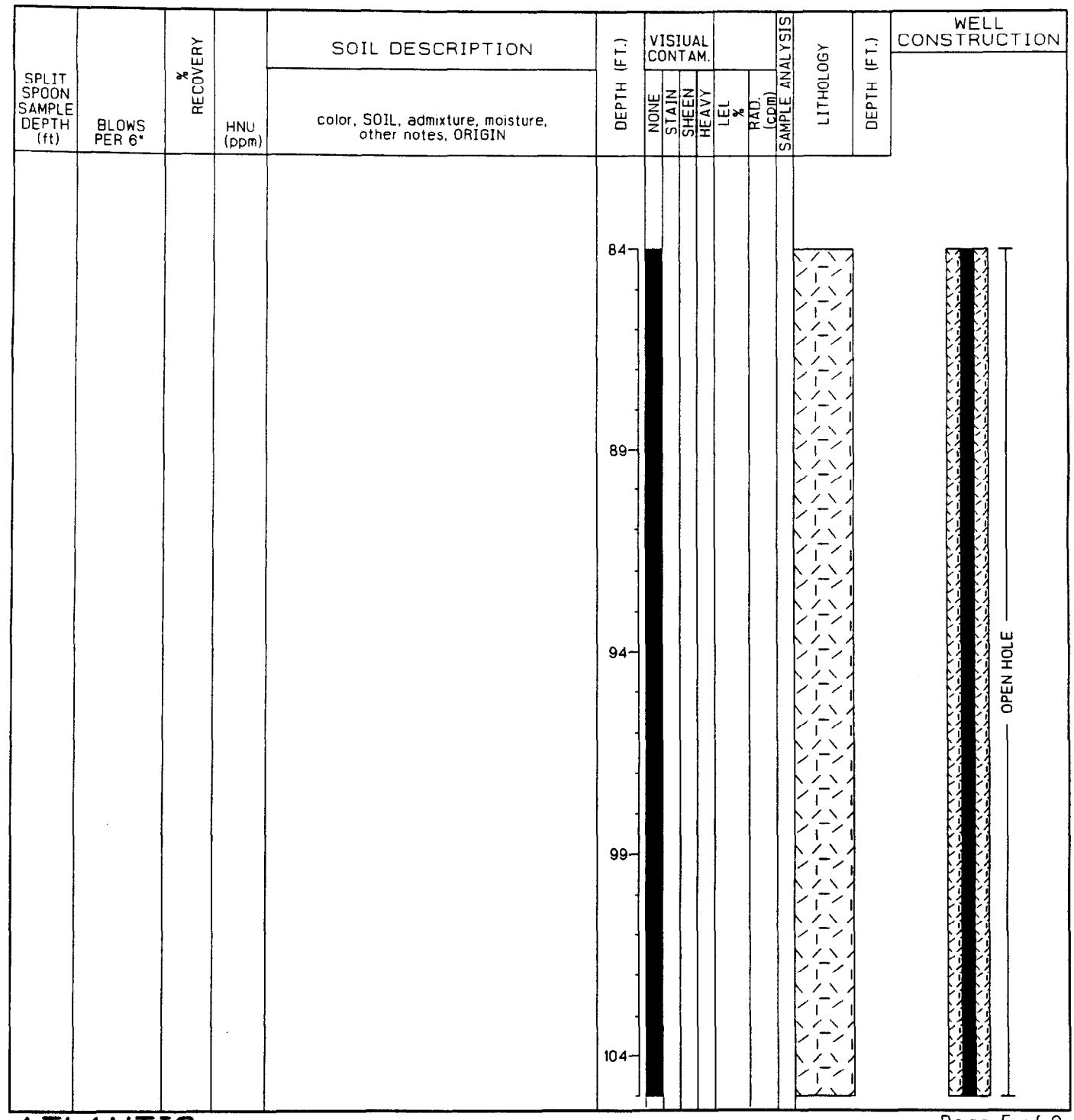
ATLANTIC

BORING LOG 2L MW 8D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 09/06/90
DATA COMPLETED: 09/12/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 87.1
PROTECTIVE CASING ELEVATION: 89.33
WELL ELEVATION: 89.33
WATER LEVEL: 0.0 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY SUNNY, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					84										
					89										
					94										OPEN HOLE
					99										
					104										



ATLANTIC

BORING LOG 2L MW 8D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 09/06/90
DATA COMPLETED: 09/12/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 87.1
PROTECTIVE CASING ELEVATION: 89.33
WELL ELEVATION: 89.33
WATER LEVEL: 0.0 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY SUNNY, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					105										
					110										
					115										OPEN HOLE
					120										
				END OF BORING AT 124.37 feet	125									124.4	

ATLANTIC

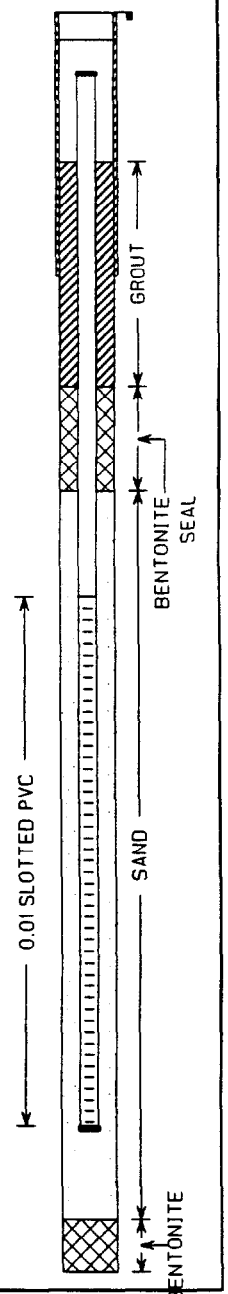
BORING LOG 2L MW 9S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/16/90
DATA COMPLETED: 08/17/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 85.3
PROTECTIVE CASING ELEVATION: 88.15
WELL ELEVATION: 86.96
WATER LEVEL: 77.96 (03/21/91)
DATUM: SUBASE
WEATHER: 95°, CLEAR SKIES, VERY HUMID
INSPECTOR: MICHAEL NEJDL AND ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	5 7 9 9	85	0.0	Brown, fine to medium SAND and GRAVEL, damp, FILL	0					0	40			0.0
2-4	9 7 5 7	40	6.5	Dark brown, fine SAND and GRAVEL, trace clay, damp, FILL						0	50			
4-6	7 6 5 9	20	3.0	Brown, medium SAND and GRAVEL, moist, FILL	5					0	80			
6-8	5 4 4 4	35	2.8	Brown, medium to coarse SAND and GRAVEL, trace wood fragments, moist, FILL						0	60			
8-10	6 9 11 16	35	0.0	Brown, fine to medium SAND and GRAVEL, trace paper, trace glass, wet, FILL						0	80			
10-12	6 7 1 1	30	0.0	WOOD	10					0	60			
12-14	1 1 1 1	75	0.0	Dark grey, coarse SAND and SILT, some clay, trace wood fragments, wet, DREDGE SPOIL						0	60			12.0
14-16	1 1 1 2	100	0.0	Grey, SILT and CLAY, trace fine sand, trace shell fragments, trace wood fragments, wet, DREDGE SPOIL	15					0	50			
16-18	2 1 1 2	100	NA							NA	NA			
18-20	2 1 2 2	90	0.0							0	50			
20-22	WOH WOH WOH WOH	100	0.0		20					0	45			

WELL CONSTRUCTION



ATLANTIC

BORING LOG 2L MW 9S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/16/90
DATA COMPLETED: 08/17/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 85.3
PROTECTIVE CASING ELEVATION: 88.15
WELL ELEVATION: 86.96
WATER LEVEL: 77.96 (03/21/91)
DATUM: SUBASE
WEATHER: 95°, CLEAR SKIES, VERY HUMID
INSPECTOR: MICHAEL NEJDL AND ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
20-22	WOH WOH WOH WOH				21									
22-24	WOH WOH 1 2	100	0.0							0	70			
24-26	1 2 1 2	100	0.0							0	45			
					26									
26-28	NA	100	0.0							0	40			
28-30	NA	100	0.0	Brown, medium SAND, trace gravel, wet Brown, medium SAND and GRAVEL, wet						0	30			27.85 28.0
30-32	NA	60	0.0	Brown, fine SAND, some gravel, wet	31					0	50			30.0
32-34	NA	60	0.0	Brown, SILT, some gravel, wet						0	30			32.0
34-36	NA	65	0.0							0	45			
36-38	13 6 5 6	65	0.0	Grey-brown, SILT and CLAY, trace fine sand, trace gravel, trace wood, wet	36					0	30			36.0
38-40	4 16 12 14	20	0.0	Brown, fine SAND and GRAVEL, wet						0	30			38.0
40-42	6 9 4 5	45	0.0		41					0	35			

WELL CONSTRUCTION

NATIVE MATERIAL CAVE IN

ATLANTIC

BORING LOG 2L MW 9S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/16/90
DATA COMPLETED: 08/17/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 85.3
PROTECTIVE CASING ELEVATION: 88.15
WELL ELEVATION: 86.96
WATER LEVEL: 77.96 (03/21/91)
DATUM: SUBASE
WEATHER: 95°, CLEAR SKIES, VERY HUMID
INSPECTOR: MICHAEL NEJDL AND ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
42-44	100/3	10	0.0	AUGER REFUSAL AT 42.5 feet	42	■				0	60			42.5	NATIVE MATERIAL CAVE IN
					47										
					52										
					57										
					62										

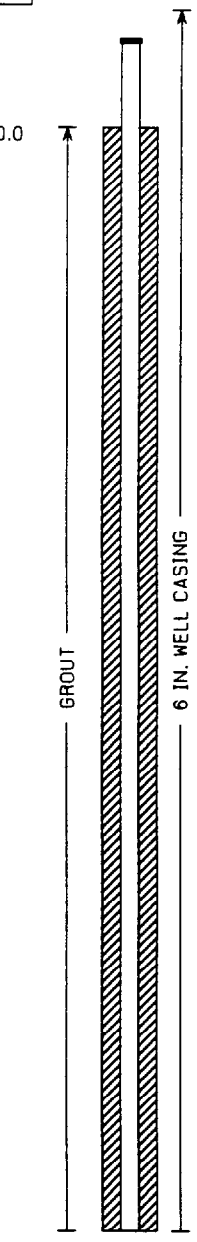
ATLANTIC

BORING LOG 2L MW 9D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/20/90
DATA COMPLETED: 08/29/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 85.4
PROTECTIVE CASING ELEVATION: 87.11
WELL ELEVATION: 87.11
WATER LEVEL: 26.87 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY SUNNY, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				FOR OVERBURDEN SOIL DESCRIPTION SEE BORING LOG 2LMW9S	0									0.0	GROUT; 6 IN. WELL CASING
					5										
					10										
					15										
					20										



ATLANTIC

BORING LOG 2L MW 9D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/20/90
DATA COMPLETED: 08/29/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 85.4
PROTECTIVE CASING ELEVATION: 87.11
WELL ELEVATION: 87.11
WATER LEVEL: 26.87 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY SUNNY, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
					26										
					31										GROUT; 6 IN. WELL CASING
					36										
					41									42.0	

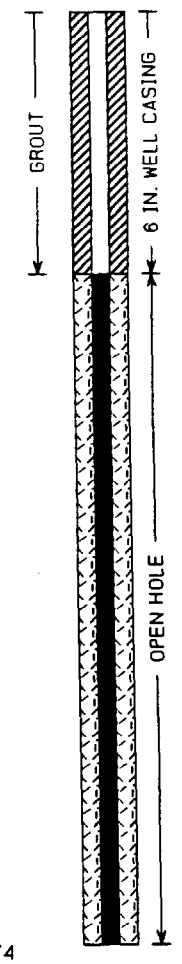
ATLANTIC

BORING LOG 2L MW 9D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/20/90
DATA COMPLETED: 08/29/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 85.4
PROTECTIVE CASING ELEVATION: 87.11
WELL ELEVATION: 87.11
WATER LEVEL: 26.87 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY SUNNY, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				BEDROCK	42										
					47										
					52										
					57										
				END OF BORING AT 59.74 feet	62									59.74	



ATLANTIC

BORING LOG 2L MW 13S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/22/90
DATA COMPLETED: 08/22/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 86.9
PROTECTIVE CASING ELEVATION: 88.80
WELL ELEVATION: 88.53
WATER LEVEL: 75.09 (03/21/91)
DATUM: SUBASE
WEATHER: 65°, CLEAR SKIES, LIGHT WIND
INSPECTOR: MICHAEL NEJDL AND ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD (cpm)	SAMPLE ANALYSIS
0-2	5 8 7 9	35	0.4	Brown, medium to coarse SAND and GRAVEL, damp, FILL					0	40	
2-4	22 24 22 26	100	0.0	Dark brown, SILT, some gravel, red staining, grading to moist at 6.0 feet, FILL					0	35	
4-6	24 21 17 18	100	0.0						0	50	
6-8	12 11 9 8	100	0.0						0	60	■
8-10	10 11 25 28	100	NA	Grading to red, medium SAND and GRAVEL, trace silt, trace plastic, wet, FILL					NA	NA	
10-12	8 7 6 4	15	0.0	Grey-brown, SILT, trace gravel, wet, FILL					0	30	
12-14	8 9 10 12	10	0.0	Brown, fine SAND and SILT, trace black ash, wet, FILL					0	30	
14-16	3 8 27 100/1	60	0.0	Brown, SILT, some gravel, some ash, wet, FILL					0	40	
				AUGER REFUSAL AT 16.0 feet CORE from 16.0 - 36.0 feet 16.0-22.3 Orange-pink gneiss, medium to coarse grained, quartz, potassium feldspar, plagioclase with minor biotite, Mamacoke Formation							

DEPTH (FT.): 0, 5, 10, 15, 20

LITHOLOGY — DEPTH (FT.): 0.0, 16.0

WELL CONSTRUCTION: GROUT; BENTONITE SEAL; 0.01 SLOTTED PVC; SAND; BENTONITE PELLETS

ATLANTIC

BORING LOG 2L MW 13S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/22/90
DATA COMPLETED: 08/22/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 86.9
PROTECTIVE CASING ELEVATION: 88.80
WELL ELEVATION: 88.53
WATER LEVEL: 75.09 (03/21/91)
DATUM: SUBASE
WEATHER: 65°, CLEAR SKIES, LIGHT WIND
INSPECTOR: MICHAEL NEJDL AND ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				22.3-24.3 Light to dark grey gneiss, grading to finer grained, more biotite throughout. Mamacoke Formation	21										
				24.3-31.6 Alternating bands of light grey, white, dark grey, and light orange gneiss. Quartz, plagioclase, potassium feldspar, and biotite banding. Mamacoke Formation	26										
				31.6-36.0 Light to dark grey, fine to medium grained, quartz, plagioclase, biotite gneiss. Mamacoke Formation	31										
					36									36.0	BENTONITE PELLETS
					41										

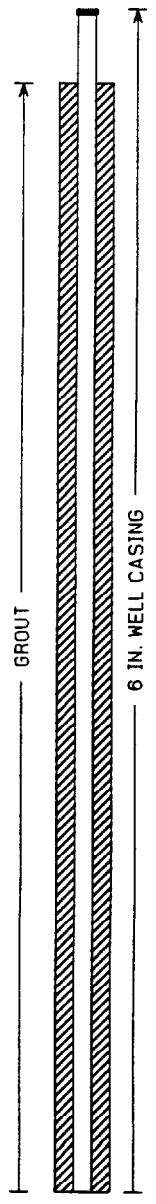
ATLANTIC

BORING LOG 2L MW 13D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/29/90
DATA COMPLETED: 08/30/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 86.8
PROTECTIVE CASING ELEVATION: 88.2
WELL ELEVATION: 88.2
WATER LEVEL: 5.4 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY SUNNY, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				FOR OVERBURDEN SOIL DESCRIPTION SEE BORING LOG 2LMW13S	0									0.0	
					5										
					10										
					15										
				BEDROCK	20									19.5	



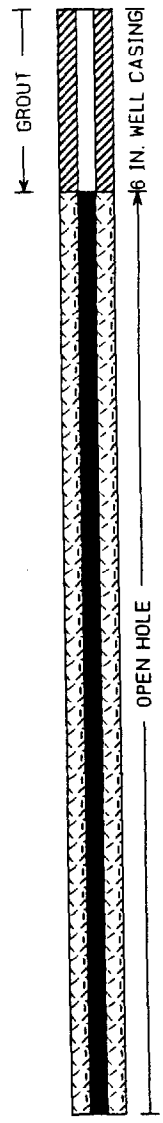
ATLANTIC

BORING LOG 2L MW 13D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/29/90
DATA COMPLETED: 08/30/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 86.8
PROTECTIVE CASING ELEVATION: 88.2
WELL ELEVATION: 88.2
WATER LEVEL: 5.4 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY SUNNY, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
					26										
					31										
					36										
					41										



ATLANTIC

BORING LOG 2L MW 13D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/29/90
DATA COMPLETED: 08/30/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 86.8
PROTECTIVE CASING ELEVATION: 88.2
WELL ELEVATION: 88.2
WATER LEVEL: 5.4 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY SUNNY, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					42										
					47										
					52										OPEN HOLE
					57										
				END OF BORING AT 60.03 feet	62									60.03	

ATLANTIC

BORING LOG 2L MW 14S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 07/31/90
DATA COMPLETED: 07/31/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: SCOTT METCALF
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 91.9
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 85°, CLEAR SKIES
INSPECTOR: MIKE NEJDL
CHECKED BY: CURT KRAEMER

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	9 16 26 26	70	0.0	Brown, fine to coarse SAND, trace silt, some gravel, damp, FILL	0					0	40			0.0	
2-4	15 8 4 8	7	0.0							0	40				
4-6	9 6 4 7	10	0.0	Brown, fine to coarse SAND and GRAVEL, trace silt, damp	5					0	60			4.0	
6-8	6 5 4 3	100	0.0	Brown, fine SAND and SILT, trace wood fragments, damp						0	70			6.0	
8-10	5 8 12 14	85	0.0	Brown, fine to medium SAND, little gravel, trace silt, damp						0	60			8.0	
10-12	11 40 50/5	60	0.0		10					0	50				
12-14	17 100	40	0.0	Brown fine to coarse SAND, little gravel, trace silt, moist						0	65			12.0	
				AUGER REFUSAL AT 13.0 feet, NO WELL INSTALLED, only indication of moisture was in bottom six inches of boring.	15									13.0	
					20										

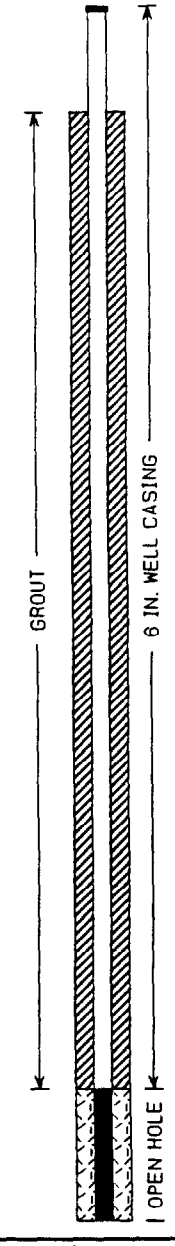
ATLANTIC

BORING LOG 2L MW 14D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/07/90
DATA COMPLETED: 08/15/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 91.9
PROTECTIVE CASING ELEVATION: 93.90
WELL ELEVATION: 93.90
WATER LEVEL: 5.23 (03/21/91)
DATUM: SUBASE
WEATHER: 85°, HOT, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				0.0-13.5 NOT SAMPLED	0									0.0	
					5										
					10										
				BEDROCK										13.5	
					15										
					20										



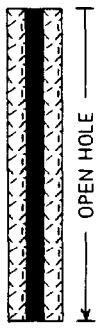
ATLANTIC

BORING LOG 2L MW 14D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/07/90
DATA COMPLETED: 08/15/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 91.9
PROTECTIVE CASING ELEVATION: 93.90
WELL ELEVATION: 93.90
WATER LEVEL: 5.23 (03/21/91)
DATUM: SUBASE
WEATHER: 85°, HOT, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
					26										
				END OF BORING AT 27.0 feet										27.0	
					31										
					36										
					41										



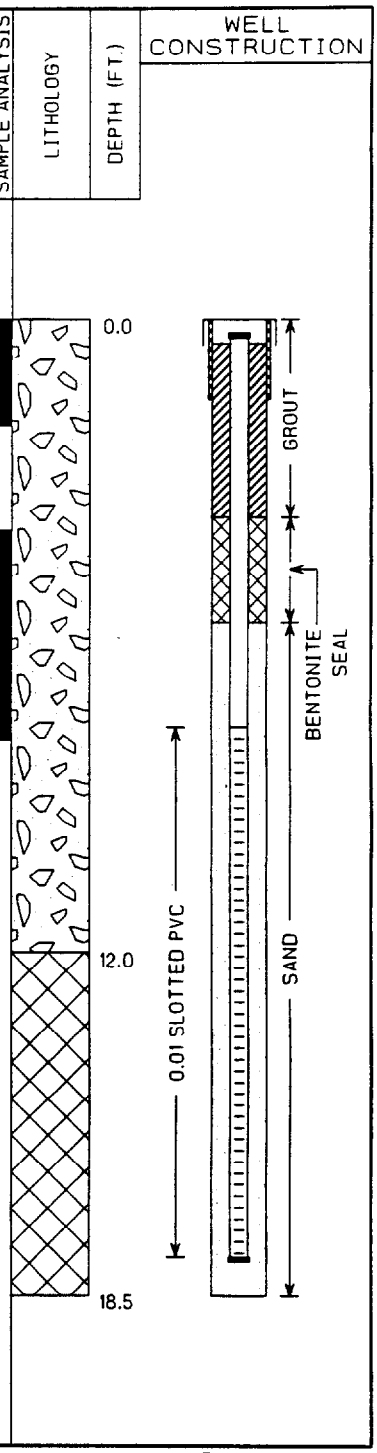
ATLANTIC

BORING LOG 2L MW 17S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/15/90
DATA COMPLETED: 08/15/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 82.48
PROTECTIVE CASING ELEVATION: 82.48
WELL ELEVATION: 82.12
WATER LEVEL: 76.23 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY SUNNY, HUMID
INSPECTOR: MICHAEL NEJDL
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS
0-2	15 17 12 40	65	0.1	Brown, fine SAND and GRAVEL, damp, FILL					0	50	
2-4	50 12 7 8	40	0.1						0	50	
4-6	25 16 9 10	35	0.0	Brown, fine to medium SAND and GRAVEL, damp, FILL					0	50	
6-8	21 67 14 4	40	0.1	Grey-brown, fine to medium SAND and GRAVEL, moist, FILL					0	60	
8-10	7 54 38 20	30	1.0	Brown, medium SAND and GRAVEL, trace brick fragments, moist, FILL					0	60	
10-12	13 11 7 9	5	1.4	Brown, medium SAND and GRAVEL, some silt, trace paper, wet, FILL					0	55	
12-14	8 7 1 1	75	0.0	Grey-brown, SILT and CLAY, wet, DREDGE SPOIL					0	60	
14-16	NA	75	0.0	Dark brown, SILT and CLAY, wet, DREDGE SPOIL					0	40	
16-18	2 1 2 1	95	0.0	Dark brown, fine SAND and SILT, trace stems and plant matter, DREDGE SPOIL					0	30	
18-20	100/6	100	0.0	Piece of weathered bedrock in end of catcher. AUGER REFUSAL AT 18.5 feet					0	50	



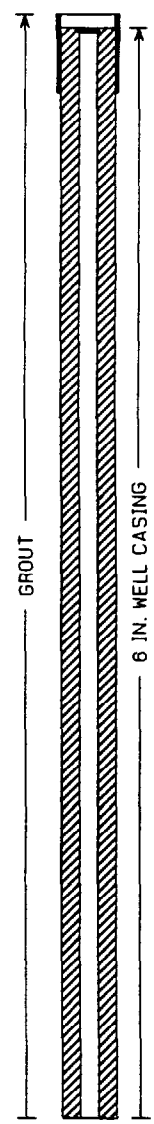
ATLANTIC

BORING LOG 2L MW 17D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/16/90
DATA COMPLETED: 08/20/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 82.62
PROTECTIVE CASING ELEVATION: 82.37
WELL ELEVATION: 82.37
WATER LEVEL: 5.23 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY CLEAR
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				FOR OVERBURDEN SOIL DESCRIPTION SEE BORING LOG 2LMW17S	0									0.0	
					5										
					10										
					15										
				BEDROCK	20									18.0	



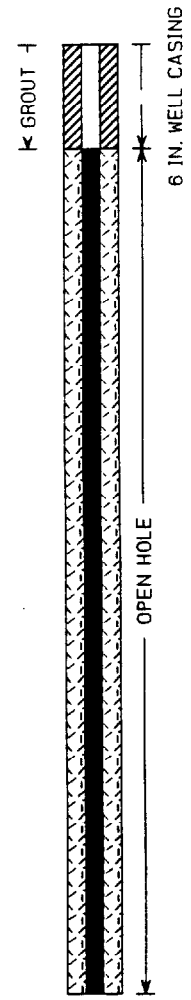
ATLANTIC

BORING LOG 2L MW 17D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/16/90
DATA COMPLETED: 08/20/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 82.62
PROTECTIVE CASING ELEVATION: 82.37
WELL ELEVATION: 82.37
WATER LEVEL: 5.23 (03/21/91)
DATUM: SUBASE
WEATHER: 80°, MOSTLY CLEAR
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
					26										
					31										
					36										
				END OF BORING AT 39.0 feet	41									39.0	



ATLANTIC

BORING LOG 2L MW 18S

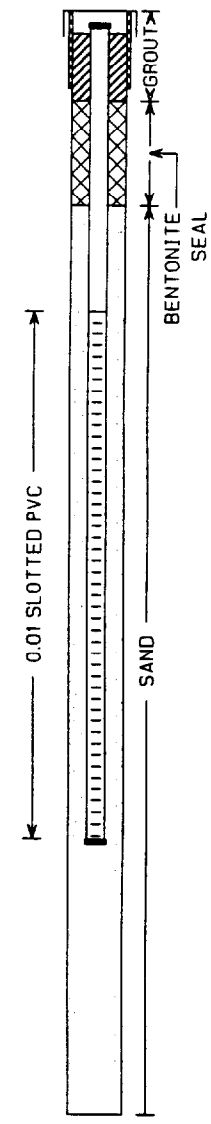
PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/03/90
DATA COMPLETED: 08/07/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: SCOTT METCALF
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 77.94
PROTECTIVE CASING ELEVATION: 77.94
WELL ELEVATION: 77.60
WATER LEVEL: 71.55 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, OVERCAST
INSPECTOR: MICHAEL NEJDL
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	22 30 29 19	50	6.1	Brown, medium SAND and GRAVEL, damp, FILL					0	120			0.0
2-4	22 45 26 12	35	0.8	Grey, medium SAND, some ash, trace wood fragments, damp, FILL					0	120			
4-6	8 7 5 5	30	3.2	Brown, medium SAND and GRAVEL, trace leaves, damp, FILL					0	120			
6-8	4 2 11 14	10	0.5	Brown, medium to coarse SAND and GRAVEL, moist, FILL					0	140			
8-10	14 23 11 6	30	0.6	Brown, medium SAND and GRAVEL, trace paper, trace wood fragments, wet, FILL					0	150			
10-12	7 14 10 8	25	0.1	Brown, medium SAND and GRAVEL, trace wood fragments, wet, FILL					0	40			
12-14	NA	30	0.1	Brown, coarse SAND and GRAVEL, wet, FILL					0	35			
14-16	6 2 3 3	0	NA	NO RECOVERY					NA	NA			14.0
16-18	3 2 2 2	15	0.1	Brown, fine SAND, trace gravel, wet, FILL					0	30			16.0
18-20	3 3 2 3	75	0.0	Brown, SILT and CLAY, trace wood fragments, wet, DREDGE SPOIL					0	40			18.0
20-22	2 1 3 1	75	0.4	Dark brown, SILT and CLAY, trace shell fragments, wet, DREDGE SPOIL					0	30			

DEPTH (FT.): 0, 5, 10, 15, 20

WELL CONSTRUCTION



ATLANTIC

BORING LOG 2L MW 18S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/03/90
DATA COMPLETED: 08/07/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: SCOTT METCALF
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 77.94
PROTECTIVE CASING ELEVATION: 77.94
WELL ELEVATION: 77.60
WATER LEVEL: 71.55 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, OVERCAST
INSPECTOR: MICHAEL NEJDL
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
20-22	2 1 3 1				21									
22-24	2 1 2 1	0	NA	NO RECOVERY						NA	NA			22.0
24-26	2 1 1 2	100	0.4	Dark brown, SILT and CLAY, trace shell fragments, wet, DREDGE SPOIL						0	37.5			24.0
26-28	2 3 3 2	100	0.1		26					0	37.5			
28-30	3 4 4 4	100	0.1							0	40			
30-32	5 12 24 96	75	0.3	Dark brown, fine SAND and SILT, trace root structures, wet, TOP SOIL Brown, fine SAND and GRAVEL, trace silt, wet	31					0	40			29.5 30.0
32-34	100/3	80	0.0	Brown, medium to coarse SAND and GRAVEL, wet AUGER REFUSAL AT 33.5 feet						0	40			33.5
					36									
					41									

WELL CONSTRUCTION: SAND

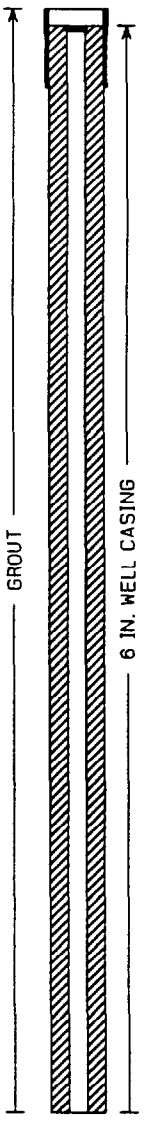
ATLANTIC

BORING LOG 2L MW 18D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/08/90
DATA COMPLETED: 08/15/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 77.67
PROTECTIVE CASING ELEVATION: 77.34
WELL ELEVATION: 77.34
WATER LEVEL: 8.55 (03/21/91)
DATUM: SUBASE
WEATHER: 80-85°, MOSTLY CLEAR, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				FOR OVERBURDEN SOIL DESCRIPTION SEE BORING LOG 2LMW18S	0									0.0	
					5										
					10										
					15										
					20										



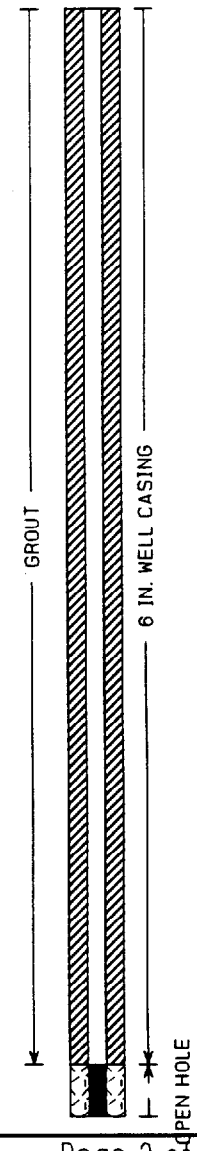
ATLANTIC

BORING LOG 2L MW 18D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/08/90
DATA COMPLETED: 08/15/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 77.67
PROTECTIVE CASING ELEVATION: 77.34
WELL ELEVATION: 77.34
WATER LEVEL: 8.55 (03/21/91)
DATUM: SUBASE
WEATHER: 80-85°, MOSTLY CLEAR, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
					26										
					31										
				BEDROCK	36									36.0	
					41										



BORING LOG 2L MW 18D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A LANDFILL
DATE STARTED: 08/08/90
DATA COMPLETED: 08/15/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 77.67
PROTECTIVE CASING ELEVATION: 77.34
WELL ELEVATION: 77.34
WATER LEVEL: 8.55 (03/21/91)
DATUM: SUBASE
WEATHER: 80-85°, MOSTLY CLEAR, HUMID
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				END OF BORING AT 49.03 feet	42, 47, 52, 57, 62									49.03	OPEN HOLE

ATLANTIC

BORING LOG 2D MW 10S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A DOWNSTREAM
DATE STARTED: 09/20/90
DATA COMPLETED: 09/20/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JOE RAAB
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 52.8
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 65°, CLEAR SKIES, LIGHT WIND
INSPECTOR: MICHAEL NEJDL
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	10 15 17 29	75	0.3	Brown, fine to coarse SAND, some silt, damp	0					0	40			0.0	
2-4	3 7 17 64	25	0.3	Red-brown, fine SAND and SILT, wet at 5.0 feet						0	40			3.0	
4-5	13 4 3 4	100	0.3							0	60				
				AUGER REFUSAL AT 5.0 feet NO WELL INSTALLED	5									5.0	
					10										
					15										
					20										

ATLANTIC

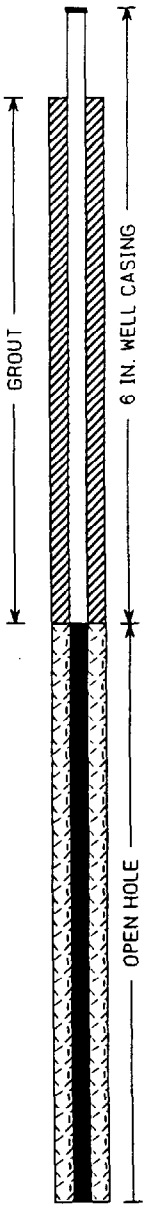
BORING LOG 2D MW 10D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A DOWNSTREAM
DATE STARTED: 09/24/90
DATA COMPLETED: 09/25/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 52.8
PROTECTIVE CASING ELEVATION: 54.52
WELL ELEVATION: 54.52
WATER LEVEL: 10.25 (03/21/91)
DATUM: SUBASE
WEATHER: 65°, CLEAR, COOL
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
				0.0-3.5 Light brown boulders and cobbles	0									0.0
				BEDROCK										3.5
					5									
					10									
					15									
					20									

WELL CONSTRUCTION



ATLANTIC

BORING LOG 2D MW 10D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A DOWNSTREAM
DATE STARTED: 09/24/90
DATA COMPLETED: 09/25/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 52.8
PROTECTIVE CASING ELEVATION: 54.52
WELL ELEVATION: 54.52
WATER LEVEL: 10.25 (03/21/91)
DATUM: SUBASE
WEATHER: 65°, CLEAR, COOL
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
					26									26.09	OPEN HOLE
				END OF BORING AT 26.09 feet											
					31										
					36										
					41										

ATLANTIC

BORING LOG 2D MW 11S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A DOWNSTREAM
DATE STARTED: 08/28/90
DATA COMPLETED: 08/28/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JON YEATON
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 45.4
PROTECTIVE CASING ELEVATION: 47.77
WELL ELEVATION: 46.85
WATER LEVEL: 44.75 (03/21/91)
DATUM: SUBASE
WEATHER: 75°, CLEAR SKIES
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS
0-2	1 1 1 1	75	0.0	Dark brown, fine SAND and SILT, trace roots, moist, TOP SOIL Light brown, fine SAND and SILT, rust colored mottling, trace roots, wet at 3.0 feet					0	30	
2-4	1 2 4 5	100	0.0						0	40	
4-6	8 11 13 18	100	0.2						0	60	
6-8	12 13 13 14	100	0.2	Grey, fine to medium SAND, some silt, rust colored mottling, wet					0	40	
8-10	8 10 12 12	100	0.2						0	40	
10-12	8 7 10 11	80	NA	Grey-brown, fine SAND and SILT, rust colored mottling, wet					NA	40	
12-14	5 9 18 16	100	0.0	Grey-brown, fine SAND and SILT, wet					0	60	
14-16	4 8 10 16	100	0.0						0	60	
16-18	35 41 100/4	75	0.0	Light brown, medium to coarse SAND, trace silt, wet AUGER REFUSAL AT 17.5 feet					0	40	

DEPTH (FT.): 0, 5, 10, 15, 20

LITHOLOGY / DEPTH (FT.): 0.0, 0.2, 6.0, 10.0, 16.0, 17.5

WELL CONSTRUCTION: GROUT, BENTONITE SEAL, 0.01 SLOTTED PVC, SAND

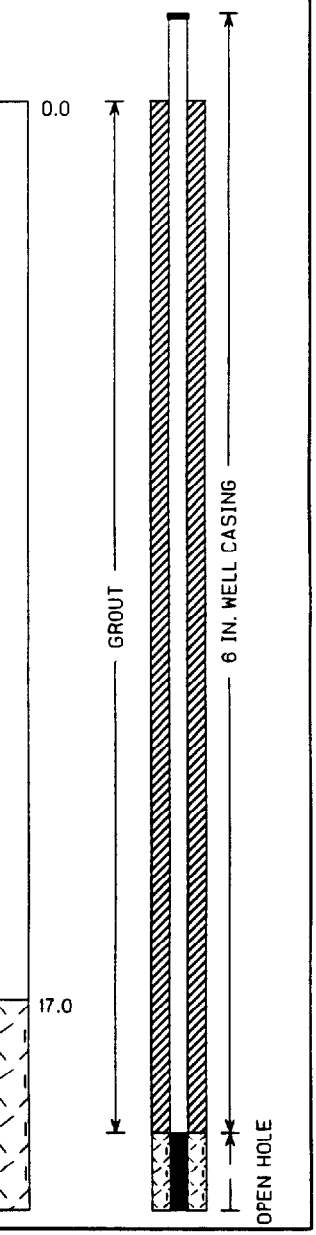
ATLANTIC

BORING LOG 2D MW 11D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A DOWNSTREAM
DATE STARTED: 09/24/90
DATA COMPLETED: 09/25/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 51.5
PROTECTIVE CASING ELEVATION: 53.20
WELL ELEVATION: 53.20
WATER LEVEL: 7.97 (03/21/91)
DATUM: SUBASE
WEATHER: 65°, COOL, CLEAR
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				FOR OVERBURDEN SOIL DESCRIPTION SEE BORING LOG 2DMW11D	0									0.0	
					5										
					10										
					15										
				BEDROCK	20									17.0	



ATLANTIC

BORING LOG 2D MW 11D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A DOWNSTREAM
DATE STARTED: 09/24/90
DATA COMPLETED: 09/25/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 51.5
PROTECTIVE CASING ELEVATION: 53.20
WELL ELEVATION: 53.20
WATER LEVEL: 7.97 (03/21/91)
DATUM: SUBASE
WEATHER: 65°, COOL, CLEAR
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
				END OF BORING AT 25.55 feet	26									25.55	OPEN HOLE
					31										
					36										
					41										

ATLANTIC

BORING LOG 2D MW 15S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A DOWNSTREAM
DATE STARTED: 09/19/90
DATA COMPLETED: 09/19/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JOE RAAB
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 42.2
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 65', OVERCAST
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
0-2	6 7 9 12	50	0.3	Dark brown, fine SAND and SILT, trace roots, damp, TOP SOIL	0									0.0	
				Brown, fine to medium SAND, some gravel, damp						0	50			0.25 1.0	
2-4	4 8 10 11	100	0.3	Red brown, fine SAND and SILT, moist											
				Grading to grey-brown color						0	60				
4-6	10 100/5	50	0.3	5.0-8.4 White to grey, fine grained gneiss, quartz, biotite, plagioclase, and potassium feldspar. Mamacoke Formation	5					0	50			5.0	
				8.4-12.6 Grading to dark grey, biotite rich, gneiss, occasional lenses of quartz and feldspars. Mamacoke Formation	10										
				12.6-23.8 White to grey, fine grained gneiss, quartz, biotite, plagioclase, and potassium feldspar. Mamacoke Formation	15										
					20										

ATLANTIC

BORING LOG 2D MW 15S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A DOWNSTREAM
DATE STARTED: 09/19/90
DATA COMPLETED: 09/19/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JOE RAAB
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

GROUND ELEVATION: 42.2
PROTECTIVE CASING ELEVATION: -
WELL ELEVATION: -
WATER LEVEL: -
DATUM: SUBASE
WEATHER: 65°, OVERCAST
INSPECTOR: ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				23.8-29.0 Grey to orange-pink, fine grained gneiss, grading to more potassium feldspar than previous core sections.	21 26										
				END OF CORE 29.0 ft.	31 36 41									29.0	

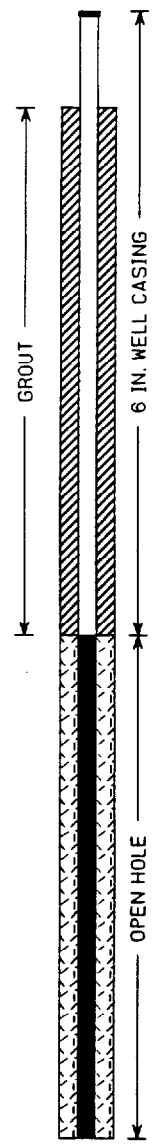
ATLANTIC

BORING LOG 2D MW 15D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A DOWNSTREAM
DATE STARTED: 09/18/90
DATA COMPLETED: 09/19/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 42.2
PROTECTIVE CASING ELEVATION: 44.09
WELL ELEVATION: 44.09
WATER LEVEL: 5.46 (03/21/91)
DATUM: SUBASE
WEATHER: 60°, CLEAR
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				0.0-4.0 NOT SAMPLED	0									0.0	
				BEDROCK	5									4.0	
					10										
					15										
				END OF BORING AT 19.51 feet	20									19.51	



ATLANTIC

BORING LOG 2D MW 16S

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A DOWNSTREAM
DATE STARTED: 09/18/90
DATA COMPLETED: 09/19/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: JOE RAAB
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

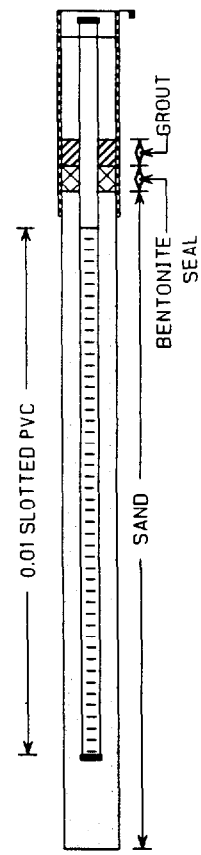
GROUND ELEVATION: 35.6
PROTECTIVE CASING ELEVATION: 38.08
WELL ELEVATION: 37.85
WATER LEVEL: 34.30 (03/21/91)
DATUM: SUBASE
WEATHER: 60°, CLEAR SKIES, VERY WINDY
INSPECTOR: LYNN METCALF AND ERIK NESS
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD (cpm)	SAMPLE ANALYSIS
0-2	5 7 10 11	50	0.2	Dark brown, fine SAND and SILT, trace roots, moist, TOP SOIL; Brown, medium to coarse SAND and GRAVEL, trace silt, moist					0	40	
2-4	6 9 10 11	30	0.4						0	50	
4-6	100/5	5	0.2						0	50	
6-8	26 30 13 7	50	0.2	Grey, fine to very fine SAND and SILT, wet					1	50	
8-10	6 20 31 45	60	0.2	Brown, fine to medium SAND and GRAVEL, trace silt, wet					1	40	
10-12	42 100/5	100	0.2						1	50	
12-14	100/5	100	0.2						1	40	
				AUGER REFUSAL AT 13.5 feet							

DEPTH (FT.): 0, 5, 10, 15, 20

LITHOLOGY / DEPTH (FT.): 0.0, 0.5, 6.0, 8.0, 13.5

WELL CONSTRUCTION



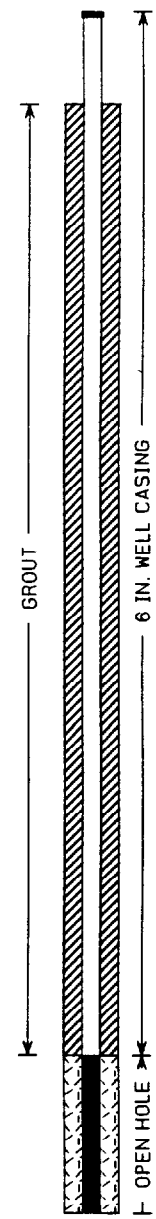
ATLANTIC

BORING LOG 2D MW 16D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A DOWNSTREAM
DATE STARTED: 09/13/90
DATA COMPLETED: 09/18/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 35.9
PROTECTIVE CASING ELEVATION: 37.69
WELL ELEVATION: 37.69
WATER LEVEL: 3.74 (03/21/91)
DATUM: SUBASE
WEATHER: 50-60°, CLEAR SKIES
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				FOR SOIL DESCRIPTION SEE BORING LOG 2DMW16S	0									0.0	
					5										
					10										
				BEDROCK										12.5	
					15										
					20										



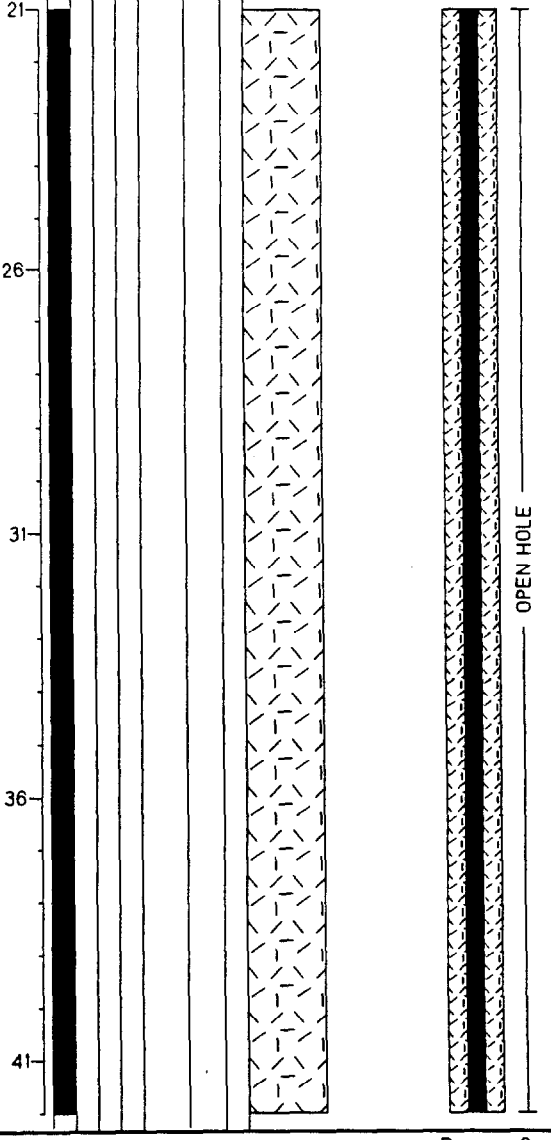
ATLANTIC

BORING LOG 2D MW 16D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A DOWNSTREAM
DATE STARTED: 09/13/90
DATA COMPLETED: 09/18/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 35.9
PROTECTIVE CASING ELEVATION: 37.69
WELL ELEVATION: 37.69
WATER LEVEL: 3.74 (03/21/91)
DATUM: SUBASE
WEATHER: 50-60°, CLEAR SKIES
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
					26										
					31										OPEN HOLE
					36										
					41										



ATLANTIC

BORING LOG 2D MW 16D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: AREA A DOWNSTREAM
DATE STARTED: 09/13/90
DATA COMPLETED: 09/18/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 35.9
PROTECTIVE CASING ELEVATION: 37.69
WELL ELEVATION: 37.69
WATER LEVEL: 3.74 (03/21/91)
DATUM: SUBASE
WEATHER: 50-60°, CLEAR SKIES
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					42										
					47										
					52										
					57										
				END OF BORING AT 59.91 feet	62									59.91	OPEN HOLE

ATLANTIC

OVER BANK DISPOSAL AREA (OBDA)

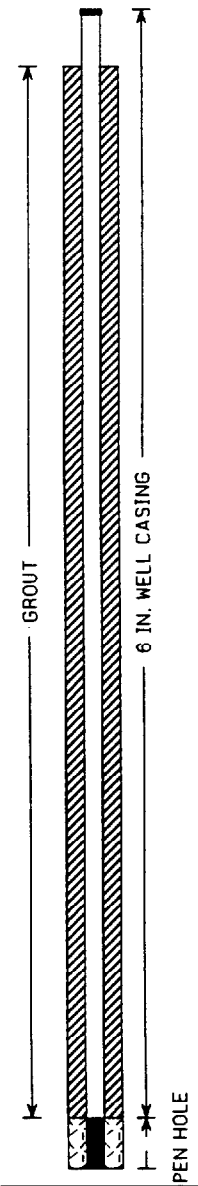
BORING LOG 3 MW 12D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: OVER BANK DISPOSAL AREA
DATE STARTED: 09/07/90
DATA COMPLETED: 09/10/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 41.10
PROTECTIVE CASING ELEVATION: 42.20
WELL ELEVATION: 42.20
WATER LEVEL: 0.5 (03/21/91)
DATUM: SUBASE
WEATHER: 70°, RAINING
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	LEL %	RAD (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
				FOR SOIL DESCRIPTION SEE BORING LOG 3MW12D	0									0.0
					5									
					10									
				BEDROCK	15									15.0
					20									

WELL CONSTRUCTION



ATLANTIC

BORING LOG 3 MW 12D

PROJECT: IR STUDY NSB - NLON
PROJECT NO: 1256-10
LOCATION: OVER BANK DISPOSAL AREA
DATE STARTED: 09/[illegible]/90
DATA COMPLETED: 0[illegible]/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC.
DRILLER: CRAIG CONNER
DRILLING METHOD: AIR ROTARY
SAMPLING METHOD:

GROUND ELEVATION: 41.10
PROTECTIVE CASING ELEVATION: 42.20
WELL ELEVATION: 42.20
WATER LEVEL: 0.5 (03/21/91)
DATUM: SUBASE
WEATHER: 70°, RAINING
INSPECTOR: AKHTER HOSSAIN AND LYNN METCALF
CHECKED BY: ERIK NESS

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISIUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	LEL %	RAD. (cpm)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
					21										
					26									26.1	OPEN HOLE
				END OF BORING AT 26.1 feet											
					31										
					36										
					41										

ATLANTIC

APPENDIX B

SUPPLEMENTAL SITE INVESTIGATION AREA A LANDFILL

DRAFT-FINAL
SUPPLEMENTAL SITE INVESTIGATION
AREA A LANDFILL

INSTALLATION RESTORATION PROGRAM
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CONNECTICUT

Prepared For:

Northern Division
Naval Facilities Engineering Command
10 Industrial Highway
Lester, PA 19113-2090

Navy Contract No.: N62472-88-C-1294

Prepared By:

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Atlantic Project No.: 2072-01-02

March 1995

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Attachment C: Laboratory Analytical Results

REMEDIAL ACTION SUPPLEMENTAL SITE INVESTIGATION

1.0 General Discussion

Supplemental investigation work on the Area A Landfill site was conducted after a Step II RI investigation of the DRMO was completed. A work plan was subsequently developed to fill data gaps as necessary to support preparation of an FS and remedial design (Phase II Work Plan, May 1993, Atlantic). Selected aspects of the work plan relevant to the remedial action for the Area Landfill soils operable unit were implemented prior to other portions of the work plan. The goal of this supplemental investigation, which is the subject of this report, is to gain a better definition on the extent of soil contamination in the vicinity of the bituminous concrete pad. These aspects are highlighted in Table 5-8 and Figure 5-3 of the Briefing Document, *Proposed Interim Remedial Actions* (Atlantic, May 1993). Succinctly, the additional data were collected by drilling 24 borings, field screening soil sample for PCBs, and conducting off-site laboratory analysis of 13 soil samples.

The field investigation results presented in this report will be included in the Phase II RI/FS for the Area A Landfill and will also be summarized in the FFS for the Area A Landfill operable unit (soils).

2.0 Site Investigation Procedures

This section provides detailed information on the procedures used to conduct the site investigation and laboratory analytical program. Procedures and sampling plan summaries are provided for the soils investigation, including the results of field analyses. A summary of the quality assurance/quality control program (QA/QC) is also provided.

2.1 Laboratory Analysis Program

The laboratory analysis program was implemented by PACE, Inc., of Hampton, New Hampshire. The work was completed in accordance with the Quality Assurance Project Plan (prepared by PACE and dated February 1993), which complied with the Navy's Naval Energy and Environmental Support Activity (NEESA) document 20.1-047B, *Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program.*

All applicable organic analyses were performed in accordance with U.S. EPA Contract Laboratory Program (CLP) Statement of Work (SOW ILM01.8), *Organic Analysis for Multi-Media, Multi-Concentration, Statement of Work, U.S. Contract Laboratory Program, U.S. EPA, March 1990.* Dioxin analysis was performed in accordance with U.S. EPA CLP Statement of Work (SOW) DFLM01.01.

All applicable inorganic analysis was performed in accordance with the U.S. EPA CLP Statement of Work (SOW ILM01.8), dated March 1990. Toxicity Characteristic Leachate Procedure (TCLP) extractions were performed on two soil samples in accordance with the procedures specified in 40 CFR, Section 261, Appendix II. Hazardous constituents were analyzed in the TCLP extract following U.S. EPA SW-846 protocol. The TCLP was established by the U.S. EPA to simulate the leaching of chemicals from a material disposed in a solid waste disposal area.

Tables 2-1, 2-2, and 2-3 summarize the target compound list (TCL) parameters and contract-required quantitation limits (CRQLs) for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and PCBs/pesticides, respectively. Actual laboratory detection limits are in some cases lower than the CRQLs listed in Tables 2-1, 2-2, and 2-3, due to instrument capabilities. Values reported between laboratory detection limits and the CRQL were qualified as such by the laboratory.

Table 2-4 is a summary of the target analyte list (TAL) parameters and contract-required detection limits (CRDLs) for inorganic analytes. Actual laboratory detection limits are, in most cases, lower than CRDLs listed in Table 2-4. Values reported between these limits were qualified as such by the laboratory.

TABLE 2-1
TARGET COMPOUND LIST: VOLATILE ORGANICS

Compound	CAS Number	Contract-Required Quantitation Limits (CRQL)	
		Water (ppb)	Soil/Sediment (ppb)
Chloromethane	74-87-3	2	10
Bromomethane	74-83-9	2	10
Vinyl Chloride	75-01-4	2	10
Chloroethane	75-00-3	2	10
Methylene Chloride	75-09-2	2	10
Acetone	67-64-1	5	10
Carbon Disulfide	75-15-0	1	10
1,1-Dichloroethene	75-35-4	1	10
1,1-Dichloroethane	75-34-3	5	10
1,2-Dichloroethene (total)	540-59-0	1	10
Chloroform	67-66-3	1	10
1,2-Dichloroethane	107-06-2	1	10
2-Butanone	78-93-2	5	10
1,1,1-Trichloroethane	71-55-6	1	10
Carbon Tetrachloride	56-23-5	1	10
Bromodichloromethane	75-27-4	1	10
1,2-Dichloropropane	78-87-5	1	10
cis-1,3-Dichloropropene	10061-01-5	1	10
Trichloroethene	79-01-6	1	10
Dibromochloromethane	124-48-1	1	10
1,1,2-Trichloroethane	79-00-5	1	10
Benzene	71-43-2	1	10
trans-1,3-Dichloropropene	10061-02-6	1	10
Bromoform	75-25-2	1	10
4-Methyl-2-pentanone	108-88-2	5	10
2-Hexanone	591-78-6	5	10
Tetrachloroethene	127-18-4	1	10
1,1,2,2-Tetrachloroethane	79-34-5	1	10
Toluene	108-88-2	1	10
Chlorobenzene	108-90-7	1	10
Ethyl Benzene	100-41-4	1	10
Styrene	100-42-5	1	10
Xylenes (total)	133-02-7	1	10

Notes:
1) Laboratory analysis procedures per U.S. EPA, 1990. *Organic Analysis for Multi-Media, Multi-Concentration, Statement of Work*, Revision 3/90. US Contract Laboratory Program. EPA/CLP, Washington, D.C.
2) Medium Concentration Soil/Sediment CRQLs for Volatile Compounds are 125 times the individual Low Concentration Soil/Sediment CRQL. The CRQL is the CLP Contract Required Quantitation Limit.
3) Specific detection limits are highly matrix-dependent. The Quantitation Limits listed herein are provided for guidance and may not always be achievable.
4) Quantitation Limits listed for soil/sediment are based on wet weight. The Quantitation Limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis as required by the contract, will be higher.
5) CAS number is chemical abstract service number.
6) ppb - parts per billion.

TABLE 2-2 TARGET COMPOUND LIST: SEMIVOLATILE ORGANICS			
Compound	CAS Number	Contract-Required Quantitation Limits (CRQL)	
		Water (ppb)	Soil/Sediment (ppb)
Phenol	108-95-2	10	330
bis(2-chloroethyl)ether	111-4-4	10	330
2-Chlorophenol	95-57-8	10	330
1,3-Dichlorobenzene	541-73-1	10	330
1,4-Dichlorobenzene	106-46-7	10	330
1,2-Dichlorobenzene	95-50-1	10	330
2-Methylphenol	95-48-7	10	330
bis(2-chloroisopropyl)ether	39638-32-9	10	330
4-Methylphenol	106-44-5	10	330
N-nitroso-di-n-propylamine	621-64-7	10	330
Hexachloroethane	67-72-1	10	330
Nitrobenzene	98-95-3	10	330
Isophorone	78-59-1	10	330
2-Nitrophenol	88-75-5	10	330
2,4-Dimethylphenol	105-67-9	10	330
bis(2-chloroethoxy)methane	111-91-1	10	330
2,4-Dichlorophenol	120-83-2	10	330
1,2,4-Trichlorobenzene	120-82-1	10	330
Naphthalene	91-20-3	10	330
4-Chloroaniline	106-47-8	10	330
Hexachlorobutadiene	87-68-3	10	330
4-Chloro-3-methylphenol	59-50-7	10	330
2-Methylnaphthalene	91-57-6	10	330
Hexachlorocyclopentadiene	77-47-4	10	330
2,4,6-Trichlorophenol	88-06-2	10	330
2,4,5-Trichlorophenol	95-95-4	25	800
2-Chloronaphthalene	91-58-7	10	330
2-Nitroaniline	88-74-4	25	800
Dimethyl Phthalate	131-11-3	10	330
Acenaphthylene	208-96-8	10	330
2,6-Dinitrotoluene	606-20-2	10	330
3-Nitroaniline	99-09-2	25	800
Acenaphthene	83-32-9	10	330
2,4-Dinitrophenol	51-28-5	25	800
4-Nitrophenol	100-02-7	25	800
Dibenzofuran	132-64-9	10	330

TABLE 2-2 (continued) TARGET COMPOUND LIST: SEMIVOLATILE ORGANICS			
Compound	CAS Number	Contract-Required Quantitation Limits (CRQL)	
		Water (ppb)	Soil/Sediment (ppb)
2,4-Dinitrotoluene	121-14-2	10	330
Diethylphthalate	84-66-2	10	330
4-Chlorophenyl-phenylether	7005-72-3	10	330
Fluorene	86-73-7	10	330
4-Nitroaniline	100-10-6	25	800
4,6-Dinitro-2-methylphenol	534-52-1	25	800
N-nitrosodiphenylamine	86-30-6	10	330
4-Bromophenyl-phenylether	101-55-3	10	330
Hexachlorobenzene	118-74-1	10	330
Pentachlorophenol	87-86-5	25	800
Phenanthrene	85-01-8	10	330
Anthracene	120-12-7	10	330
Di-n-butylphthalate	86-74-2	10	330
Fluoranthene	206-44-0	10	330
Pyrene	129-00-0	10	330
Butylbenzylphthalate	85-68-7	10	330
3,3-Dichlorobenzidine	91-94-1	10	330
Benzo(a)anthracene	56-55-3	10	330
Chrysene	218-01-9	10	330
bis(2-Ethylhexyl)phthalate	117-81-7	10	330
Di-n-octylphthalate	117-84-0	10	330
Benzo(b)fluoranthene	205-99-2	10	330
Benzo(k)fluoranthene	207-08-9	10	330
Benzo(a)pyrene	50-32-8	10	330
Indeno(1,2,3-cd)pyrene	193-39-5	10	330
Dibenzo(a,h)anthracene	53-70-3	10	330
Benzo(g,h,i)perylene	191-24-2	10	330
Carbazole	86-74-8	10	330

Notes:
1) Laboratory analysis procedures per U.S. EPA, 1990. *Organic Analysis for Multi-Media, Multi-Concentration, Statement of Work,* Revision 3/90. US Contract Laboratory Program. EPA/CLP, Washington, D.C.
2) Medium Concentration Soil/Sediment CRQLs for Semivolatile Organics are 60 times the individual Low Concentration Soil/Sediment CRQL. The CRQL is the CLP Contract Required Quantitation Limit. The CRQL is the CLP Contract Required Quantitation Limit.
3) Specific detection limits are highly matrix-dependent. The Quantitation Limits listed herein are provided for guidance and may not always be achievable.
4) Quantitation Limits listed for soil/sediment are based on wet weight. The Quantitation Limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis as required by the contract, will be higher.
5) CAS number is chemical abstract service number.
6) ppb - parts per billion.

TABLE 2-3
TARGET COMPOUND LIST: PESTICIDES/PCBs

Compound	CAS Number	Contract-Required Quantitation Limits (CRQL)	
		Water (ppb)	Soil/Sediment (ppb)
alpha-BHC	319-84-6	0.05	1.7
beta-BHC	319-85-7	0.05	1.7
delta-BHC	319-86-8	0.05	1.7
gamma-BHC	58-89-9	0.05	1.7
Heptachlor	76-44-8	0.05	1.7
Aldrin	309-00-2	0.05	1.7
Heptachlor Epoxide	1024-57-3	0.05	1.7
Endosulfan I	959-98-8	0.05	1.7
Dieldrin	60-57-1	0.10	3.3
4,4'DDE	72-55-9	0.10	3.3
Endrin	72-20-8	0.10	3.3
Endosulfan II	33213-65-9	0.10	3.3
4,4'DDD	72-54-8	0.10	3.3
Endosulfan Sulfate	1031-07-8	0.10	3.3
4,4'DDT	50-29-3	0.10	3.3
Methoxychlor	72-43-5	0.50	17.0
Endrin Ketone	53494-70-5	0.10	3.3
Endrin Aldehyde	7421-36-3	0.10	3.3
alpha-chlordane	5103-71-9	0.05	1.7
gamma-chlordane	5103-74-2	0.05	1.7
Toxaphene	8001-35-2	5.0	170.0
PCB Aroclor-1016	12674-11-2	1.0	33.0
PCB Aroclor-1221	11104-28-2	2.0	67.0
PCB Aroclor-1232	11141-16-5	1.0	33.0
PCB Aroclor-1242	53469-21-9	1.0	33.0
PCB Aroclor-1248	12672-29-6	1.0	33.0
PCB Aroclor-1254	11097-69-1	1.0	33.0
PCB Aroclor-1260	11096-82-5	1.0	33.0

Notes:
1) Laboratory analysis procedures per U.S. EPA, 1990. *Organic Analysis for Multi-Media, Multi-Concentration, Statement of Work,* Revision 3/90. US Contract Laboratory Program. EPA/CLP, Washington, D.C.
2) Medium Concentration Soil/Sediment CRQLs for Pesticide/PCB TCL Compounds are 15 times the individual Low Concentration Soil/Sediment CRQL. The CRQL is the CLP Contract Required Quantitation Limit. The CRQL is the CLP Contract Required Quantitation Limit.
3) Specific detection limits are highly matrix-dependent. The Quantitation Limits listed herein are provided for guidance and may not always be achievable.
4) Quantitation Limits listed for soil/sediment are based on wet weight. The Quantitation Limits calculated by the laboratory for soil/sediment, calculated on a dry-weight basis as required by the contract, will be higher.
5) CAS number is chemical abstract service number.
6) ppb - parts per billion.

TABLE 2-4 TARGET ANALYTE LIST: INORGANICS	
Compound	**Contract-Required Detection Limit (CRDL) Water (ppb)**
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5,000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	3
Magnesium	5,000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5,000
Selenium	5
Silver	10
Sodium	5,000
Thallium	10
Vanadium	50
Zinc	20
Boron	500
Cyanide	10

Notes: 1) Laboratory analysis procedure per *Contract Laboratory Program Inorganic Analysis for Multi-Media, Multi-Concentration, Statement of Work*, Revision 3/90, U.S. Contract Laboratory Program, U.S. EPA, 1990.
2) Boron is not a TAL Compound under CLP and, therefore, the value reported is a method detection limit and not a CRDL.
3) ppb - parts per billion.

Soils at two sample locations were also tested for several design parameters including pH, percentage of ash, percentage of moisture, percentage of organic carbon, specific gravity, cation exchange capacity, and grain-size distribution.

2.2 Surveying and Mapping

Methodologies and references used for surveying and mapping are described in subsections 2.2.1 and 2.2.2, respectively.

2.2.1 Surveying

Surveying for the project was provided by Criscuolo/Shepard Associates, P.C., North Branford, Connecticut (Criscuolo/Shepard). Criscuolo/Shepard established elevations and coordinates for all test borings.

All elevations were based on trigonometric leveling among established geodetic monuments. All vertical control was double-run to confirm final elevations. Elevations are accurate to Class V-2. The geodetic control is shown on a map titled *Base Traverse and Monuments*, NAVFAC Drawing No. 2,037,619; Code Identification No. 80091; Size: F; Contract No. N62472-78-C-3422(ES), Sheet 1 of 2, prepared for the Department of the Navy by Kieltyka, Woodis & Pike Land Surveyors. The datum is mean low water, which is 1.39 feet below the standard United States Geological Survey (USGS) datum.

Locations were based on field methods that conform to the standards of a Class A-2 survey. The Connecticut State Plane Coordinate System was used, based on the previously mentioned monumentation.

2.2 Mapping

Map information (e.g., topography, buildings, utilities) was developed, based on an aerial survey performed and prepared by Golden Aerial Surveys, Inc. of Newtown, Connecticut, and an on-site ground survey performed by Criscuolo/Shepard. These maps have a scale of 1 inch = 20 feet and a one-foot contour interval.

AutoCAD™, a computer-aided design software package, was used to develop site plans, cross sections, and other data presentation plans. The base maps were developed from the Golden Aerial Surveys, Inc. maps. Scales are noted on the plans; contour intervals are at one foot except as noted on the plans.

2.3 Soils Investigation

The inclusive subsections herein, subsections 2.3.1 through 2.3.2, describe the objectives, methodologies, and scope of work for sampling and analysis of test borings.

2.3.1 Test Borings

The objectives of the test boring program were to characterize further the extent and degree of soil contamination at the site in the vicinity of the bituminous concrete pad. The drilling was performed by Columbia Environmental Drilling Company of Columbia, Connecticut (Columbia). Atlantic personnel inspected the drilling, screened and collected soil samples for analysis, and logged sample data.

A total of 24 borings were installed during October and November of 1993 at the Area A Landfill Bituminous Concrete Pad site. Borings were extended to a depth of 16 feet unless refusal was encountered at a shallower depth. The borings were advanced using 4.25-inch inner diameter (I.D.)/hollow-stem augers. Samples were collected continuously with a three-inch diameter, split-spoon sampler. Atlantic personnel logged physical characteristics such as color, density, lithology, and moisture, as well as any visual evidence of contamination (i.e., staining or sheen) according to Atlantic Procedure 1030. Each sample was screened in the field for VOCs with an HNu PI 101 Organic Vapor Analyzer, and for PCBs with a gas chromatograph.

Atlantic personnel selected a total of 13 subsurface soil samples from the 24 borings for laboratory analysis. Samples were selected as specified in the Phase II Work Plan. Every sample was analyzed for the following parameters: VOCs, SVOCs, pesticides, PCBs, and inorganics. Selected soil samples were also analyzed for dioxin and the following engineering parameters: grain-size distribution, moisture content, specific gravity, organic content, cation exchange capacity, pH, and total organic carbon content. Two samples were also analyzed by the Toxicity Characteristic Leachate Procedure (TCLP) for all toxicity constituents. Specific analyses performed, soil-sampling intervals, and sampling rationale are provided in Table 2-5. PCB analytical and screening results are also summarized in Table 2-5 and are further discussed in subsection 2.3.2.

The test boring logs are provided in Attachment A. The logs provide the physical characteristics and soil classification, density information, observations of visual contamination, organic vapor screening results, and PCB field-screening data.

2.3.2 Field Screening Using Gas Chromatography

A gas chromatograph (GC) was used in the field to screen soil samples for PCBs to select samples to be analyzed in the off-site laboratory and to aid in the delineation of PCB contamination. A soil sample was collected from each split-spoon and analyzed for PCBs using a Hewlett Packard gas chromatograph (HP 5890 Series II) in accordance with U.S. EPA Method FM-18, as specified in the Field Sampling Plan. Each sample was extracted and analyzed on two separate capillary columns, one column for primary analysis and the second for confirmation analysis. GC-field screening results for the determination of PCB concentrations are reported in Table 2-5. Laboratory analytical sample selection was weighted toward samples having elevated PCB concentrations, as determined by GC field-screening analysis. The field-screening data correlated directly with analytical data received from the laboratory indicating areas of elevated PCBs in soil. The presence of unknown interference compounds may have slightly obscured the results from several sampling locations; these sample points were sent to the laboratory for additional confirmation.

TABLE 2-5
SAMPLING PROGRAM SUMMARY
AREA A BITUMINOUS CONCRETE PAD

Sample ID	Sample Depth (ft)	Sample Selection Rationale or Comments	VOC	SVOC	Inor-ganics	Pesti-cides	PCBs	TCLP VOC	TCLP SVOC	TCLP Inorg-anic	TCLP PEST	TCLP PCB	Dioxin	PCB Field Screening (ppm)	Analyt-ical PCBs (ppm)	Engin-eering
							SOILS									
2LTB8	0-2	Field-screening results indicate no PCBs detected, not sampled.												ND		
	2-4													ND		
	4-6													ND		
	6-8													ND		
	8-10													ND		
	10-12													ND		
	12-14													ND		
	14-16													ND		
	16-18													NA		
	18-20													NA		
2LTB9	0-2	No PCBs detected in boring sample collected from 0-2 interval as specified in Work Plan.	•	•	•	•	•							BDL	0.160	
	2-4													BDL		
	4-6													BDL		
2LTB10	0-2	Field-screening results indicate no PCBs detected, not sampled.												ND		
	2-4													ND		
	4-6													ND		
	6-8													NA		
	8-10													NA		
	10-12													ND		
	12-14													ND		
	14-16													ND		
2LTB11	0-2	Field-screening results indicate no PCBs detected, not sampled.												ND		
	2-4													ND		
	4-6													ND		
	6-8													ND		
	8-10													ND		
	10-12													ND		
	12-14													ND		
	14-16													ND		

TABLE 2-5 (continued)
SAMPLING PROGRAM SUMMARY
AREA A BITUMINOUS CONCRETE PAD

Sample ID	Sample Depth (ft)	Sample Selection Rationale or Comments	VOC	SVOC	Inor-ganics	Pesti-cides	PCBs	TCLP VOC	TCLP SVOC	TCLP Inorg-anic	TCLP PEST	TCLP PCB	Dioxin	PCB Field Screening (ppm)	Analyt-ical PCBs (ppm)	Engin-eering
2LTB12	0-2	Field-screening results indicate no PCBs detected, not sampled.												ND		
	2-4													ND		
	4-6													ND		
	6-8													ND		
	8-10													ND		
	10-12													ND		
	12-14													ND		
	14-16													ND		
2LTB13	0-2	No PCBs detected in boring; sample collected for dioxin as specified in Work Plan.	•	•	•	•	•						•	BDL	0.220	
	2-4													BDL		
	4-6													ND		
	6-8													ND		
	8-10													ND		
	10-12													NA		
	12-14													NA		
	14-16													ND		
2LTB14	0-2	Field-screening results indicate very low PCBs; not sampled.												1.4		
	2-4													BDL		
	4-6													BDL		
	6-8													BDL		
	8-10													BDL		
	10-12													BDL		
	12-14													BDL		
	14-16													ND		
2LTB15	0-2	Field-screening results indicate PCBs below detection levels; not sampled.												BDL		
	2-4													BDL		
	4-5.5													ND		
2LTB16	0-2	No PCBs detected in boring; sample collected from 0-2 interval as specified in Work Plan.	•	•	•	•	•							BDL	0.380	
	2-4													ND		
	4-6															

TABLE 2-5 (continued)
SAMPLING PROGRAM SUMMARY
AREA A BITUMINOUS CONCRETE PAD

Sample ID	Sample Depth (ft)	Sample Selection Rationale or Comments	VOC	SVOC	Inor-ganics	Pesti-cides	PCBs	TCLP VOC	TCLP SVOC	TCLP Inorg-anic	TCLP PEST	TCLP PCB	Dioxin	PCB Field Screening (ppm)	Analyt-ical PCBs (ppm)	Engin-eering
2LTB17	0-2	No PCBs detected in boring; collected sample from 0-2 interval as specified in Work Plan. Engineering sample collected to represent surface soil conditions.	•	•	•	•	•							BDL	0.087	•
	2-4													ND		
	4-6													ND		
	6-8													ND		
	8-10													ND		
	10-12													ND		
	12-14													ND		
	14-16													ND		
2LTB18	0-2	Highest level of PCBs in boring (0.8 ppm), based on field-screening results.	•	•	•	•	•	•	•	•	•	•		0.8	0.490	
	2-4													BDL		
	4-6													BDL		
	6-8													ND		
	8-10													ND		
	10-12													ND		
	12-14													ND		
	14-16													ND		
2LTB19	0-2													BDL		
	2-4	Highest level of PCBs in boring (5.4 ppm), based on field-screening results.	•	•	•	•	•							5.4	1.20	
	4-6	Took engineering sample from this interval to determine characteristics of soils at depth.												BDL		•
	6-8													BDL		
	8-10													*		
	10-12													NA		
	12-14													BDL		
	14-16													BDL		
2LTB20	0-2													ND		
	2-4													ND		
	4-6													BDL*		
	6-8	Sampled interval showing interference on GC that could mask PCBs.	•	•	•	•	•							BDL*	0.30	
	8-10													NA		

TABLE 2-5 (continued)
SAMPLING PROGRAM SUMMARY
AREA A BITUMINOUS CONCRETE PAD

Sample ID	Sample Depth (ft)	Sample Selection Rationale or Comments	VOC	SVOC	Inor-ganics	Pesti-cides	PCBs	TCLP VOC	TCLP SVOC	TCLP Inorg-anic	TCLP PEST	TCLP PCB	Dioxin	PCB Field Screening (ppm)	Analyt-ical PCBs (ppm)	Engin-eering
2LTB20 (cont'd)	10-12													ND		
	12-14													NA		
	14-16													ND		
2LTB21	0-2	Field-screening results indicate PCBs below detection levels; not sampled.												BDL		
	2-4													BDL		
	4-6													BDL		
	6-8													BDL		
	8-10													BDL		
	10-12													BDL		
	12-14													BDL		
	14-16													BDL		
2LTB22	0-2													BDL		
	2-4													BDL		
	4-6													NA		
	6-8	Highest level of PCBs in boring (3.1 ppm).	•	•	•									3.1		
	8-10	Sampled this interval to obtain analytical data to supplement field-screening data from the interval above.				•	•							NA	0.099	
	10-12													NA		
	12-14													ND		
	14-16													ND		
2LTB23	0-2													ND		
	2-4													BDL		
	4-6	Took composite sample from intervals with highest PCB reading (130 ppm in 4-6 and 50+ ppm in 6-8) due to lack of sample volume in both intervals.	•	•	•	•	•						•	130	51.0	
	6-8													50+		
	8-10													37		
	10-12													ND		
	12-14													ND		
	14-16													ND		
2LTB24	0-2	Field-screening results indicate PCBs below detection levels; not sampled.												BDL		
	2-4													0.82		

TABLE 2-5 (continued)
SAMPLING PROGRAM SUMMARY
AREA A BITUMINOUS CONCRETE PAD

Sample ID	Sample Depth (ft)	Sample Selection Rationale or Comments	VOC	SVOC	Inor-ganics	Pesti-cides	PCBs	TCLP VOC	TCLP SVOC	TCLP Inorg-anic	TCLP PEST	TCLP PCB	Dioxin	PCB Field Screening (ppm)	Analyt-ical PCBs (ppm)	Engin-eering
2LTB24 (cont'd)	4-6													BDL		
	6-8													NA		
	8-10													ND		
	10-12													ND		
	12-14													ND		
2LTB25	0-2													BDL		
	2-4													NA		
2LTB26	0-2													BDL		
	2-4													BDL		
	4-5.2	Highest PCB level in boring (2.0 ppm), based on field-screeing results.	•	•	•	•	•	•	•	•	•	•		2.0	0.049	
2LTB27	0-2	Field-screening results indicate PCBs were not detected or below detection limits; not sampled.												ND		
	2-4													BDL		
	4-6													BDL		
	6-8													ND		
	8-10													ND		
2LTB28	0-2													BDL		
	2-4													BDL		
	4-6	Highest PCB level in boring (37 ppm), based on field screening results.	•	•	•	•	•							37	10.60	
	6-8													28		
	8-10													31		
	10-12													BDL		
	12-14													ND		
	14-16													ND		
2LTB29	0-2													BDL		
	2-4													BDL		
	4-6													BDL		
	6-8													BDL		
	8-10													BDL		
	10-12	Sampled this interval due to presence of unknown contaminants detected in GC.	•	•	•	•	•							BDL*	0.40	
	12-14													BDL*		
	14-16													ND		

TABLE 2-5 (continued)
SAMPLING PROGRAM SUMMARY
AREA A BITUMINOUS CONCRETE PAD

Sample ID	Sample Depth (ft)	Sample Selection Rationale or Comments	VOC	SVOC	Inor-ganics	Pesti-cides	PCBs	TCLP VOC	TCLP SVOC	TCLP Inorg-anic	TCLP PEST	TCLP PCB	Dioxin	PCB Field Screening (ppm)	Analyt-ical PCBs (ppm)	Engin-eering
2LTB30	0-2	Field-screening results indicate PCBs below detection limits, not sampled.												BDL		
	2-3.16													BDL		
2LTB31	0-2													BDL		
	2-4													BDL		
	4-6													BDL		
	6-8													BDL		
	8-10	Sampled this interval due to presence of unknown contaminants detected on GC.	•	•	•	•	•							*	3.80	
	10-12													NA		
	12-14													BDL		
	14-16													ND		
BITUMINOUS CONCRETE																
2LC1	0-0.1	Sampled in area of staining as specified in Work				•	•							NA	ND	
2LC2	0-0.1	Sampled in area of staining as specified in Work				•	•							NA	0.490	
2LC3	0-0.1	Sampled in area of staining as specified in Work				•	•							NA	ND	
2LC4	0-0.1	Sampled in area of staining as specified in Work				•	•							NA	0.340	

* Contains interference components (unknowns)

2.4 Quality Assurance/Quality Control (QA/QC)

The project was conducted in accordance with the approved Quality Assurance Project Plan (QAPP) prepared by PACE and dated February 1993. Development of the QAPP was based on guidance provided in *Sample and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program*, NEESA 20.2-047B.

The program implemented at the NSB-NLON was performed under NEESA Level D Guidelines for 10 percent of the data. This guideline is equivalent to Data Quality Objectives (DQO) Level 4 as defined by the U.S. EPA. Level D requires the strict use of extensive and detailed analytical protocols and data validation procedures. The remainder (90 percent) of the analyses and data validation was performed under NEESA Level C guidelines which, for this project, required the use of CLP analyses with less stringent data validation protocols.

Data validation reports are provided in Attachment B. The Quality Assurance/Quality Control (QA/QC) program is summarized in subsections 2.4.1 through 2.4.3.

2.4.1 Field Quality Control (QC) Samples

The project QA/QC plan specified the collection of field QA/QC samples, including field duplicates, referee duplicates, trip blanks, field blanks, and equipment rinsates.

Referee duplicate samples were collected by an U.S. EPA oversight contractor. To date, final results of the referee duplicate analyses have not been received.

Trip blanks contained deionized laboratory water and were shipped from the laboratory to the field and back. The equipment rinsates consisted of distilled water utilized as a final rinsate in the decontamination procedures. The field blanks were samples of water used by the driller and water used during equipment decontamination.

The analyses of the trip blanks indicated the presence of low levels of volatile organics but did not demonstrate any significant problems. Analysis of the equipment rinsates indicated the presence of low levels of volatile organics, semivolatile organics, pesticides, and metals and therefore caused some results to be qualified as nondetected.

Matrix spike and matrix-spike duplicates were also analyzed as part of the laboratory QA/QC plan. Matrix spikes and matrix-spike duplicates were analyzed for volatiles, semivolatiles and pesticides/PCBs, TAL metals, cyanide, and boron, at a frequency of one in 20 samples of a similar matrix or one per batch of samples, whichever was greater. The duplicate and matrix-spike analyses frequency for sample delivery groups was acceptable.

The types of quality control samples, the specified frequencies of collection, and the sample quantities collected for this investigation are summarized in Table 2-6.

TABLE 2-6 SUMMARY OF QA/QC SAMPLES		
Sample Type	**Specified Frequency**	**Actual Sample Quantity**
Field Duplicates	10% per matrix	2
Referee Duplicates	As determined by U.S. EPA	0
Equipment Rinsates	Collect one per day, analyze every other day. Analyze remaining samples if pertinent analytes are found in the rinsates.	5
Trip Blanks	One per cooler containing VOC samples.	7
Field Blanks	One per source of decontamination and drilling water.	2

Notes:
1) Matrix spikes and matrix-spike duplicates were performed at a frequency of 5% per matrix for organic analyses.
2) Matrix spikes and duplicates were performed at a frequency of 5% per matrix for inorganic analyses.

2.4.2 Data Validation

Data validation involved a review and evaluation of both field and laboratory information, including: laboratory-generated reporting forms; raw field and analytical quality control data; analytical results; and matrix effects. Qualifiers were assigned to data, if appropriate, based on the information review. Data qualifiers were transcribed on the laboratory database and subsequently added to any of the data tables generated. A summary of the data qualifiers is provided in Table 2-7. Only validated data qualifiers are presented in the report analytical summaries; however, both sets of qualifiers are presented in the complete data summaries in Attachment B.

A minimum of ten percent of the data generated was validated under Navy Level D requirements (DQO Level 4), as presented in the NEESA document entitled *Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program*, NEESA 20.2-047B. The remaining data generated were reviewed under Navy Level C requirements, based on NEESA 20.2-047B guidelines. Level C validation was performed primarily from the information provided in the data package reporting forms. Reasons for qualification of data are discussed in further detail in Attachment B.

2.4.3 Data Quality Objectives

Data validation was used to evaluate whether the data quality objectives (DQOs) for all measurements (field and laboratory) had been reached. The DQOs include considerations of precision, accuracy, and completeness, as defined in the following paragraphs of this subsection. Attachment B summarizes the qualifications made to the analytical data.

TABLE 2-7 DATA QUALIFIERS	
Laboratory Data Qualifiers	
B	(organics) Compound was detected in the associated blank.
B	(inorganics) Compound concentration is between the instrument detection limit and the CRDL.
C	GC result was confirmed by GC/MS.
D	On a Form 2: surrogate was diluted out. On a Form 1: data from a secondary dilution (DL). Compare to data on the Form 1 of the primary dilution.
E	Compound was detected above the upper limit of the instrument calibration.
I	Interference prevents quantitation.
J	Compound concentration is an estimate. Either the compound was identified positively as a trace value, or it is a nontarget for which no calibration was performed.
N	The identification given for the GC/MS nontarget compound is based on presumptive evidence (mass-spectral matching) only.
P	There is greater than a 25% concentration difference between quantitation on the primary and confirmatory GC columns. The lower value was reported.
U	Compound was analyzed for but not detected at the listed concentration.
X-Z	Qualifiers with definitions explained in the narrative.
Validated Data Qualifiers	
J	Estimated value.
U	Nondetected.
R	Rejected result based on data validation guidelines.

Precision is a test of the repeatability of a measurement, and it is based upon the results of field or laboratory duplicates. Field precision is considered acceptable if the relative percent difference (RPD) between two duplicate samples is within +/-30 percent (aqueous samples) or +/-50 percent (soil samples). Laboratory precision is considered acceptable if the RPD between two duplicate samples is with +/- 20 percent (aqueous samples) or +/- 35 percent (soil samples). RPDs were calculated as part of the data-validation process. No results were rejected based on results for precision.

Accuracy of analysis was determined by the evaluation of matrix spike and matrix-spike duplicate recoveries of known quantities. The degree of accuracy and recovery of an analyte expected for the analysis of QA samples and spiked samples is dependent upon the matrix, method of analysis, and compound or element being determined in the analysis. Unless otherwise specified, the QC objective for accuracy is a recovery of 75 to 125 percent. Accuracy calculations, prepared by the laboratory, are provided in the laboratory analytical package. Analytes exhibiting values higher or lower than this range were estimated in associated samples. No results were rejected based on accuracy considerations.

Completeness is a measurement of valid data obtained relative to the total amount of data generated. The QC objective for data completeness, as a percentage of valid data reported, was equal to or more than 90 percent. Only 0.3 percent of all data was rejected, corresponding to a completeness of 99.7 percent.

Based upon consideration of precision, accuracy, and completeness, the data quality objectives for this project were met or exceeded.

3.0 Site Investigation Results

3.1 Introduction

This subsection presents an evaluation of the chemical analytical data. The chemical concentrations are compared to ARARs and "to be considered" (TBC) values. These regulations refer to cleanup standards and other substantive environmental protection criteria promulgated by law, along with relevant guidance criteria. For metals in soil analyzed on a mass weight basis, soil concentrations are also compared to estimated background metal concentrations in soils. Further discussion on state and federal laws and guidance is presented in subsection 3.1.1. Background concentrations for metals are discussed in subsection 3.1.2. Complete laboratory analytical summary reports are provided in Attachment C.

3.1.1 Applicable or Relevant and Appropriate Requirements

CERCLA, or Superfund, cleanups pursuant to Section 121 (d) of Superfund Amendments and Reauthorization Act of 1986 (SARA) must attain Federal and State ARARs. As defined further in the NCP, applicable requirements mean those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, requirement, or other circumstance at a CERCLA site.

If a requirement is not applicable, it still may be relevant and appropriate. Relevant and appropriate requirements mean those cleanup standards that address problems or situations sufficiently similar to those encountered at the CERCLA site, in that their use is well suited to the particular site.

In accordance with U.S. EPA guidance (CERCLA Compliance with Other Laws Manual, U.S. EPA, August 1989), ARARs are grouped into three categories: chemical-specific, location-specific, and action-specific.

In addition to ARARs, other state or federal advisories, criteria, or guidance can be identified as "to be considered" (TBC) for a particular release. The TBC category consists of any state or federal guidance that may be useful in evaluating site chemical concentrations or developing a remedy. The chemical-specific values for TBCs are included as a screening criteria in this report. There are no chemical-specific ARAR values for soils. Final decisions will consider these TBCs; however, they will weigh more heavily on ARARs and health-and-environmental risk assessment. The sources of TBCs used in this report are primarily from CTDEP's December 1994 Proposal for Connecticut Clean-up Standard Regulations. Other TBCs are as noted.

3.1.2 Inorganic Background Concentrations

Inorganic background concentrations were established using procedures outlined in the Atlantic Work Plan (Atlantic, October 1992), as modified by a memorandum dated February 10, 1993, and as approved in a memorandum dated March 24, 1993. These site-specific values are necessary to allow for a comparison of metal concentrations (mass weight basis) detected at each site to naturally occurring background concentrations. These background concentrations do not fall in the ARAR or TBC category because they are not federal or state law or guidance. However, this method is an established procedure to evaluate inorganic concentrations at a site. Values above background are most likely related to site usage.

The upper value detected in the range for each constituent was used to establish the background level. These background levels are presented in Table 3-1. Background soil samples were collected from undisturbed areas on and around the submarine base. Sample locations are represented in Figure 3-1. Two samples at discrete depths (0 to 2 feet and 2 to 4 feet) were collected at each location. A total of 16 samples were used in each calculation to determine the background level. The site-specific values developed are lower than those prepared by USGS for the Eastern U.S. (Shacklette and Boerngen), which were used in the previous Phase I RI.

3.2 Area A Landfill Bituminous Concrete Pad

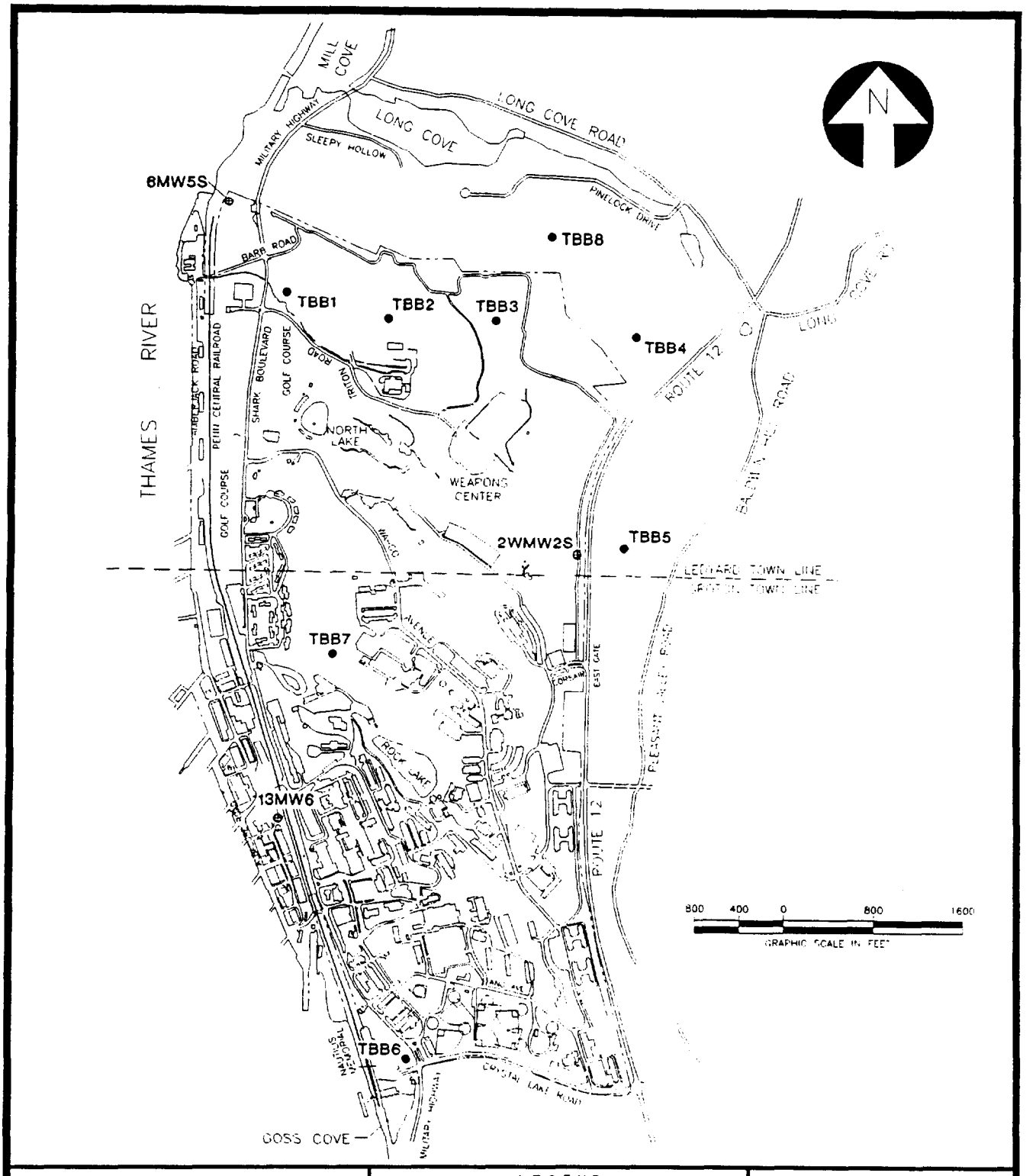
The field investigation at this site consisted of test boring installation and soil sample collection and analysis. Sampling locations are depicted in Figure 3-2. Thirteen subsurface soils were collected from 24 test boring locations at the site and 4 samples of the bituminous concrete pad were collected. The site analytical program for the samples are summarized in subsection 2.3.1 and Table 2-5. Analytical results are summarized in Tables 3-2 through 3-6. Complete results are provided in Appendix C. Sampling locations are represented in Figure 3-2.

The Area A Landfill Bituminous Concrete Pad soils were screened in the field for PCBs by gas chromatography (GC) and for organic vapors by an HNu with an 11.7 eV detector. The field-screening results are shown in the boring logs (Appendix A) and Table 2-5 for PCB results. The goal of field-screening is to facilitate the selection of the most highly contaminated soils when visual and olfactory evidence is absent and to aid in the delineation of PCB contamination.

The soil borings show the site stratigraphy to a depth of approximately 16 feet. The soils at the Area A Landfill Bituminous Concrete Pad primarily consist of fill material which overlays a fine sand and silt layer (dredge spoils). Fill material was observed in all borings and frequently contained wood, brick fragments, plastic, metal, concrete and glass to depths of 16 feet. During drilling activities, groundwater was observed to be between 5 and 10 feet below ground surface.

TABLE 3-1 NATURAL SITE-SPECIFIC BACKGROUND LEVELS FOR INORGANIC COMPOUNDS	
Parameter	**Background Level**
Aluminum	17,600
Antimony	2.05
Arsenic	3.6
Barium	57.2
Beryllium	0.76
Cadmium	0.24
Calcium	499
Chromium	21.5
Cobalt	8
Copper	25.6
Iron	17,200
Lead	17.5
Magnesium	3,650
Manganese	188
Mercury	0.05
Nickel	10
Potassium	2,580
Selenium	0.80
Silver	0.385
Sodium	41
Thallium	0.29
Vanadium	35.1
Zinc	31.3
Boron	5.8

1) ppm - parts per million.



INSTALLATION RESTORATION STUDY NAVAL SUBMARINE BASE - NEW LONDON GROTON, CT	LEGEND ● 13MW6 - EXISTING MONITORING WELL ● TBB7 - TEST BORING	FIGURE 3-1 BACKGROUND SAMPLING LOCATIONS ATLANTIC ENVIRONMENTAL SERVICES, INC.

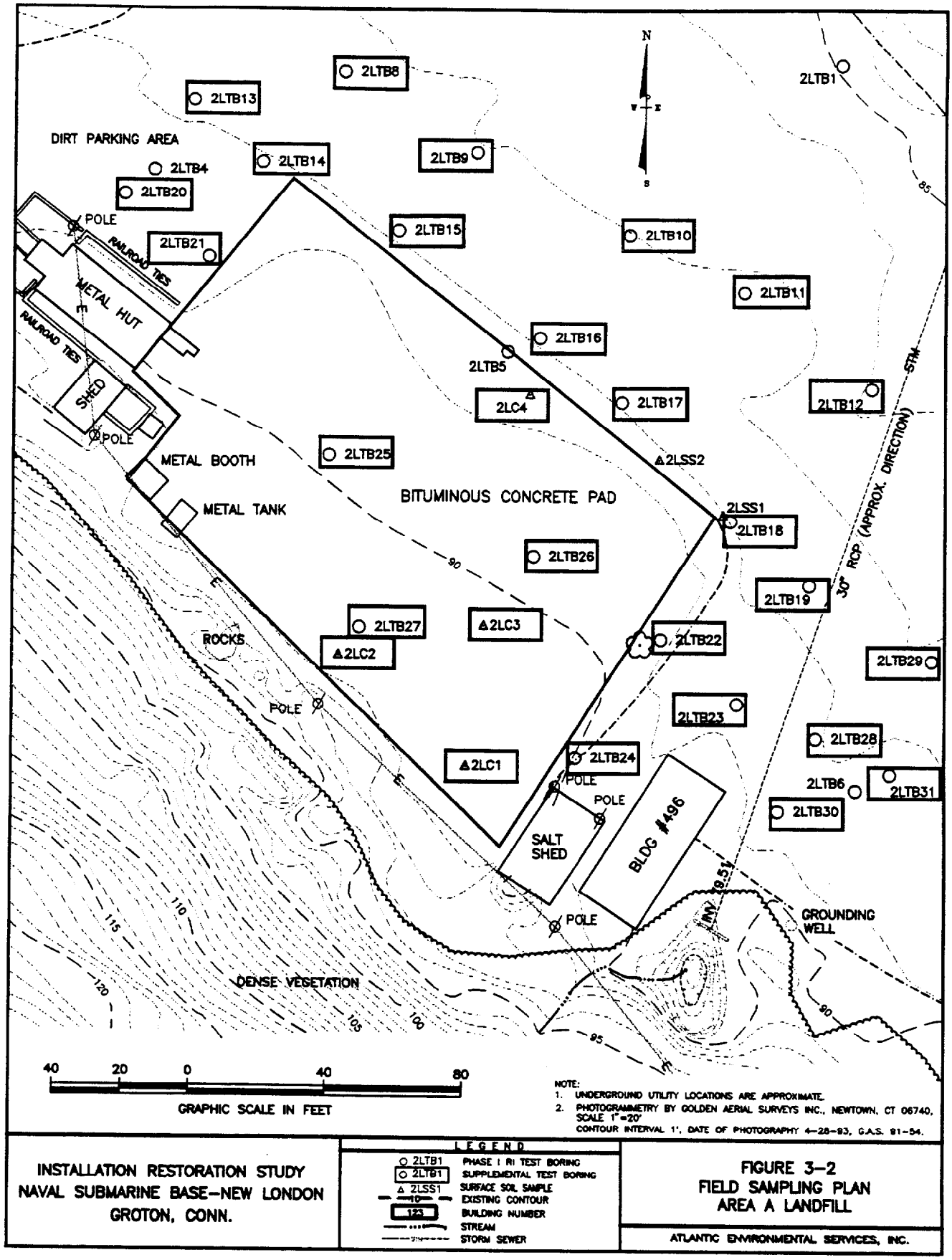

N
W
E
S
2LTB1
2LTB8
2LTB13
DIRT PARKING AREA
2LTB14
2LTB9
2LTB4
2LTB20
POLE
2LTB21
RAILROAD TIES
METAL HUT
RAILROAD TIES
SHED
POLE
2LTB15
2LTB10
2LTB11
2LTB16
2LTB5
2LC4
2LTB17
2LTB12
STM
30" RCP (APPROX. DIRECTION)
METAL BOOTH
2LTB25
2LSS2
BITUMINOUS CONCRETE PAD
METAL TANK
2LSS1
2LTB18
2LTB26
2LTB19
2LTB27
2LC3
2LTB22
ROCKS
2LC2
2LTB29
POLE
2LTB23
2LTB28
2LC1
2LTB24
POLE
POLE
2LTB6
2LTB31
2LTB30
SALT SHED
BLDG #496
POLE
GROUNDING WELL
DENSE VEGETATION
40 20 0 40 80
GRAPHIC SCALE IN FEET
NOTE:
1. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE.
2. PHOTOGRAMMETRY BY GOLDEN AERIAL SURVEYS INC., NEWTOWN, CT 06740, SCALE 1"=20'
CONTOUR INTERVAL 1', DATE OF PHOTOGRAPHY 4-28-93, G.A.S. 91-54.
INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE-NEW LONDON
GROTON, CONN.
LEGEND
2LTB1 PHASE I RI TEST BORING
2LTB1 SUPPLEMENTAL TEST BORING
2LSS1 SURFACE SOIL SAMPLE
EXISTING CONTOUR
123 BUILDING NUMBER
STREAM
STORM SEWER
FIGURE 3-2
FIELD SAMPLING PLAN
AREA A LANDFILL
ATLANTIC ENVIRONMENTAL SERVICES, INC.

TABLE 3-2
NAVAL SUBMARINE BASE - NEW LONDON
AREA A LANDFILL
SUMMARY OF SOIL ANALYTICAL DATA (VOLATILES)

PARAMETER	TBC[1] DIRECT EXPOSURE INDUSTRIAL	TBC[1] POLLUTANT MOBILITY GA	SOURCE	SAMPLE ID / (DEPTH) 2LTB9 (0-2)	2LTB13 (0-2)	2LTB16 (0-2)	2LTB17 (0-2)	2LTB18 (0-2)	2LTB19 (2-4)	2LTB20 (6-8)	2LTB22 (6-8)	2LTB23 (4-8)	2LTB26 (4-6)	2LTB28 (4-6)	2LTB29 (10-12)	2LTB31 (8-10)
VOLATILE ORGANIC COMPOUNDS (ppb)																
Methylene Chloride	760,000	100	CTDEP[2]	10 UJ	12 UJ	12 U	11 UJ	8 J	25	3000 UJ	22	3300 UJ	11 U	12 U	12 U	16 U
Acetone	1,000,000	14,000	CTDEP	19 UJ	24 U	65 UJ	71 UJ	75	44 U	3000 U	80 UJ	3300 U	57 U	37 U	44 U	63 U
2-Butanone	1,000,000	8,000	CTDEP	10 U	11 U	12 U	12 U	13	11 U	3000 U	19 U	3300 U	11 U	12 U	12 U	13 U
Toluene	1,000,000	8,700	CTDEP	8 J	11 U	16	10 J	4 J	11 U	3000 U	27	1800 J	19	13	12 J	19
Ethylbenzene	1,000,000	2,600	CTDEP	10 U	11 U	5 J	11 U	10 U	11 U	7700	17 U	14000 J	11 U	12 U	12 U	13 U
Xylene (total)	1,000,000	1,400	CTDEP	10 U	11 U	12 U	11 U	8 J	7 J	8800	17 U	75000 J	11 U	12 U	12 U	13 U

Notes:
1. TBC indicates to be considered values.
2. CTDEP: Connecticut Department of Environmental Protection December 1994 Proposal for the Connecticut Clean-Up Standard Regulations.

J indicates estimated value based on data validation.
U indicates not detected, value shown is the detection limit.
ppb indicates concentrations in parts per billion.
Shading indicates value above TBC.

TABLE 3-3
NAVAL SUBMARINE BASE - NEW LONDON
AREA A LANDFILL
SUMMARY OF SOIL ANALYTICAL DATA (SEMIVOLATILES)

PARAMETER	TBC[1] DIRECT EXPOSURE INDUSTRIAL	TBC[1] POLLUTANT MOBILITY GA	SAMPLE ID / (DEPTH) 2LTB9 (0-2)	2LTB13 (0-2)	2LTB16 (0-2)	2LTB17 (0-2)	2LTB18 (0-2)	2LTB19 (2-4)	2LTB20 (6-8)	2LTB22 (6-8)	2LTB23 (4-8)	2LTB26 (4-6)	2LTB28 (4-6)	2LTB29 (10-12)	2LTB31 (8-10)
SEMIVOLATILE ORGANIC COMPOUNDS (ppb)															
4-Methylphenol	--	--	350 U	350 U	9300 UJ	11000 UJ	9900 U	340 J	12000 U	2200 U	2000 J	720 U	380 U	400 U	420 U
Naphthalene	2,500,000	5,600	350 U	350 U	9300 UJ	11000 UJ	9900 U	1000	20000	2200 U	920 J	390 J	380 U	400 U	420 U
2-Methylnaphthalene	--	--	350 U	350 U	9300 UJ	11000 UJ	9900 U	430	12000 U	2200 U	1500 U	370 J	380 U	400 U	420 U
Acenaphthylene	2,500,000	8,400	350 U	350 U	9300 UJ	11000 UJ	9900 U	350 U	12000 U	2200 U	1500 U	720 U	220 J	400 U	420 U
Acenaphthene	--	--	350 U	350 U	9300 UJ	11000 UJ	9900 U	620	8400 J	2200 U	1500 U	750	380 U	400 U	420 U
Dibenzofuran	--	--	350 U	350 U	9300 UJ	11000 UJ	9900 U	490	13000	2200 U	1500 U	690 J	380 U	400 U	420 U
Fluorene	2,500,000	5,600	350 U	350 U	9300 UJ	11000 UJ	9900 U	790	17000	2200 U	1500 U	1400	380 U	400 U	420 U
Phenanthrene	2,500,000	4,000	350 U	350 U	9300 UJ	11000 UJ	9900 U	1800	61000	3700	1500 U	5700	570	400 UJ	390 J
Anthracene	2,500,000	40,000	350 U	350 U	9300 UJ	11000 UJ	9900 U	500	19000	2200 U	1500 U	1600	380 U	400 U	420 U
Carbazole	--	--	350 U	350 U	9300 UJ	11000 UJ	9900 U	410	9800 J	2200 U	1500 U	970	380 U	400 U	420 U
Fluoranthene	2,500,000	5,600	300 J	350 U	9300 UJ	11000 UJ	9900 U	1800	47000	4100	1500 U	4800	1000	520 J	570
Pyrene	2,500,000	4,000	310 J	350 U	9300 UJ	11000 UJ	9900 U	1700	40000	4900	1500 UJ	4600	1200	650 J	890 J
Benzo(a)anthracene	7,800	660	200 J	350 U	9300 UJ	11000 UJ	9900 U	950	23000	2400	1500 U	2800	610	510 J	400 J
Chrysene	--	--	190 J	350 U	9300 UJ	11000 UJ	9900 U	920	19000	2600	1500 U	2500	810	520	540 J
Benzo(b)fluoranthene	7,800	660	180 J	350 U	9300 UJ	11000 UJ	9900 U	860	15000	2400 J	1500 U	2400 J	840 J	400 U	440 J
Benzo(k)fluoranthene	78,000	660	210 J	350 U	9300 UJ	11000 UJ	9900 U	540 J	14000 J	1700 J	1500 U	1600 J	530 J	400 J	480 J
Benzo(a)pyrene	780	660	190 J	350 U	9300 UJ	11000 UJ	9900 U	750	15000	2100 J	1500 U	2100 J	620 J	530	450 J
Indeno(1,2,3-cd)pyrene	--	--	350 U	350 U	9300 UJ	11000 UJ	9900 U	230 J	12000 U	2200 UJ	1500 U	640 J	240 J	310 J	420 UJ
Benzo(g,h,i)perylene	--	--	350 U	350 U	9300 UJ	11000 UJ	9900 U	260 J	12000 U	2200 UJ	1500 U	590 J	230 J	320 J	420 UJ

Notes:

[1] TBC means to be considered. All values presented from CTDEP December 1994 Proposal for the Connecticut Clean-Up Standard Regulations.

J indicates estimated value based on data validation.

U indicates not detected, value shown is the detection limit.

ppb indicates concentrations in parts per billion.

TABLE 3-4
NAVAL SUBMARINE BASE - NEW LONDON
AREA A LANDFILL
SUMMARY OF SOIL ANALYTICAL DATA (PESTICIDES/PCBs)

PARAMETER	TBC[1] DIRECT EXPOSURE INDUSTRIAL	TBC[1] POLLUTANT MOBILITY GA	TBC[1] SOURCE	SAMPLE ID / (DEPTH) 2LC1	2LC2	2LC3	2LC4	2LTB9 (0-2)	2LTB13 (0-2)	2LTB16 (0-2)	2LTB17 (0-2)	2LTB18 (0-2)
PESTICIDES (ppb)												
alpha-BHC	--	--		1.7 U	15 UJ	21 J	1.7 U	1.8 U	3.6 UJ	1.9 UJ	1.9 U	1.8 UJ
Heptachlor	140	2	CTDEP	1.7 U	15 UJ	86 U	1.7 U	1.8 U	3.6 UJ	1.9 UJ	1.9 U	1.8 UJ
Aldrin	--	--		1.7 U	15 UJ	86 U	1.7 U	1.8 U	3.6 UJ	0.56 J	1.9 U	1.8 UJ
Heptachlor epoxide	67	2	CTDEP	0.51 J	4.2 J	300 J	2.2 J	1.8 U	3.6 UJ	1.9 UJ	1.9 U	1.8 UJ
Endosulfan I	--	--		1.7 U	15 UJ	78 J	1.7 U	1.8 U	3.6 UJ	1.9 UJ	1.9 U	1.8 UJ
Dieldrin	38	0.4	CTDEP	3.3 U	30 UJ	160 J	3.3 U	7.5	6.9 UJ	4.4 J	4.5 J	3.5 U
Endrin	20,000	--	CTDEP	0.79 J	30 UJ	15 J	3.5 J	1.6 J	6.9 UJ	2.4 J	0.89 J	3.5 U
Endosulfan II	--	--		3.3 UJ	30 UJ	440 J	3.3 U	3.5 U	6.9 UJ	3.7 UJ	2 J	3.5 U
Endrin ketone	--	--		3.3 UJ	30 UJ	130 J	3.6 J	3.5 U	6.9 UJ	3.7 UJ	3.6 U	3.5 U
Endrin aldehyde	--	--		9.4 J	30 UJ	170 U	3.3 U	3.5 U	6.9 UJ	3.7 UJ	19 J	3.5 U
alpha-Chlordane	490	12	CTDEP	1.7 U	15 UJ	86 U	1.7 U	25 J	12 J	39 J	16 J	1.8 UJ
gamma-Chlordane	490	12	CTDEP	1.7 U	15 UJ	86 U	1.1 J	31	12 J	61 J	11 J	1.8 UJ
4,4'-DDE	--	--		3.3 U	30 UJ	170 U	5 J	60	45 J	20 J	28 J	67 J
4,4'-DDD	--	--		3.3 U	30 UJ	170 U	12 J	370	96 J	79 J	110	110 UJ
4,4'-DDT	500		FFDC[2]	3.3 U	30 UJ	550	4.3 J	71 J	110 J	7.3 UJ	12 J	3.5 U
DDTR[3]	500		FFDC	3.3	30	550	21.3	501	251	99	150	67
PCBs (ppb)												
PCB Aroclor-1242	10,000/2000		U.S.EPA[4]/CTDEP[5]	33 U	300 UJ	1700 U	33 U	35 U	69 UJ	37 UJ	36 U	35 UJ
PCB Aroclor-1254	10,000/2000		U.S.EPA/CTDEP	33 U	300 UJ	1700 U	33 U	160	220 J	150 J	87 J	490 J
PCB Aroclor-1260	10,000/2000		U.S.EPA/CTDEP	33 UJ	490 J	1700 U	340 J	35 U	69 UJ	230 J	36 U	35 U
Total PCBs	10,000/2000		U.S.EPA/CTDEP	ND	490	ND	340	160	220	380	87	490
DIOXINS/FURANS (ppb)												
Dioxin-Total TEF[6]				NA	NA	NA	NA	NA	0.00159	NA	NA	NA

TABLE 3-4 (continued)
NAVAL SUBMARINE BASE - NEW LONDON
AREA A LANDFILL
SUMMARY OF SOIL ANALYTICAL DATA (PESTICIDES/PCBs)

PARAMETER	TBC[1] DIRECT EXPOSURE INDUSTRIAL	TBC[1] POLLUTANT MOBILITY GA	TBC[1] SOURCE	SAMPLE ID / (DEPTH) 2LTB19 (2-4)	2LTB20 (6-8)	2LTB22 (8-10)	2LTB23 (4-8)	2LTB26 (4-6)	2LTB28 (4-6)	2LTB29 (10-12)	2LTB31 (8-10)
PESTICIDES (ppb)											
alpha-BHC				1.8 U	2.1 U	2 U	190 U	1.9 UJ	18 U	18 U	19 U
Heptachlor	140	2	CTDEP	0.51 J	2.1 U	2 U	79 J	1.9 UJ	5 J	18 U	19 U
Aldrin				1.8 U	2.1 U	2 U	190 UJ	1.9 UJ	18 U	18 U	19 U
Heptachlor epoxide	67	2	CTDEP	1.8 U	0.66 J	2 U	190 UJ	1.9 UJ	18 U	4.3 J	19 U
Endosulfan I				1.8 U	2 J	2 U	190 U	1.9 UJ	31 J	18 U	19 U
Dieldrin	38	0.4	CTDEP	3.5 U	4.1 U	1.2 J	360 U	3.6 UJ	35 U	27 J	38 U
Endrin	20,000		CTDEP	3.7	3.9 J	4 U	470	3.6 UJ	20 J	36 U	38 U
Endosulfan II				3.5 U	4.1 U	4 U	360 U	3.6 UJ	35 U	36 U	38 U
Endrin ketone				3.5 U	5.9 J	4 U	360 U	3.6 UJ	35 U	36 U	38 U
Endrin aldehyde				3.5 U	91	4 U	360 U	3.6 UJ	35 U	36 U	63
alpha-Chlordane	490	12	CTDEP	1.8 U	2.1 U	2.4	190 U	2 J	18 U	86	19 U
gamma-Chlordane	490	12	CTDEP	1.8 U	2.1 U	3 J	190 U	1.9 UJ	18 U	84 J	19 U
4,4'-DDE				270	4.1 U	16	360 U	4.2 J	35 U	220 J	450
4,4'-DDD				210 J	34 J	24 J	360 U	9.6 J	420 J	1700	410 J
4,4'-DDT	500		FFDC[2]	14 J	13 J	13 J	360 U	3.6 UJ	58 J	770 J	410 J
DDTR[3]	500		FFDC	494	47	53	ND	13.8	478	2470	1270
PCBs (ppb)											
PCB Aroclor-1242	10,000/2000		U.S.EPA[4]/CTDEP[5]	35 U	41 U	40 U	3600 U	36 UJ	350 U	360 U	1700
PCB Aroclor-1254	10,000/2000		U.S.EPA/CTDEP	1200 J	300 J	99 J	51000	49 J	8100	490 J	2100
PCB Aroclor-1260	10,000/2000		U.S.EPA/CTDEP	35 U	41 U	40 U	3600 U	36 UJ	2500	360 U	380 U
Total PCBs	10,000/2000		U.S.EPA/CTDEP	1200	300	99	51000	49	10600	490	3800
DIOXINS/FURANS (ppb)											
Dioxin-Total TEF[6]				NA	NA	NA	ND	NA	NA	NA	NA

Notes:

1. TBC indicates to be considered values.
2. FFDC Act Tolerance Level.
3. DDTR indicates total concentrationof 4,4-DDE, 4,4-DDD, and 4,4-DDT.
4. U.S. EPA Guidance Value.
5. CTDEP: Connecticut Department of Environmental Protection December 1994 Proposal for the Connecticut Clean-Up Standard Regulation.
6. TEF indicates Toxic Equivalent Factor.

J indicates estimated value based on data validation.
U indicates not detected, value shown is the detection limit.
NA indicates not analyzed.
ND indicates not detected.
ppb indicates concentrations in parts per billion.
Shading indicates value above TBC.

TABLE 3-5
NAVAL SUBMARINE BASE - NEW LONDON
AREA A LANDFILL
SUMMARY OF SOIL ANALYTICAL DATA (INORGANICS)

PARAMETER	INORGANIC BACKGROUND LEVELS	SAMPLE ID / (DEPTH)												
		2LTB9 (0-2)	2LTB13 (0-2)	2LTB16 (0-2)	2LTB17 (0-2)	2LTB18 (0-2)	2LTB19 (2-4)	2LTB20 (6-8)	2LTB22 (6-8)	2LTB23 (4-8)	2LTB26 (4-6)	2LTB28 (4-6)	2LTB29 (10-12)	2LTB31 (8-10)
INORGANICS (ppm)														
Aluminum	17600	5600	5450	8710	5990	5150	7000	7140	9000	7840	6590	6840	8250	9280
Antimony	2.05	1.3	3.6 UJ	3.2 UJ	17.7 UJ	14.3 UJ	44.6 J	58.8 J	134 J	26.9 UJ	7.3 UJ	17.6 UJ	56.7 J	25.6 J
Arsenic	3.6	0.87	0.95 UJ	2 J	1.5 UJ	2.7	2.1 J	5 J	10.6 J	3 J	1.5 J	2.5 J	4.5 J	8.6 J
Barium	57.2	29.5	43.1 J	49 J	199 J	87.9	115 J	103 J	420 J	667 J	55.3 J	65.8 J	233 J	193 J
Beryllium	0.72	0.29	0.83	0.44	1.9	2.2	0.63	1.5	1.7	0.84	0.35	0.29	1.8	0.48
Cadmium	0.24	0.48	0.91 J	1.5 J	4.7 J	3.5	2.2 J	0.56 J	5.2 J	10 J	0.68 J	1.4 J	3.1 J	5.3 J
Calcium	499	876	1490	4680	5580	3560 J	8140	7520	17200	9960	2510	2680	5590	6930
Chromium	21.5	8.3	12.1 J	14 J	26.5 J	18.1	31.4 J	30 J	289 J	36.6 J	14.3 J	26.2 J	44.7 J	127 J
Cobalt	8	3.8	8	6.4	14.7	10.4	7.7	6.6	122	14.6	6.1	6.8	23.5	54.4
Copper	25.6	23	101 J	47.9 J	345 J	871 J	815 J	174 J	21600 J	3900 J	107 J	300 J	2830 J	819 J
Iron	17200	8860	10300	12400	15600	12200 J	26400	29500	157000	21500	11300	64400	67300	146000
Lead	17.5	13.7	119	38.2	449	244 J	307	663	1780	705	69.8	463	720	1290
Magnesium	3,650	1680	2400	2960	3570	2120	1910	1570	4780	6290	2650	1880	2120	3320
Manganese	188	93.9 J	134 J	176 J	277 J	285 J	465 J	216 J	1150 J	376 J	178 J	318 J	503 J	1040 J
Mercury	0.05	0.05 U	0.22	0.09 U	0.24 U	0.61	0.24	0.02 U	0.47	1.1	0.16	0.14	0.91	0.65
Nickel	10	13.6 J	26 J	10 J	47.8 J	31.8	81.4 J	58.9 J	1440 J	63.4 J	12.9 J	28 J	118 J	245 J
Potassium	2,580	1070	1330	1560	1310	1120	1080	994	1490	1260	1780	1060	1110	1750
Selenium	0.8	0.13 UJ	0.22 UJ	0.23 UJ	0.34 UJ	ND	0.46 UJ	0.21 UJ	0.36 UJ	0.93 UJ	0.33 UJ	0.2 UJ	0.13 U	0.16 UJ
Silver	0.385	0.15 U	0.41 U	0.38 U	2.3 U	1.3 UJ	38.9	0.26 U	12.6	12.2	1 U	2.8	9.2	4.8
Sodium	41	140 U	421	441	2030	354	4120	367 J	1610 J	3770	267 U	406 J	2770	500 J
Vanadium	35.1	13.8	17.3	23.5	31.7	16.4 J	16.8 J	138	73.2 J	32.6	22	20.5 J	27.9 J	22.6 J
Zinc	31.3	36.4 J	270 J	81.2 J	1020 J	5340	975 J	499	9850 J	1550 J	190 UJ	378 J	4030 J	7570 J
Cyanide	NA	0.12 U	0.09 U	0.08	0.22	0.1 J	0.09 U	0.11 U	0.25 U	0.27 U	0.1 U	0.1 U	0.74	0.53
Boron	5.8	0.95 U	2.6 U	2.7 U	10.3 U	11.6 U	14.9	9.4	79.8	19 U	2.1 U	30	38.5	22.7

Notes:

U indicates not detected, value shown is the detection limit.

NA indicates not available.

ND indicates not detected.

ppm indicates concentrations in parts per million.

Shading indicates value above Inorganic Background Levels.

TABLE 3-6
NAVAL SUBMARINE BASE - NEW LONDON
AREA A LANDFILL
SUMMARY OF SOIL ANALYTICAL DATA (TCLP)

PARAMETER	TBC[1]		SAMPLE ID/(DEPTH)	
	VALUE	SOURCE	2LTB18 (0-2)	2LTB26 (4-6)
TCLP INORGANICS (ppb)				
Barium	1000	CTDEP[2]	1060	532
Cadmium	5	CTDEP	58	9.7
Chromium	50	CTDEP	32.1	5.9
Lead	15	CTDEP	2190	301

Notes: 1. TBC indicates to be considered values.
2. CTDEP: Connecticut Department of Environmental Protection Proposal for the Connecticut Clean-up Standard Regulations.
ppb indicates concentrations of parts per billion.
Shading indicates value above TBC.

Two soil samples were analyzed for physical characteristics at the Area A Landfill Bituminous Concrete Pad. The following tests were performed on soils collected from 2LTB17 (0 to 2 feet (ft)) and 2LTB19 (4 to 6 ft): pH, percentage of ash, percentage of moisture, percentage of organic carbon, specific gravity, cation exchange capacity (CEC), and grain size distribution. Analytical results are presented in Table 3-7. The grain-size distribution data indicate that fill material is primarily a fine-to-coarse sand, as presented in the boring logs.

All 13 soil samples collected at the Area A Landfill Bituminous Concrete Pad site were analyzed for volatile organic compounds (VOCs). The highest concentrations of total VOCs were present in samples 2LTB20(6 to 8 ft) and 2LTB23 (4 to 8 ft), where values were reported as 16,500 and 90,800 ppb, respectively. The following VOCs were detected at one or more sampling locations: methylene chloride, acetone, 2-butanone, toluene, ethylbenzene, and total xylenes.

The TBC value for ethylbenzene (700 ppb) was exceeded in soils collected from 2LTB20 (6 to 8 ft) and 2LTB23 (4 to 8 ft), where values were reported as 7,700 and 14,000 ppb, respectively. Soils collected from 2LTB23 (4 to 8 ft) also exceeded the TBC value for toluene and total xylene, where values were reported as 1,800 and 75,000 ppb, respectively.

Visual observations of staining and sheen were observed in both borings 2LTB20 and 2LTB23, as well as olfactory evidence of contamination including hydrocarbon odors in 2LTB20 and solvent-like odors in 2LTB23.

SVOCs, predominantly polycyclic aromatic hydrocarbons (PAHs) with concentrations ranging from nondetected to 321,200 ppb, were detected in soils collected across the site. The highest levels of total SVOCs were detected at 2LTB20 (6 to 8 ft), where 321,200 ppb was reported. Moderate to high levels of total SVOCs were observed in borings 2LTB9 (0 to 2 ft), 2LTB23 (4 to 8 ft), 2LTB31 (8 to 10 ft), 2LTB29 (10 to 12 ft), 2LTB28 (4 to 6 ft), 2LTB19 (2 to 4 ft), 2LTB22 (6 to 8 ft), and 2LTB26 (4 to 6 ft), where values ranged from 1,580 to 33,900 ppb. In all of the borings where SVOCs were detected by analytical methods, visual and/or olfactory evidence of contamination was also noted in boring logs. Similar staining and/or odors were noted in the following borings: 2LTB12, 2LTB14, 2LTB15, 2LTB21, and 2LTB24.

Detection limits were high for SVOC compounds collected from 2LTB16, 2LTB17, and 2LTB18, due to interferences caused by elevated concentrations of tentatively identified compounds (TICs). It is be noted that the concentration of some SVOCs, although reported as nondetected, are likely elevated in these areas, based on visual observations and elevated TIC values.

PCBs (Aroclor 1242, Aroclor 1254, and Aroclor 1260) were detected at each of the sampling locations from low to high concentrations ranging from 49 to 51,000 ppb. Three boring locations were determined to have levels above the CTDEP TBC value of 2,000 ppb, two of which are above the U.S. EPA TBC value of 10,000 ppb; the boring locations include 2LTB31 (8 to 10 ft) (3,800 ppb), 2LTB28 (4 to 6 ft) (10,600 ppb), and 2LTB23 (4 to 8 ft) (51,000 ppb).

TABLE 3-7 SUMMARY OF ENGINEERING CHARACTERISTICS AREA A LANDFILL/BITUMINOUS CONCRETE PAD			
		2LTB17 (0-2 ft)	**2LTB19 (4-6 ft)**
pH		8.08	8.56
Ash %		92.0	93.5
Moisture %		5.6	4.5
Organic Carbon %		0.45	0.29
Specific Gravity		2.4	2.3
CEC (meq/100g)		4.9	3.9
Grain Size Distribution % (Dry Weight)			
Peroxide Digestible		2.0	0.9
Non digest Fibrous Material		<0.1	<0.1
Sand and Gravel %			
>4.75 mm	(U.S. Sieve No. 4)	26.0	17.0
Between 4.75 - 2.00 mm	(U.S. Sieve No. 10)	7.6	11.0
Between 2.00 - 1.00 mm	(U.S. Sieve No. 18)	10.0	9.0
Between 1.00 mm - 500 um	(U.S. Sieve No. 35)	14.2	14.3
Between 500 - 250 um	(U.S. Sieve No. 60)	14.0	19.4
Between 250 - 125 um	(U.S. Sieve No. 120)	10.2	15.4
Between 125 - 63 um	(U.S. Sieve No. 230)	5.6	6.1
< 63 um	(Pan)	0.6	0.5
Silt %			
Between 63 - 4 um		7.4	4.6
Clay %			
< 4 um		2.4	1.8

Field-screening results for PCBs using a GC were used to choose the most highly contaminated soils for off-site laboratory analysis and to aid in the delineation of PCBs. The laboratory analytical results were found to correlate reasonably well with the field-screening results. The good correlation between field-screening results and laboratory analytical results validates using the field-screening results along with laboratory analytical results to delineate the extent of PCBs in soils. Based on field-screening results, no other samples are expected to exceed TBC guidelines for PCBs in soil.

Samples of the bituminous concrete pad were collected from four areas where evidence of staining was observed. Very low levels of PCBs were detected in two of the four samples; the samples include 2LC2 and 2LC4, where 490 and 340 ppb was detected, respectively.

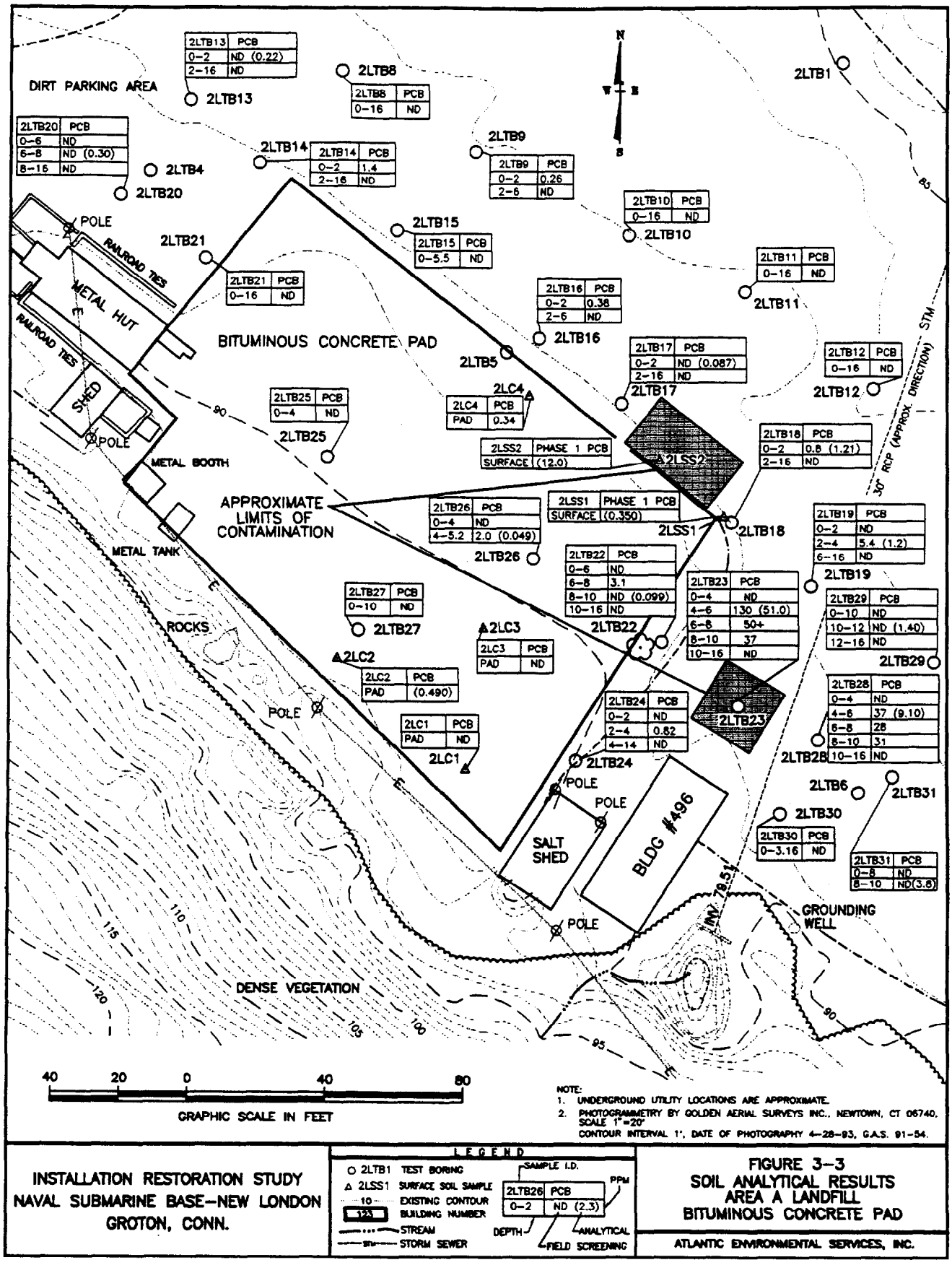
The analytical results for PCBs, from both the Phase I RI and the remedial actions field investigation data are shown in Figure 3-3.

The soils being considered for removal were selected, based on elevated levels of PCBs. The removal action at this site is aimed specifically at removing source or hot-spot areas. These areas are defined as areas where levels of PCBs in surface soils exceed 10 ppm or where levels of PCBs in subsurface soils exceed 50 ppm.

Pesticides were detected at all of the locations sampled across the site, primarily at low concentrations; however, several locations were found to have elevated levels. The pesticides 4,4-DDE, 4,4-DDD, and 4,4-DDT (DDTR) were detected at levels above the TBC value of 500 ppb in two borings: 2LTB29 (10 to 12 ft) (2,470 ppb) and 2LTB31 (8 to 10 ft) (1,270 ppb). Twelve additional pesticides were detected in one or more borings at low levels as indicated in Table 3-4.

Two soil samples were analyzed for dioxins and furans at the site; the samples were 2LTB13 (0 to 2 ft) and 2LTB23 (4 to 8 ft). Dioxins were detected only in one boring at a level below the screening level of 1 ppb that was used in the Times Beach, Missouri Superfund site. The toxic equivalent factor (TEF) value reported for 2LTB13 is 0.0016 ppb. Based on this value, dioxin is not considered to be a chemical of concern at this site.

The total metals analytical results were compared to the established background levels. Inorganic levels were above background at all locations for at least one analyte. Lead values were elevated above the background value of 19.3 ppm in all but one sample, 2LTB9 (0 to 2 ft). Lead levels above 1,000 ppm were observed in two borings: 2LTB22 (6 to 8 ft) (1,780 ppm) and 2LTB31 (8 to 10 ft) (1,290 ppm). In addition to these samples, three additional sample locations contained lead levels above 500 ppm: 2LTB20 (6 to 8 ft) (663 ppm); 2LTB23 (4 to 8 ft) (705 ppm); and 2LTB29 (10 to 12 ft) (720 ppm). Elevated concentrations of antimony, calcium, chromium, cobalt, copper, mercury, nickel, silver, sodium, zinc, and boron were detected at levels greater than one order of magnitude higher than the established background values, but were generally lower than two orders of magnitude above background. Three samples contained levels slightly higher than two orders of magnitude above background: two for copper 2LTB22 (6 to 8 ft) (21,600 ppm) and 2LTB23 (4 to 8 ft) (3,900 ppm), and one for zinc 2LTB22 (6 to 8 ft) (9,850 ppm).


DIRT PARKING AREA
2LTB13 | PCB
0–2 | ND (0.22)
2–16 | ND
2LTB13
2LTB8
2LTB8 | PCB
0–16 | ND
2LTB1
N
W
E
S
2LTB20 | PCB
0–6 | ND
6–8 | ND (0.30)
8–16 | ND
2LTB4
2LTB20
2LTB14
2LTB14 | PCB
0–2 | 1.4
2–16 | ND
2LTB9
2LTB9 | PCB
0–2 | 0.26
2–6 | ND
2LTB10 | PCB
0–16 | ND
2LTB10
POLE
RAILROAD TIES
METAL HUT
RAILROAD TIES
SHED
POLE
2LTB21
2LTB21 | PCB
0–16 | ND
2LTB15
2LTB15 | PCB
0–5.5 | ND
2LTB11 | PCB
0–16 | ND
2LTB11
2LTB16 | PCB
0–2 | 0.38
2–6 | ND
2LTB16
BITUMINOUS CONCRETE PAD
2LTB5
2LTB17 | PCB
0–2 | ND (0.087)
2–16 | ND
2LTB17
2LTB12 | PCB
0–16 | ND
2LTB12
STM
30" RCP (APPROX. DIRECTION)
2LC4
2LC4 | PCB
PAD | 0.34
2LTB25 | PCB
0–4 | ND
2LTB25
90
POLE
METAL BOOTH
2LSS2 | PHASE 1 PCB
SURFACE | (12.0)
2LSS2
2LTB18 | PCB
0–2 | 0.8 (1.21)
2–16 | ND
APPROXIMATE LIMITS OF CONTAMINATION
2LTB26 | PCB
0–4 | ND
4–5.2 | 2.0 (0.049)
2LTB26
2LSS1 | PHASE 1 PCB
SURFACE | (0.350)
2LSS1
2LTB18
2LTB19 | PCB
0–2 | ND
2–4 | 5.4 (1.2)
6–16 | ND
2LTB19
METAL TANK
2LTB22 | PCB
0–6 | ND
6–8 | 3.1
8–10 | ND (0.099)
10–16 | ND
2LTB22
2LTB23 | PCB
0–4 | ND
4–6 | 130 (51.0)
6–8 | 50+
8–10 | 37
10–16 | ND
2LTB27 | PCB
0–10 | ND
2LTB27
ROCKS
2LC3
2LC3 | PCB
PAD | ND
2LTB29 | PCB
0–10 | ND
10–12 | ND (1.40)
12–16 | ND
2LTB29
2LC2
2LC2 | PCB
PAD | (0.490)
POLE
2LTB24 | PCB
0–2 | ND
2–4 | 0.82
4–14 | ND
2LTB23
2LTB28 | PCB
0–4 | ND
4–6 | 37 (9.10)
6–8 | 28
8–10 | 31
10–16 | ND
2LTB28
2LC1 | PCB
PAD | ND
2LC1
2LTB24
POLE
POLE
BLDG #496
SALT SHED
2LTB6
2LTB31
2LTB30
2LTB30 | PCB
0–3.16 | ND
2LTB31 | PCB
0–8 | ND
8–10 | ND(3.6)
INV. 78.51
GROUNDING WELL
POLE
DENSE VEGETATION
85
90
95
100
105
110
115
120
40 20 0 40 80
GRAPHIC SCALE IN FEET
NOTE:
1. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE.
2. PHOTOGRAMMETRY BY GOLDEN AERIAL SURVEYS INC., NEWTOWN, CT 06740, SCALE 1"=20'
CONTOUR INTERVAL 1', DATE OF PHOTOGRAPHY 4–28–93, G.A.S. 91–54.
INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE–NEW LONDON
GROTON, CONN.
LEGEND
2LTB1 TEST BORING
2LSS1 SURFACE SOIL SAMPLE
10 EXISTING CONTOUR
125 BUILDING NUMBER
STREAM
STM STORM SEWER
SAMPLE I.D.
2LTB26 | PCB
0–2 | ND (2.3)
PPM
DEPTH
ANALYTICAL
FIELD SCREENING
FIGURE 3–3
SOIL ANALYTICAL RESULTS
AREA A LANDFILL
BITUMINOUS CONCRETE PAD
ATLANTIC ENVIRONMENTAL SERVICES, INC.

Although there were elevated levels of inorganics—in particular lead—inorganics do not appear to be of concern at this site. The reported disposal of battery acid (presumably from lead/acid batteries) is a possible source of lead contamination in soils. However, the site use as a landfill may have also contributed to elevated inorganic values, including lead.

Two soil samples were collected and analyzed for full TCLP parameters (VOCs, SVOCs, pesticides, herbicides, and inorganics). They include 2LTB18 (0 to 2 ft) and 2LTB26 (4 to 6 ft). There were no VOCs, SVOCs, pesticides, or herbicides detected in either of the samples. Both samples contained lead above the TCLP TBC value of 50 ppb. Soils from 2LTB18 (0 to 2 ft) contained 2,190 ppb lead and soils from 2LTB26 (4 to 6 ft) contained 301 ppb of lead. These concentrations are below the value of 5 ppm, which would classify the soil as hazardous waste. Cadmium and barium were also detected above their respective TBC values of 10 ppb and 1,000 ppb in boring 2LTB18 (0 to 2 ft), where values of 58 ppb and 1,060 ppb were reported, respectively. None of the soils tested had TCLP levels high enough to classify them as hazardous waste.

ATTACHMENT A

BORING LOGS

BORING LOG 2LTB8

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/10/93
DATE COMPLETED: 11/10/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 87.4 FT.
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: N/A
DATUM: SUBASE
WEATHER: N/A
INSPECTOR: D. BONOFF
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING: PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	11,73 37,33	90	-	Brown, fine to coarse sand, some gravel, no odor, FL.	0					ND				
2-4	34,77 100/1"	20	-	Brown, fine sand, some gravel, FL.						ND				
4-6	0,50/2"	40	-	Dark brown, fine to medium sand, some gravel, moist, slightly musty odor, FL.	5					ND				
6-8	4,3 7,8	30	-							ND				
8-10	10,11 9,9	45	-	Brown, fine to medium sand, some gravel, no odor, FL.						ND				
10-12	4,8 10,12	25	-		10					ND				
12-14	7,7 32,13	10	-							ND				
14-14.7	8/50"	20	-	Brown, fine to coarse sand, some gravel, FL.						ND				
				Refusal at 14.7 feet. END OF BORING.	15									
					20									

ATLANTIC

BORING LOG 2LTB9

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/5/93
DATE COMPLETED: 11/5/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 87.0 FT.
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: N/A
DATUM: SUBASE
WEATHER: RAINING, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING: PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	41,59 38,46	70		(Note: HNu not working due to rain.) Brown, fine to medium sand and gravel; little silt, concrete fragments, no odor, FL.	0					BDL				
2-4	25,100/4"	40								BDL				
4-6	7,13 21,29	40			5					BDL				
				Auger and sampler refusal at 6 feet. END OF BORING.	10									
					15									
					20									

ATLANTIC

BORING LOG 2LTB10

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/4/93
DATE COMPLETED: 11/4/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 87.2 FT.
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 10 FT.
DATUM: SUBASE
WEATHER: SUNNY, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING: PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	12,100/1"	40	0	Brown, fine to coarse sand and gravel; trace organics, concrete fragments, moist, no odor, FL.	0					ND				
2-4	28,50/9"	40	0							ND				
4-6	11,16 100/2"	40	0		5					ND				
6-8	18,8 9,7"	0	-	No recovery.						NA				
8-10	5,4 4,5	0	-							NA				
10-12	3,3 3,5	100	0	Dark gray CLAY and SILT, trace organics and shell fragments, strong organic odor, wet, dredge spoils, OL.	10					ND				
12-14	8,7 5,5	100	0							ND				
14-16	6,6 7,6	100	0		15					ND				
				END OF BORING AT 16 FEET.	20									

ATLANTIC

BORING LOG 2LTB11

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: AREA A CONCRETE PAD
DATE STARTED: 11/3/93
DATE COMPLETED: 11/3/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: APPROXIMATELY 87.1 FT.
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: N/A
DATUM: SUBASE
WEATHER: PARTLY CLOUDY, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING: PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	15,100/3"	40	0	Brown fine to coarse sand and gravel, miscellaneous rubble (wood, concrete, brick and glass fragments), trace ash, slight HC odor from 2 to 4 feet, FL.	0					ND				
2-4	9,8 26,37	80	0							ND				
4-6	6,5 3,1	40	0		5					ND				
6-8	4,100/3"	20	0							ND				
8-10	3,4 4,5	100	0	Dark gray-black SILT and CLAY, trace shell fragments, organic odor, OL.						ND				
10-12	2,2 3,4	80	0		10					ND				
12-14	4,5 4,5	100	0							ND				
14-16	5,5 5,5	100	0		15					ND				
				END OF BORING AT 16 FEET.	20									

ATLANTIC

BORING LOG 2LTB12

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: AREA A CONCRETE PAD
DATE STARTED: 11/2/93
DATE COMPLETED: 11/2/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: APPROXIMATELY 86.0 FT.
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 8.0 FT.
DATUM: SUBASE
WEATHER: N/A
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL,admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	29,30 22,26	70	-	Fine to medium sand, miscellaneous rubble (wood, metal, brick, plastic and glass fragments), little gravel, some black staining, slight HC odor, FL.	0		■			ND				
2-4	31,18 22,29	50	-	Fine to coarse sand and gravel, miscellaneous rubble (slag, asphalt, wood, metal and glass fragments), some black staining from 4 to 6 feet, no odor, FL.		■				ND				
4-6	7,6 8,7	70	-		5		■			ND				
6-8	6,7 11,10	40	-	Fine to coarse sand and silt, miscellaneous rubble (glass, rubber, wood, metal), saturated at approximately 8.0 feet, no odor, FL.		■				ND				
8-10	7,8 8,10	30	-			■				ND				
10-12	6,4 9,4	80	-	Fine to coarse sand and gravel, sheen, strong HC odor, FL.	10			■		ND				
12-14	6,5 4,4	50	-	Greenish-gray CLAY and SILT, trace shell fragments, organic odor, dredge spoils, OL.		■				ND				
14-16	5,5 7,8	80	-		15	■				ND				
				END OF BORING AT 16 FEET. Notes: (1) greenish fluid (like anti-freeze) noted around augers. (2) HNu not working	20									

ATLANTIC

BORING LOG 2LTB13

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/9/93
DATE COMPLETED: 11/9/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 87.8 FT.
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 6.0 FT.
DATUM: SUBASE
WEATHER: SUNNY, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	59,65 51,100/1"	80	0	Brown, fine to coarse sand, some gravel; trace organics, dry, no odor, some black staining from 4 to 6 feet, FL.	0	■				BDL		■		
2-4	49,50/2"	30	0			■				BDL				
4-6	29,16 12,11	30	0		5		■			ND				
6-8	6,4 2,8	20	0	Saturated fine sand, some silt, little gravel, brick fragments, trace organics, FL.		■				ND				
8-10	8,34 17,5	20	0	Medium to coarse sand and gravel, brick and cement fragments, FL.		■				ND				
10-12	33,29 24,20	0	-	No recovery.	10					NA				
12-14	23,100/2"	0	-							NA				
14-16	3,2 4,3	50	0	Dark gray-brown SILT, some fine sand, no odor, OL.	15	■				ND				
				END OF BORING AT 16 FEET.	20									

ATLANTIC

BORING LOG 2LTB14

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/8/93
DATE COMPLETED: 11/8/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 88.1 FT.
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 10.0 FT.
DATUM: SUBASE
WEATHER: SUNNY, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	27,33 46,39	70	0	Brown, fine to medium sand, some silt; little gravel, no odor, dry, FL.	0					1.4				
2-4	34,40 50/5"	80	0							BDL				
4-6	19,50/4"	40	0		5					BDL				
6-8	16,17 13,14	50	0							BDL				
8-10	10,11 10,6	40	0	Greenish-brown, fine sand and silt, trace gravel, some black staining, trace organics, no odor, FL.						BDL				
10-12	1,3 4,4	30	0		10					BDL				
12-14	9,7 11,12	80	0	Fine sand, silt, and clay; trace organics, little coarse gravel, trace black staining, FL.						BDL				
14-16	19,14 9,8	100	0		15					BDL				
				END OF BORING AT 16 FEET.	20									

ATLANTIC

BORING LOG 2LTB15

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/8/93
DATE COMPLETED: 11/8/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 87.7 FT.
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: N/A
DATUM: SUBASE
WEATHER: SUNNY, 50's
INSPECTOR: D. BONOFF
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING: PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	33,49 51,50/2"	80	0	Brown, fine to medium sand and gravel, some black staining from 1 to 2 feet, no odor, FL.	0					BDL				
2-4	39,54 100/2"	30	0							BDL				
4-5.5	6,6 5,50/5"	25	0		5					ND				
				Auger and sampler refusal at 5.5 feet. END OF BORING.	10									
					15									
					20									

ATLANTIC

BORING LOG 2LTB16

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/4/93
DATE COMPLETED: 11/4/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 87.8 FT.
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: N/A
DATUM: SUBASE
WEATHER: SUNNY, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	49,24 11,13	80	0	Brown, fine to medium sand and gravel; concrete, glass, metal, and and asphalt fragments, some black staining, slight HC odor in 0- to 2-foot interval, FL.	0		■			BDL		■		
2-4	14,24 22,20	0	-							NA				
4-6	21,18 24,100/2"	40	0	Auger and sampler refusal at 6.0 feet.	5	■				ND				
				END OF BORING.	10									
					15									
					20									

ATLANTIC

BORING LOG 2LTB17

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: AREA A CONCRETE PAD
DATE STARTED: 11/3/93
DATE COMPLETED: 11/3/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 87.8 FT.
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 9.0 FT.
DATUM: SUBASE
WEATHER: PARTLY CLOUDY, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING: PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	69,58 51,62	90	2	Brown fine to medium sand and gravel, miscellaneous rubble (brick, glass, wood, metal, and concrete fragments) some black staining and slight HC odor from 0 to 4 feet, FL.	0		■			BDL		■		
2-4	61,100/3"	40	2	Note: HNu not working from 4 to 10 feet.			■			ND				
4-6	8,8 100/2"	40	-		5	■				ND				
6-8	24,57 100/1"	30	-			■				ND				
8-10	12,7 6,7	70	-	Black to dark brown SILT and CLAY, trace shell fragments, organic odor, dredge spoils, OL.		■				ND				
10-12	3,6 4.5	80	2.5		10	■				ND				
12-14	4,5 5,6	70	2			■				ND				
14-16	6,5 5,7	70	7		15	■				ND				
				END OF BORING AT 16 FEET.	20									

ATLANTIC

BORING LOG 2LTB18

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: AREA A CONCRETE PAD
DATE STARTED: 11/2/93
DATE COMPLETED: 11/2/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 88.1 FT.
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 9.0 FT.
DATUM: SUBASE
WEATHER: N/A
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL,admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	49,84 57,39	80	-	Brown to dark brown fine to medium sand, little gravel, trace glass and wood fragments, some black staining, slight odor, dry, FL.	0		■			1.2		■		
2-4	33,18 41,100/2"	40	-				■			BDL				
4-6	31,43 30,15	50	-	Same as above, traces of slag and ash, FL.	5		■			BDL				
6-8	12,9 9,9	50	-	Miscellaneous rubble (brick, glass and metal fragments), some fine to medium sand and gravel; becomes saturated at approx. 9 feet, FL.		■				ND				
8-10	7,8 8,9	80	-			■				ND				
10-12	4,3 2,5	50	-	Dark gray CLAY and SILT, little fine sand, trace shell fragments, dredge spoils, OL.	10	■				ND				
12-14	6,4 4,5	80	-			■				ND				
14-16	4,3 3,3	80	-		15	■				ND				
				END OF BORING AT 16 FEET. Notes: (1) HNu not working.	20	■								

ATLANTIC

BORING LOG 2LTB19

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/10/93
DATE COMPLETED: 11/10/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 87.8 FT.
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 10.0 FT.
DATUM: SUBASE
WEATHER: SUNNY, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	34,73 51,19	80		(Note: HNu not working for this boring.) Light brown, fine to coarse sand and gravel, dry, no odor, FL.	0					BDL				
2-4	28,33 50/4"	40		Brown, fine to medium sand and gravel, miscellaneous rubble (concrete, metal, glass, brick, wood fragments), ash and slag in 2- to 4-foot interval, some black staining from 1 to 2 feet and in 6 to 8- foot interval, dry, no odor, friable, reddish-brown material (floor tile) from 9 to 10 feet, FL.						5.4				
4-6	18,23 19,16	80			5					BDL				
6-8	28,25 13,13	70								BDL				
8-10	18,18 17,8	70								INT*				
10-12	19,29 36,42	0		No recovery, saturated wash.	10					NA				
12-14	17,12 24,16	40		Saturated silt and fine to coarse sand, glass, wood, and metal fragments, little gravel, some black staining, FL.						BDL				
14-16	12,9 8,11	40			15					BDL				
				END OF BORING AT 16 FEET. * INT indicates interference and/or unknown detected.	20									

ATLANTIC

BORING LOG 2LTB20

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/9/93
DATE COMPLETED: 11/9/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 88.6
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 5.0 FT.
DATUM: SUBASE
WEATHER: SUNNY, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL admixture, moisture, other notes, ORIGIN	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING: PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY
0-2	34,59 100/1"	50	0	Brown, fine to coarse sand, some gravel, metal fragments, black staining and slight HC odor in 4- to 8-foot interval, saturated at approximately 5 feet, FL.	■				ND			
2-4	100/4"	50	0		■				ND			
4-6	24,16 10,5	10	0			■			INT*			
6-8	7,4 8,18	15	0			■			INT*		■	
8-10	12,8 13,9	0	-	No recovery.					NA			
10-12	50/1"	5	0	Gray SILT, with trace fine sand, OL.	■				ND			
12-14	6,4 3,2	0	-	No recovery.					NA			
14-16	3,4 3,6	40	0	Greenish-gray SILT, trace organics (roots), strong organic odor, OL.	■				ND			
				END OF BORING AT 16 FEET.								

DEPTH (FT.): 0, 5, 10, 15, 20

WELL CONSTRUCTION

* INT indicates interference and/or unknown detected.

ATLANTIC

BORING LOG 2LTB21

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/9/93
DATE COMPLETED: 11/9/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 88.7
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 5.5 FT.
DATUM: SUBASE
WEATHER: SUNNY, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING: PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	47,59 100/4"	80	0	Brown, fine to coarse sand and gravel, some black staining in 0- to 2-foot interval, cement fragments, saturated at 5.5 feet, FL.	0		■			BDL				
2-4	100/4"	15	0			■				BDL				
4-6	29,26 19.12	50	0		5	■				BDL				
6-8	31,14 5,4	20	0	Coarse sand and gravel; brick, cement and metal fragments; slight HC. Odor in 8-10 foot interval, FL.		■				BDL				
8-10	1,2 21,27	30	0			■				BDL				
10-12	3,6 9,7	60	0	Fine to coarse sand; some silt and fine gravel; metal, glass, and concrete fragments; some black staining in 12- to 14-foot interval, FL.	10	■				BDL				
12-14	6,4 3,4	50	0				■			BDL				
14-16	3,3 3,4	50	0	Green-brown SILT, strong organic odor, trace shell fragments, OL.	15	■				BDL				
				END OF BORING AT 16 FEET.	20									

ATLANTIC

BORING LOG 2LTB22

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/5/93
DATE COMPLETED: 11/5/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 89.6
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 10.0 FT.
DATUM: SUBASE
WEATHER: RAINING, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING: PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	15,26 29,27	80	N/A	(Note: HNu not working due to rain.) Brown to dark brown, fine to coarse sand and gravel, some black staining from 2 to 4 feet, asphalt and glass fragments, trace organics, moist, no odor, FL.	■				BDL				
2-4	48,29 23,24	80				■			BDL				
4-6	9,6 4,2	0		No recovery.					NA				
6-8	49,50/0"	20		Dark gray fine to coarse sand and gravel, traces of slag, glass fragments, moist, no odor, cobble in end of 8- to 10-foot, FL.	■				3.1		■		
8-10	11,6 4,50/5"	20			■				BDL		■		
10-12	8,6 5,5	0		No recovery, large chunk of cement in end of spoon.					NA				
12-14	4,4 6,7	80		Gray-green clay and silt, trace shell fragments, strong organic odor, dredge spoils, OL.	■				ND				
14-16	4,3 4,4	90			■				ND				
				END OF BORING AT 16 FEET.									

DEPTH (FT.): 0, 5, 10, 15, 20

ATLANTIC

BORING LOG 2LTB23

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/8/93
DATE COMPLETED: 11/8/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 88.4
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 10.0 FT.
DATUM: SUBASE
WEATHER: SUNNY, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING: PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS
0-2	34,50/1"	40	0	Brown, fine to medium sand, some gravel; metal, wood, asbestos, glass, and concrete fragments, some black staining from 2 to 8 feet, slight solvent odor from 4 to 8 feet, FL.	■				ND		
2-4	64,100/4"	40	0			■			BDL		
4-6	12,11 17,23	50	0.5			■			130		■
6-8	7,6 9,11	20	0			■			50		■
8-10	10,10 9,9	10	0	Medium to coarse sand and gravel, metal and glass debris, black staining and slight odor from 8 to 10 feet, saturated at 10 feet, FL.		■			37		
10-12	4,5 9,11	40	0		■				BDL		
12-14	4,2 4,5	70	0		■				ND		
14-16	4,5 5,4	75	0	Brown SILT, with trace fine sand, no odor or staining, OL.	■				ND		
				END OF BORING AT 16 FEET.							

DEPTH (FT.): 0, 5, 10, 15, 20

LITHOLOGY

WELL CONSTRUCTION

ATLANTIC

BORING LOG 2LTB24

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/5/93
DATE COMPLETED: 11/5/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: APPROXIMATELY 90.0 FEET
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: N/A
DATUM: SUBASE
WEATHER: RAINING, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	19,26 29,19	80	0	Brown, fine to coarse sand and gravel, some black staining, trace fibrous material and glass fragments, moist, no odor, FL.	0	■				BDL				
2-4	18,15 37,26	50	0			■	■			0.82				
4-6	9,6 4,2	30	0		5	■	■			BDL				
6-8	4,3 2,4	0	-	No recovery.						NA				
8-10	2,4 3,1	50	0	Dark gray CLAY and SILT, organic odor, trace shell fragments, cobble in end of spoon, OL.		■				ND				
10-12	1,WOH 1,2	70	0		10	■				ND				
12-14	2,1 6,50/4"	90	0	Auger refusal at 13.83 feet.		■				ND				
				END OF BORING.	15									
					20									

ATLANTIC

BORING LOG 2LTB25

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/12/93
DATE COMPLETED: 11/12/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 88.4
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: N/A
DATUM: SUBASE
WEATHER: CLOUDY, DRIZZLE, 50's
INSPECTOR: D. BONOFF
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING: PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	46,100/2"	40	N/A	(Note: HNu not working due to weather). Brown, fine silty sand, some gravel, dry, no odor, FL.	0					BDL				
2-4	37,100/9"	40	N/A							NA				
				Auger refusal at 4.0 feet. END OF BORING.	5									
					10									
					15									
					20									

ATLANTIC

BORING LOG 2LTB26

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/12/93
DATE COMPLETED: 11/12/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 89.7
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: N/A
DATUM: SUBASE
WEATHER: CLOUDY, DRIZZLE, 50's
INSPECTOR: D. BONOFF
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	29,56 51,100/4"		0	Orange-brown medium to coarse sand, some fine gravel, concrete fragments, dry, no odor, FL.	0	■				BDL			▨	
2-4	21,47 33,22		0	Brown, fine silty sand, some fine gravel, little ash, dry, moderate HC odor, some black staining, 3- to 4-foot interval, FL.		■	■			BDL			▨	
4-5.2	11,13 50/2"		0	Auger and sampler refusal at 5.16 feet. END OF BORING.	5	■				2.0		■	▨	
					10									
					15									
					20									

ATLANTIC

BORING LOG 2LTB27

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/12/93
DATE COMPLETED: 11/12/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 90.6
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 6.0 FT.
DATUM: SUBASE
WEATHER: CLOUDY, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING: PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	26,31 27,29	80	0	Brown, fine to medium sand, some gravel, miscellaneous rubble (asphalt, brick, glass, concrete, wood and metal fragments), no odor, FL.	0					ND				
2-4	44,69 20,22	40	0							BDL				
4-6	17,22 12,9	10	0		5					BDL				
6-8	8,11 9,6	70	0	Light brown, fine SAND and SILT, trace organics, saturated, no odor, rock fragments in end of spoon, FL.						ND				
8-9.66	9,13 12,100/2"	80	0							ND				
				Refusal at 9.66 feet. END OF BORING.	10									
					15									
					20									

ATLANTIC

BORING LOG 2LTB28

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/12/93
DATE COMPLETED: 11/12/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 88.1
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 10.0 FT
DATUM: SUBASE
WEATHER: CLOUDY, RAINING, 50's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL,admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	12,21 19,50/3"	80	NA	(Note: HNu not working due to rain.) Brown, fine to coarse sand and gravel, miscellaneous rubble, (brick, wood, glass metal fragments), little slag and ash from 4 to 6 feet, some black staining from 2 to 6 feet, orange staining from 6 to 10 feet, saturated at approximately 10 feet, FL.	0	■				BDL				
2-4	39,50/1"	30					■			BDL				
4-6	11,12 13,14	80			5		■			37		■		
6-8	9,6 6,5	80					■			28				
8-10	11,7 8,9	30					■			31				
10-12	13,10 11,7	60			10	■				BDL				
12-14	12,8 6,7	90		Dark gray, fine SAND and SILT, organic odor, dredge spoils, OL. Dark gray SILT, some CLAY, trace shell fragments, organic odor, dredge spoils, OL.		■				ND				
14-16	6,4 6,3	50			15	■				ND				
				END OF BORING AT 16 FEET.	20									

ATLANTIC

BORING LOG 2LTB29

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/15/93
DATE COMPLETED: 11/15/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: APPROXIMATELY 87.1 FEET
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 10 FT
DATUM: SUBASE
WEATHER: SUNNY, 60's
INSPECTOR: DOUG BONOFF
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL,admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	17,34 47,22	100	0	Brown-black fine to coarse sand, trace gravel, miscellaneous rubble (brick, metal, glass and wood fragments), trace slag from 1 to 4 feet, ash and cinder from 5.5 to 6 feet, some iron staining from 2 to 4 feet, dry, no odor, FL.	■				BDL				
2-4	18,18 36,6	50	0			■	■		BDL				
4-6	20,28 33,50/3	75	0		■				BDL				
6-8	26,20 10,7	40	0	Orange ash and cinder, glass fragments, unidentified white and green salt-like material with bottom, dry, no odor, FL.	■				BDL				
8-10	8,12 8,7	0	0	No recovery.	■				NA				
10-12	4,3 3,3	25	0	Orange-brown fine to coarse sand, trace wood fragments, saturated, no odor, FL.	■				INT*		■		
12-14	5,3 3,4	90	0	Orange-brown glass and ash chnker?, no odor, FL.	■				INT*				
14-16	5,5 4,5	100	0	Gray silt, trace clay, trace shell fragments, dredge spoils, black stain at approximately 13 feet, organic odor, OL.	■	■			ND				
				END OF BORING AT 16 FEET.									

DEPTH (FT.): 0, 5, 10, 15, 20

* INT indicates interference and/or unknown detected.

ATLANTIC

BORING LOG 2LTB30

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/15/93
DATE COMPLETED: 11/15/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 88.4
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: N/A
DATUM: SUBASE
WEATHER: SUNNY, 60's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING: PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	14,12 11,21	80	0	Brown, fine to coarse sand, some gravel, trace brick and wood fragments, dry, no odor, rock fragments in end of 2- to 4-inch spoon, FL.	0					BDL				
2-3.16	12,21 50/2"	40	0							BDL				
				Refual at 3.16 feet. END OF BORING.	5									
					10									
					15									
					20									

ATLANTIC

BORING LOG 2LTB31

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-26-04-04
LOCATION: CONCRETE PAD
DATE STARTED: 11/15/93
DATE COMPLETED: 11/15/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING
DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON

GROUND ELEVATION: 88.1
PROTECTIVE CASING ELEVATION: N/A
WELL ELEVATION: N/A
WATER LEVEL: APPROX. 8.0 FEET
DATUM: SUBASE
WEATHER: SUNNY, 60's
INSPECTOR: J. GRUENENFELDER
CHECKED BY: EJN

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	FIELD SCREENING PCBs (ppm)	XRF (ppm)	SAMPLE ANALYSIS	LITHOLOGY	WELL CONSTRUCTION
0-2	19,31 47,50/3"	70	0	Brown, fine to coarse sand and gravel, miscellaneous rubble, (brick, wood, and glass fragments), ash from 1.5 to 2.0 feet, slag and some black staining from 8 to 10 feet, saturated at 8 feet, no odor, FL.	0	■				BDL				
2-4	37,27 26,29	40	0			■				BDL				
4-6	21,17 19,26	80	0		5	■				BDL				
6-8	22,14 17,11	50	0			■				BDL				
8-10	5,4 21,13	50	0				■			INT*		■		
10-12	17,18 16,11	0	N/A	No recovery.	10					NA				
12-14	14,13 13,12	50	0	Dark gray to greenish-gray SILT and CLAY, trace shell fragments, organic odor, dredge spoils, OL.		■				BDL				
14-16	12,8 8,6	100	0		15	■				ND				
				END OF BORING AT 16 FEET.										

* INT indicates interference and/or unknown detected.

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ATLANTIC

ATTACHMENT B

DATA VALIDATION REPORT

DATA VALIDATION REPORT

SDG No.: GRT15

Site: Groton, Naval Subase

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Prepared by:

Organic Section Prepared by:

CTJ for Elissa McDonagh

Elissa McDonagh
Organic Data Validator

Inorganic Section Prepared by:

CTJ for Lorie MacKinnon

Lorie MacKinnon
Inorganic Data Validator

DATA VALIDATION REPORT

RE: SDG No.: GRT15
Site: Groton, Naval Subase

Volatiles: 8/soil/2DSD27(0-1), 2DSD33(0-1), 2DSD21(0-1), 2LTB18(0-2), 2DSD25(1-3), 2DSD29(0-1) 2DSD24(1-3), 2DSD28(0-1)
7/aqueous/SED4RB, SED6RB, 1093ER13, TB931025, 102893TB9, 102893TB10, 1093TB11

Semivolatiles: 8/soil/2DSD27(0-1), 2DSD33(0-1), 2DSD21(0-1), 2LTB18(0-2), 2DSD29(0-1), 2DSD25(1-3), 2DSD24(1-3), 2DSD28(0-1)
3/aqueous/SED6RB, SED3RB, 1093ER13

Pesticides: 16/soil/2DSD27(0-1), 2DSD33(0-1), 2DSD21(0-1), 2LTB18(0-2), 2DSD25(1-3), 2DSD26(1-3), 2DSD24(1-3), 2DSD28(0-1), 2DSD29(0-1), 2WSD23, 2WSD24, 2WSD25, 2WSD26, 2DSD19(1-3), 3SD7(1-3), 2DSD18
7/aqueous/SED6RB, SED3RB, 1093ER13, SED4RB, SED8 Area A, SED10 Area A, SED9RB

Metals: 8/soil/2DSD27(0-1), 2DSD33(0-1), 2DSD21(0-1), 2LTB18(0-2), 2DSD25(1-3), 2DSD29(0-1), 2DSD24(1-3), 2DSD28(0-1)
3/aqueous/SED6RB, SED3RB, 1093ER13

TCLP: 2/soil/3SD7(1-3), 2LTB18(0-2)

Conventional Chemistry: 23/soil/2DSD26(1-3), 2DSD27(0-1), 2DSD33(0-1), 2DSD18, 2DSD21(0-1), 2WSD23, 2WSD24, 2WSD25, 2WSD26, 2DSD19(1-3), 3SD7(1-3), 2DSS16, 2DSS1, 2DSS13, 2DSS11, MCLL1, 3DSD4A, 2DSS2, 2DSS19, 2DSD28(0-1), 2DSD29(0-1), 2DSD24(1-3), 2DSD25(1-3) (TOC, Grain size)

4/soil/2DSD26(1-3), 2DSD21(0-1), 2DSD28(0-1), 2DSD29(0-1) (TOC, Grain size, pH, Specific Gravity, Moisture content, CEC)

INTRODUCTION

The validation of volatile, semivolatile, pesticides and inorganic analytical data from SDG No. GRT15 was performed according to Navy Level C requirements, equivalent to DQO Level 4, as presented in the 'Navy Level C Review of Laboratory Data Generated under NEESA 20.2-047B', developed by META Environmental, Inc. In the cases where those guidelines differed from those of the U.S. EPA Region 1 Functional Guidelines for evaluating Organic Analyses and the U.S. EPA Region I Functional Guidelines for Evaluating Inorganic Analyses (6/88), the latter were used.

Because there are no data validation guidelines for the conventional chemistry parameters requested, the following methods were used for review of the associated data: pH Method 9045 SW-846, Cation Exchange Capacity Method 9081 SW-846, % Moisture Method 209F Standard Methods, Specific Gravity Method 213E Standard Methods, % Ash Method D482-80 ASTM and % Organic Carbon Walkley Black.

Form I copies with the data validation results and recommendations for each fraction of each validated sample have been submitted.

The data submitted for GRT15 was found to be generally good. There were some qualifications of VOA and ABN data due to blank contamination, calibration, surrogate recoveries, matrix spike/matrix spike duplicate results and holding times. There were some qualification of PEST data due to blank contamination, surrogate recoveries and matrix spike/matrix spike duplicate results.

There was some qualification of inorganic data due to uncertainty at the low end of calibration, blank contamination, ICP Interference Check results, matrix spike recoveries, laboratory duplicate precision and Laboratory Control Sample results. There was some qualification of the Conventional chemistry data due to holding times.

There was some qualification of inorganic TCLP data due to uncertainty at the low end of calibration, blank contamination and interference check standard results. There was no qualification of organic TCLP data.

INTRODUCTION

NEESA requires the analysis of method blank spikes along with the analysis of samples. The results of the method blank spikes are to be plotted on control charts and submitted with the data package.

For the VOA and ABN fractions, the method blank spikes are essentially the same thing as the method blanks. The method blanks submitted by the laboratory may be evaluated as method blank spikes by plotting the surrogate recoveries on a control chart. In compliance with NEESA requirements, the laboratory did submit control charts which plotted the surrogate recoveries.

For the PEST fraction, a method blank spike must contain at least two pesticide compounds and/or one PCB compound, and the recovery results plotted on a control chart. In compliance with NEESA requirements, the laboratory did submit control charts which plotted the recoveries.

For the METALS and Wet chemistry fraction, a blank spike is the same as the laboratory control sample. The recoveries of each furnace element and three ICP metals and one analyte for Wet Chemistry must be plotted on a control chart. In compliance with Neesa requirements, the laboratory did submit the control charts with plotted recoveries.

It should be noted that NEESA specifies that samples be shipped within 24 hours of collection ensuring that the laboratory is able to meet holding times which begin at the time of collection. It should be noted that the samples 2DSD28(0-1), 2DSD29(0-1), 2DSD24(1-3), 2DSD25(1-3), SED9RB Area A, SED10RB Area A and 3DS7(1-3) were not shipped within 24 hours.

ORGANIC DATA

Evaluation of the volatile(VOA), semivolatile(ABN) and pesticide (PEST) organic data was based on the following parameters:

* ● Data completeness
● Holding times
* ● GC/MS Tuning
● Calibration
● Blanks
● Surrogate Recoveries
● Matrix spike/matrix spike duplicate
● Internal standard performance
● Pesticide instrument performance
* ● Compound identification
* ● Compound quantitation

* All criteria were met for this parameter.

Data Completeness

The data package contained all of the forms required by the SOW for the VOA, ABN and PEST fraction samples.

It should be noted that sample SED9RB was listed as on hold on the chain of custody. This sample was analyzed for PEST.

PEST fraction sample 2WSD24 should have received a sulfur cleanup and 10 fold dilution. Due to lab oversight, the sample did not receive cleanup and was run undiluted and at a two fold dilution.

Copy quality was good.

Holding Times

All of the VOA fraction samples were analyzed within the required holding times. No action is recommended.

The ABN fraction sample 1093ER13 was extracted 1 day outside of the required 7 days from the date of collection for aqueous samples. It is recommended to estimate positive and non-detected results (J1, UJ1).

Holding Times

It should be noted that the ABN fraction blank SBLKHI was analyzed 5 days outside of the required 40 days from the date of extraction. No action is recommended.

The PEST fraction samples were extracted and analyzed within the required holding times. No action is recommended.

GC/MS Tuning

All of the BFB and DFTPP tuning criteria were within the required limits.

It should be noted that VOA fraction sample SED6RBDL was analyzed outside the 12 hour tune. Data from the BFB surrogate was evaluated and the mass spectral tune was shown to be compliant. No action is recommended.

Calibration

The following problems were noted with the initial and/or continuing calibration of the VOA and ABN systems.

VOA Instrument CMS-HP (initial calibration date 8/30/93):

Compound	IC 08/30/93	CC 11/03/93	CC 11/11/93
Bromomethane		X	X
Acetone	X		X
Carbon disulfide		X	X
1,2-Dichloroethane			X
Bromoform		X	

Associated: samples	08/30/93	All samples listed below
	11/03/93	2DSD21(0-1), 2DSD28(0-1), 2DSD25(1-3), 2DSD24(1-3), 2DSD29(0-1), 2DSD27(0-1), 2DSD33(0-1), 2DSD21(0-1)MS, 2DSD21(0-1)MSD
	11/11/93	2LTB18(0-2)

Calibration

VOA Instrument GMS-HP (initial calibration date 10/30/93):

Compound	IC 10/30/93	CC 11/09/93	CC _____
Methylene Chloride	XX	X	
Acetone	XX	X	
Carbon disulfide		X	
4-methyl-2-pentanone		X	
2-hexanone		X	

Associated: samples
10/30/93 SED4RB, TB1025, SED6RB, 1093TB9, 1093TB10, SED4RBDL, SED6RBDL and all samples listed below
11/09/93 1093ER13, 1093TB11, 1093ER13DL

ABN Instrument "FMS-HP" (initial calibration date 10/28/93):

Compound	IC 10/28/93	CC 11/15/93	CC 12/06/93
2,2'oxybis(1-chloropropane)	X		X
hexachlorocyclopentadiene		X	
2,4-dinitrophenol			X
pentachlorophenol			X
pyrene			
Di-n-octylphthalate			
benzo(b)fluoranthene			
Dibenz(a,h)anthracene			
Benzo(g,h,i)perylene			
2,4,6-tribromophenol			XXX

Compound	IC 12/07/93	CC 12/10/93
2,2'oxybis(1-chloropropane)	XX	XX
hexachlorocyclopentadiene	XX+	X
2,4-dinitrophenol		
pentachlorophenol		
pyrene		X
Di-n-octylphthalate		X
benzo(b)fluoranthene		X
Dibenz(a,h)anthracene		X
Benzo(g,h,i)perylene		X
2,4,6-tribromophenol		

Calibration

ABN Instrument "FMS-HP" (initial calibration date 10/28/93):

Associated: samples	10/28/93	All samples listed below
	11/15/93	SBLKFX
	12/06/93	SBLKFD, SBLKFE, SED6RB, 1093ER13, SED4RB, 2DSD28(0-1), 2DSD28(0-1)MS, 2DSD28(0-1)MSD, 2DSD29(0-1)
	12/07/93	SBLKFF, SBLKFG, 2DSD27(0-1), 2DSD33(0-1) 2DSD21(0-1), 2DSD21(0-1)MS, 2LTB18(0-2), 2DSD21(0-1)MSD, 2LTB18(0-2)MS, 2LTB18(0-2)MSD
	12/10/93	SBLKFH, 2DSD25(1-3), 2DSD24(1-3)

ABN instrument HMS-HP (initial calibration date 11/17/93):

Compound	IC 11/17/93	CC 12/20/93	CC
4-chlorophenyl phenyl ether		X	
4,6-dinitro-2-methylphenol		X	
di-n-octylphthalate		X	
benzo(k)fluoranthene	X	X	

Associated: samples	11/17/93	All samples listed below
	12/20/93	SBLKHI

X - %RSD > 30% or %D >25%; Estimate (J^3) postitive results in the associated samples.

XX - %RSD > 50%or %D > 50%; Estimate positive results (J^4) and non-detects (UJ^4).

XXX- Surrogate %D >25% or %RSD > 30%; Estimate positive results (J26) for compounds associated with the out of control surrogates.

\+ - RF was low; Estimate positive results (J2) and reject non-detects (R2).

Blanks

The VOA, ABN and PEST fraction low and medium level laboratory method blanks, equipment rinsates and trip blanks contained the following maximum quantities of contaminants:

LOW LEVEL:

Compound	Maximum	Action Level
2-Butanone	24 ug/L	240 ug/L, ug/kg
Acetone	79 ug/L	790 ug/L, ug/kg
Methylene Chloride	7 ug/kg	70 ug/kg
4,4'-DDD	1.1 ug/L, 44 ug/kg	220 ug/kg
4,4'-DDT	.21 ug/L, 8.4 ug/kg	42 ug/kg

MEDIUM LEVEL:

Compound	Maximum	Action Level
bis(2-thylhexyl)phthalate	6800 ug/kg	68,000 ug/kg

Blank Actions

- Value < CRQL; report CRQL followed by "U" (U^6).
- Value > CRQL and < action level; report value followed by "U" (U^7).
- Value > CRQL and > action level; report value unqualified.

The action level values were compared to the sample values after application of sample dilution factors, and the following actions are recommended: Methylene chloride in samples 2LTB18(0-2), 2DSD21(0-1), 2DSD25(1-3), 2DSD27(0-1), 2DSD28(0-1), 2DSD33(0-1), 2DSD29(0-1), 2DSD21(0-1)MS and 2DSD21(0-1)MSD and 4,4'-DDT in samples 2DSD26(1-3)DL, 2DSD28(0-1)DL, 2WSD26 and 2DSD19(1-3) should be reported as the CRQL followed by "U" (U6). Methylene chloride in samples 2DSD24(1-3), acetone in samples 2LTB18(0-2), 2DSD21(0-1), 2DSD24(1-3), 2DSD25(1-3), 2DSD27(0-1), 2DSD28(0-1), 2DSD33(0-1), 2DSD29(0-1), 2DSD21(0-1)MS and 2DSD21(0-1)MSD and butanone in samples 2LTB18(0-2) and 2DSD29(0-1) and 4,4'-DDD in samples 2DSD24(1-3)DL, 2DSD25(1-3)DL, 2DSD26(1-3), 2DSD26(1-3)DL, 2DSD28(0-1)DL, SED8 AREA A, 2LTB18(0-2)DL, 2WSD26, 2DSD21(0-1)DL, 2DSD24(1-3), 2DSD27(0-1)DL, 2DSD29(0-1)DL, 2DSD33(0-1)DL, 2DSD18DL, 2LTB18(0-2), 2WSD23DL, 2WSD25DL, 3SD7(1-3)DL and

Blanks

2DSD19(1-3)DL and 4,4'-DDT in samples 2DSD24(1-3)DL, 2DSD25(1-3)DL, 2DSD26(1-3), 2DSD21(0-1), 2DSD24(1-3), 2DSD25(1-3), 2DSD27(0-1)DL, 2DSD28(0-1), 2DSD29(0-1), 2DSD33(0-1)DL, 2DSD18 and 3DS7(1-3)DL should be reported as the value followed by "U" (U7), thereby raising the CRQL and reporting the value as non-detected. Bis(2-ethylhexyl)phthalate in the medium level samples 2LTB18(0-2), 2LTB18(0-2)MS and 2LTB18(0-2)MSD should be reported as the CRQL followed by "U" (U6).

Surrogate Recoveries

All of the VOA soil fraction surrogate recoveries were within the contract required recovery range (CRR). No action is recommended.

The VOA fraction surrogate Toluene-d8 was under-recovered in the aqueous samples 1093TB9, 1093TB10, SED4RB, SED4RBDL, SED6RB, SED6RBDL and TB1025. It is recommended to estimate positive results (J9) and non-detects (UJ9) within the associated area of the chromatograms for those samples. The VOA fraction samples 1093TB9, 1093TB10 and TB1025 had surrogate problems but were not reanalyzed due to insufficient volume.

The ABN aqueous fraction surrogate recoveries were within the contract required recovery range (CRR). No action is recommended.

The ABN fraction surrogate 2-Fluorophenol was under-recovered in the soil samples 2DSD29(0-1) and 2DSD21(0-1). The ABN fraction surrogate dichlorobenzene was under-recovered in the soil sample 2DSD29(0-1).

The EPA validation guidelines require that at least two suroogates in any given fraction be out of control before corrective action is necessary. Therefore, no action is recommended.

The PEST fraction surrogate DCB was under-recovered in the aqueous samples PBLK89, PBLK9B, PBLK92, 1094ER13, SED10RB, SED3RB, SED4RB, SED6RB, SED8 Area A and SED9RB. It is recommended to estimate positive results (J9) and non-detects (UJ9) within that area of the chromatogram and dependent upon the column calibration used to quantitate results. The PEST fraction surrogate TCX was under-recovered in the soil samples PBLK90, PBLK94, PBLK91, 2LTB18(0-2), 2LTB18(0-2)DL, 2WSD24, 2WSD25,

Surrogate Recoveries

2WSD26, 3SD7(1-3), 2SD24(1-3), 2SD24(1-3)DL, 2SD25(1-3), 2SD26(1-3), 2SD26(1-3)DL, 2SD21(0-1)MS and 2SD21(0-1)MSD. It is recommended to estimate positive results (J9) and non-detects (UJ9) within that area of the chromatogram and dependent upon the column calibration used to quantitate results. The PEST fraction surrogate DCB was over-recovered in the soil samples 2LTB18(0-2) and 2LTB18(0-2)DL. It is recommended to estimate positive results (J8) within that area of the chromatogram and dependent upon the column calibration used to quantitate results.

Matrix Spike/Matrix Spike Duplicate

All of the VOA fraction MS/MSD percent recoveries and RPDs were within the CRR. No action is recommended.

Two medium level sets of ABN fraction MS/MSDs were submitted. The percent recoveries and RPDs were within the CRR. No action is recommended.

The low level MS/MSD ABN fraction compounds 1,4-dichlorobenzene and 1,2,4-trichlorobenzene had high %RPDs. It is recommended to estimate positive results (J13) in the unspiked sample.

A comparison of the unspiked compounds present in the sample/MS/MSD sets yield the following information: The compound bis(2-ethylhexyl)phthalate in 2DSD28(0-1)/MS/MSD was detected in the MS/MSD above the CRQL and not detected in the sample. It is recommended to estimate the positive (J24) and non-detected (UJ24) results for that compound in the sample/MS/MSD set.

The PEST fraction compounds dieldrin, endrin and 4,4'-DDT were recovered at less than ten percent in the matrix spike and matrix spike duplicate. It is recommended to estimate positive results (J12) and reject non-detects (R5) in the unspiked sample.

Field Duplicate Precision

There were no field duplicate samples submitted with this case.

Internal Standard Performance

All VOA aqueous and soil Internal Standard (IS) areas were within the CRR. No action is recommended.

The ABN IS Perylene-d12 was grossly under-recovered in the soil sample SBLKFE. No action is recommended.

Pesticide Instrument Performance

All DDT retention times were greater than twelve minutes. All continuing calibration standard compound retention times were within the established RT windows.

All DDT percent breakdowns were less than twenty percent each and thirty percent total. The Endrin percent breakdown was > 20 % in the standards PEMY5 analyzed 12/07/93 (18:36) column SPB1701, PEMY6 analyzed 12/08/93 (21:35) column SPB1701, PEMY7 analyzed 12/10/93 (03:32) column SPB1701 and PEMY8 analyzed 12/10/93 (22:03) column SPB1701. It is recommended to estimate positive results for endrin (J19) and endrin ketone (JN19) in all associated samples. If no endrin is present, but endrin ketone and/or endrin aldehyde are present, reject the CRQL (R8) for endrin. Associate samples are listed in the following table:

PEMY5	PEMY6	PEMY7	PEMY8
PBLK89	All samples listed under PEMY5 and:	All samples listed under PEMY5 and:	All samples listed under PEMY5 and:
SED4RB	PBLK9B	2WSD24	PBLK55
SED3RB	SED8 AREA A	2WSD24DL	2DSD28(0-1)
SED6RB	PBLK94	2DSD19(1-3)	2DSD28(0-1)DL
PBLK90	2DSD21(0-1)	2DSD19(1-3)DL	2DSD29(0-1)
2DSD25(1-3)	2DSD21(0-1)MS	2DSD18	2DSD29(0-1)DL
2DSD25(1-3)DL	2DSD21(0-1)MSD	2DSD18DL	2DSD27(0-1)
2DSD24(1-3)	2DSD21(0-1)DL	2DSD26(1-3)DL	2DSD27(0-1)DL
2DSD24(1-3)DL	2DSD33(0-1)		2WSD23
PBLK91	2DSD33(0-1)DL		2WSD23DL
2LTB18(0-2)	2DSD26(1-3)		2WSD25
2LTB18(0-2)DL			2WSD25DL
3SD7(1-3)			2WSD26
3SD7(1-3)DL			
PBLK92			
1093ER13			
SED9RB			
SED10B			

Pesticide Instrument Performance

The following samples had a shift in retention time of >+/- 0.05 minutes for TCX (Tetrachloro-m-xylene) and/or a shift in retention time of >0.10 minutes for DCB (Decachlorobiphenyl):

Sample	Column	TCX	DCB
2DSD25(1-3)DL	SPB-1701	X	X
3SD7(1-3)	SPB-1701	X	X
2DSD21(0-1)	SPB-1701	X	X
2DSD21(0-1)DL	SPB-1701	X	X
2DSD33(0-1)	SPB-1701	X	X
2DSD33(0-1)DL	SPB-1701	X	X
2DSD19(1-3)	SPB-1701	X	X
2DSD19(1-3)DL	SPB-1701	X	X
2DSD18	SPB-1701	X	X
2DSD18DL	SPB-1701	X	X
2DSD28(0-1)DL	SPB-1701	X	X
2DSD29(0-1)DL	SPB-1701	X	X
2DSD27(0-1)	SPB-1701	X	X
2DSD27(0-1)DL	SPB-1701	X	X
2WSD25DL	SPB-1701	X	X
2DSD25(1-3)DL	SPB-608	X	X
2SD7(1-3)DL	SPB-608	X	X
2DSD21(0-1)	SPB-608	X	X
2DSD21(0-1)DL	SPB-608	X	X
2DSD33(0-1)	SPB-608	X	X
2DSD33(0-1)DL	SPB-608	X	X
2DSD19(1-3)	SPB-608	X	X
2DSD19(1-3)DL	SPB-608	X	X
2DSD18	SPB-608	X	X
2DSD18DL	SPB-608	X	X
2DSD28(0-1)DL	SPB-608	X	X
2DSD29(0-1)DL	SPB-608	X	X
2DSD27(0-1)	SPB-608	X	X
2DSD27(0-1)DL	SPB-608	X	X
2WSD25DL	SPB-608	X	X

The chromatograms of the samples affected were checked for peaks within an expanded window. No action is recommended. The pesticide instrument resolution summary reported resolution values of >/= 60% and all peaks on the RESC chromatograms are 10 - 100% full scale. All initial calibration compound %RSDs were < 20% for all single component compounds and the surrogates were <30%. The pesticide initial calibration for multicomponent analytes had a minimum of three peaks reported per compound and the representative peaks were 25 - 100 % scale in the chromatograms.

Pesticide Instrument Performance

The laboratory followed the correct analytical sequence. The pesticide calibration verification compounds met the RPD criteria of < 25%.

It should be noted that the pesticide florisil cartridge check IND recoveries were 80-120% for all compounds. The GPC calibration pesticide matrix recovery was greater than 110% for the compound 4,4'-DDT for the associated samples: PBLK91, 2LTB18(0-2), 2LTB18(0-2)DL, 2SD7(1-3) and 3SD7(1-3)DL. It is recommended to estimate positive results (J29) for 4,4'-DDT in these samples.

Compound Identification

It should be noted that pesticide fraction samples 2DSD21(0-1), 2DSD25(1-3), 2DSD28(0-1) and 2DSD18 did not report 4,4'-DDD concentrations. It is recommended to reject the non-detected results (R9). The concentrations of 4,4'-DDD were not reported as the concentrations were above the calibration range and were not able to be quanted by the data system.

Compound Quantitation

It should be noted that the pesticide compounds which had concentration values differing by greater than 25% in the two column analyses were qualified with a J28 flag.

It should also be noted that for all VOA, ABN and PEST fraction compounds detected above the calibration range, it is recommended to estimate the positive results (J23).

Tentatively Identified Compounds

This section is not applicable as raw data was not reviewed as part of the Level C review.

Data Assessment

This package contains re-extraction, re-analysis or dilution. After reviewing the associated QC, the following recommendations are made:

VOA:

SED4RB, SED4RBDL

Use positive results for the compound acetone from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

SED6RB, SED6RBDL

Use positive results for the compound acetone from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

1093ER13, 1093ER13DL

Use positive results for the compound acetone from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

ABN: No recommendations are necessary.

PEST: 2DSD21(0-1), 2DSD21(0-1)DL

Use positive and non-detected results from the undiluted analysis.

2DSD24(1-3), 2DSD24(1-3)DL

Use positive and non-detected results from the undiluted analysis.

Data Assessment

PEST: 2DSD25(1-3), 2DSD25(1-3)DL

Use positive result for 4,4'-DDE from the diluted analysis.

Use non-detected result for the compound 4,4'-DDD from the diluted analysis.

Use all other positive and non-detected results from the original analysis.

2DSD26(1-3), 2DSD26(1-3)DL

Use positive result for 4,4'-DDE from the original analysis.

Use all other positive and non-detected results from the original analysis.

2DSD27(0-1), 2DSD27(0-1)DL

Use all positive and non-detected results from the original analysis.

2DSD28(0-1), 2DSD28(0-1)DL

Use non-detected result for 4,4'-DDD from the diluted analysis.

Use all other positive and non-detected results from the original analysis.

2DSD29(0-1), 2DSD29(0-1)DL

Use all positive and non-detected results from the original analysis.

2DSD33(0-1), 2DSD33(0-1)DL

Use all positive and non-detected results from the original analysis.

Data Assessment

PEST: 2DSD18, 2DSD18DL

Use non-detected result for 4,4'-DDD from the diluted analysis.

Use all other positive and non-detected results from the original analysis.

2LTB18(0-2), 2LTB18(0-2)DL

Use positive result for 4,4'-DDE from the diluted analysis.

Use all other positive and non-detected results from the original analysis.

2WSD23, 2WSD23DL

Use all positive and non-detected results from the original analysis.

2WSD24, 2WSD24DL

Use positive result for 4,4'-DDD from the diluted analysis.

Use all other positive and non-detected results from the original analysis.

2WSD25, 2WSD25DL

Use positive result for 4,4'-DDT from the diluted analysis.

Use all other positive and non-detected results from the original analysis.

3DS7(1-3), 3DS7(1-3)DL

Use all positive and non-detected results from the original analysis.

2DSD19(1-3), 2DSD19(1-3)DL

Use all positive and non-detected results from the original analysis.

INORGANIC DATA

The inorganic data were evaluated based on the following parameters:

*	●	Data Completeness
	●	Laboratory blanks
	●	CRDL standard
	●	Matrix spike results
	●	Duplicate analysis results
*	●	Calibration verification results
	●	Interference check standard results
	●	Laboratory control sample results
	●	Holding times
NA	●	Furnace AA results
*	●	ICP serial dilution results
*	●	Detection limits
NA	●	Calculation checks

* - all criteria were met for this parameter.

Overall Comments

There was some qualification of inorganic data due to uncertainty at the low end of calibration, blank contamination, ICP Interference Check results, matrix spike recoveries, laboratory control sample results and laboratory duplicate precision.

There was some qualification of the Conventional chemistry data due to holding times. There was some qualification of TCLP data due to uncertainty at the low end of calibration, blank contamination, interference check standard results and lack of matrix spike and duplicate information.

The data package contained all required forms and raw data for the TAL analysis. It should be noted that although a batch matrix spike and duplicate was performed for the TCLP analysis, the raw data and Forms 5 and 6 were not included in the package.

Holding Times

Holding times were reviewed and found to meet criteria for all metals parameters.

It should be noted that there are no established holding times for soil samples for many wet chemistry parameters. Guidelines for aqueous samples should be used if possible. In

Holding Times

the case of cation exchange capacity and specific gravity, there are no holding times listed in the method. In the case of pH, analysis should be done as soon as possible for aqueous samples. Because there is no established holding time for soils, the validator used the holding time of 48 hours from the time of collection which would allow shipping time and the laboratory to do the analysis as soon as possible. The pH results for samples 2DSD26(1-3), 2DSD21(0-1), 2DSD28(0-1) and 2DSD29(0-1) shall be estimated (J1) as analysis took place 2 to 4 days outside of this advisory holding time.

Calibration

Initial and continuing calibration verifications were reviewed. Frequency requirements and recoveries for calibration standards were met for all analyses.

The 2xIDL TCLP Arsenic standard (38 ug/L) was over-recovered at 122% and 131%. Therefore, all positive sample results less than 3xIDL level of 57 ug/L should be estimated due to uncertainty at the low end(J^2). The 2xIDL TCLP Selenium standard (28 ug/L) was under-recovered at 40%. Therefore, all positive and non-detected sample results less than 3xIDL level of 42 ug/L should be estimated due to uncertainty at the low end(J^2, UJ2). The CRA Mercury standard(0.2 ug/L, 0.06 mg/kg) in the 11/09/93 run was under-recovered at 70%. As the only sample on the run was a preparation blank, no samples are qualified.

The Zinc 2xCRDL standards (40 ug/L, 8 mg/kg) were over-recovered at 124%, 129%, 121% and 123%. Therefore, all positive sample results less than 3xCRDL of 60 ug/L or 12 mg/kg shall be estimated (J2). The Manganese 2xCRDL standards (30 ug/L, 6 mg/kg) were over-recovered at 133% and 134%. Therefore, all positive sample results less than 3xCRDL of 45 ug/L or 9 mg/kg shall be estimated (J2).

Blanks

Blank frequency and results were reviewed. Frequency requirements were met for all analyses.

The preparation blanks, calibration blanks and equipment rinsates contained low levels of several metals. The following tables list the concentrations of each metal found in the calibration blanks and the prep blank and their associated IDL. Associated with these tables are maximum concentration tables

Blanks

with the resultant action levels. The action level is calculated as 5x the maximum concentration found in any blank. Sample results less than 5x the maximum concentration found in any blank may be due to contamination or instrumental problems, and thus may not be indicative of the actual concentration of the native sample.

	Concentration (ug/L unless otherwise noted)				
Element	IDL				
Aluminum	14.3	-21.1	-30.1	-25.3	-40.3
		-34.9	-21.1	-31.9	-19.9
		-25.9			
Antimony	16.4	19.4	17.6		
Barium	1.6	4.0	5.6	5.2	5.8
		4.6	6.6	11.1TBLK	
Calcium	14.0	-27.6	-37.3	-29.4	-27.6
		-26.4	-33.7	-25.8	-27.1
		-18.3	99.9RB3	50.4RB6	
Chromium	2.7	2.83TBLK			
Cobalt	1.9	2.0	1.9	2.0	
Copper	1.3	2.9	4.7	5.0	4.7
		4.3	5.0	3.6	0.26mg/kg
Iron	4.8	30.8	15.3	11.0	20.4
		33.4	-3.2mg/kg	-26.8	-16.8
		-20.4	-22.5	-13.6	-17.0
		-19.8	-15.1	11.9RB3	116RB6
		528ER13			
Lead	11.7	113.7TBLK		1.3RB6	
Magnesium	13.3	-42.5	-8.8mg/kg	-50.3	-37.3
		-34.6	-43.3	-48.5	-39.9
		-33.8	-33.8		
Manganese	1.0	1.1	1.5	1.7	1.1
		1.7	1.1	6.0RB6	26.5ER13
Mercury	0.1	0.1TBLK	0.1	0.11RB3	0.33ER13

Blanks

Concentration (ug/L unless otherwise noted)

Element	IDL				
Nickel	8.4	14.8	21.4		
Silver	1.9	-1.9	1.9		
Selenium	2.3	-2.4 (TAL Analysis)			
Selenium	21.8	-26.4	-23.1TBLK (TCLP Analysis)		
Sodium	16.0	6.38mg/kg	101RB3	162RB6	41.1ER13
Zinc	1.8	3.0	4.1	3.1	3.1
		3.3	3.4	2.0	1.9
		2.1	2.2	6.6RB3	5.3RB6
		4.0ER13			
Boron	11.9	13.8	24.3	26.9	26.2
		22.8	26.6	21.0	25.4
		12RB3			

The following blank action table reflects the highest blank level that affects all samples. The table does not include the Equipment Rinsate blank levels that affect specific samples.

Concentration (mg/kg)

Element	Highest Level	Action Level
Aluminum	8.06	40.3
Antimony	3.88	19.4
Barium	1.32	6.6
Calcium	7.46	37.3
Cobalt	0.40	2.0
Copper	1.00	5.0
Iron	6.68	33.4
Magnesium	10.06	50.3
Mercury	0.015	0.075
Selenium	0.48	2.4
Silver	0.38	1.9
Sodium	6.38	31.9
Zinc	0.82	4.1
Boron	5.38	26.9

Blanks

The action level values were compared to the sample value after application of sample dilution factors, and sample results less than the action level were reported as not detected (U3). As the action levels are applied to samples before final concentration calculation, due to low percent solids for several samples, the action levels were elevated.

The following blank action table reflects the highest blank level that affects the TCLP sample results.

Concentration (ug/L)

Element	Highest Level	Action Level
Barium	11.12	55.6
Chromium	2.84	14.2
Lead	113.7	568.5
Mercury	0.10	0.5
Selenium	26.40	132
Silver	1.90	9.5

The action level values were compared to the sample value after application of sample dilution factors, and sample results less than the action level were reported as not detected (U3).

The following blank action table reflects the highest blank level that affects samples associated with Equipment Rinsate 13 (those sampled on 11/02/93) and whose action levels are greater than those established by laboratory contaminants:

Concentration (mg/kg)

Element	Highest Level	Action Level
Iron	105.6	528.0
Manganese	5.3	26.5
Mercury	0.066	0.33
Sodium	8.22	41.1

Blanks

The following blank action table reflects the highest blank level that affects samples associated with Equipment Rinsate SED3RB (those sampled on 10/25/93 and 10/26/93) and whose action levels are greater than those established by laboratory contaminants:

Element	Concentration (mg/kg) Highest Level	Action Level
Calcium	20.0	99.0
Mercury	0.033	0.16
Sodium	20.2	101.0
Zinc	1.32	6.6

The following blank action table reflects the highest blank level that affects samples associated with Equipment Rinsate SED6RB (those sampled on 10/27/93 and 10/28/93) and whose action levels are greater than those established by laboratory contaminants:

Element	Concentration (mg/kg) Highest Level	Action Level
Calcium	10.1	50.5
Iron	23.2	116
Lead	0.26	1.3
Manganese	1.20	6.0
Sodium	32.4	162
Zinc	1.06	5.3

The action level values were compared to the sample value after application of sample dilution factors, and sample results less than the action level were reported as not detected (U3).

ICP Interference Check Results

The ICP interference check sample results were reviewed and all recoveries met required criteria. The ICS solutions were analyzed at the proper frequency. Antimony, Barium, Copper, Sodium and Vanadium were detected in the ICSA solution above the 2xIDL level but should not be present. Due to high levels of Iron in the soil samples 2DSD21(0-1), 2DSD28(0-1) and 2DSD29(0-1), the following qualifications are made: the Antimony, Barium, Copper, Sodium and Vanadium levels for samples 2DSD28(0-1) and 2DSD29(0-1) are low in comparison (less than 10X) with the estimated interference. Therefore, estimate (UJ4, J4) those analyte results.

For sample 2DSD21(0-1), the Antimony, Barium, Sodium and Vanadium sample levels are low in comparison with the estimated interference. Therefore, only the Antimony, Barium, Sodium and Vanadium results are estimated (UJ4, J4).

In the TCLP analysis, Arsenic and Lead were detected in the ICSA solution above the 2xIDL level but should not be present. The sample raw data was checked for interferent levels. The Iron level for sample 3SD7(1-3) was 1/2 that of the ICSA solution. As the sample was non-detected for Arsenic, only the Lead result is estimated (J4).

Matrix Spike Recoveries

A Metals and Cyanide matrix spike was performed on sample 2DSD21(0-1). Copper and Manganese were over-recovered. Therefore, the detected results will be estimated (J5) and the non-detects accepted without qualification. Antimony, Lead, Silver, Vanadium and Cyanide were under-recovered. Therefore, all Antimony, Lead, Silver, Vanadium and Cyanide results will be estimated (J5, UJ5).

A Mercury and Metals TCLP matrix spike was performed as batch QC, but results were not submitted. Due to the lack of recovery information, all results are estimated (UJ5, J5).

Field Duplicates

No field duplicates were identified in this SDG group.

Laboratory Duplicates

A Metals and Cyanide laboratory duplicate was performed on sample 2SD21(0-1). Duplicate Precision for all analytes except Calcium and Lead met the required validation criteria of <35% RPD for soils. Positive Calcium and Lead results are therefore estimated(J6).

A Mercury and Metals TCLP laboratory duplicate was performed as batch QC, but results were not submitted. Due to the lack of precision information, all postive results are estimated (J6).

In the grain size analysis, a duplicate was performed on sample 2SD28(0-1) and 3SD7(1-3). The RPDs for all catagories were within the 35% validation guidelines for soils.

Laboratory Control Sample Results

The solid laboratory control sample (LCS) results were reviewed, and the criteria were met for all parameters, except Iron. The control windows were established to be 7020 - 15,100 mg/kg and the Iron LCS result was 6388 mg/kg. Therefore, all Iron results will be estimated (UJ8, J8).

Furnace AA Results

This section is not applicable as all Furnace elements were analyzed by ICP.

Instrument Detection Limits

Instrument detection limits (IDLs) were reviewed and found to be less than the contract required detection limits (CRDL). In the case of Lead, two instruments were used. The IDL for the TJA01 was 11.7 ug/L, greater than the CRDL of 3ug/L. However, the only results reported from the instrument analysis were greater than five times the IDL. Therefore, the data is accepted.

The TCLP analysis was performed on the TJA01 ICP with the following IDL's: Arsenic 34.5 ug/L (CRDL 10 ug/L), Lead 11.7 ug/L (CRDL 3 ug/L) and Selenium 21.8 ug/L (CRDL 5 ug/L). As the maximum contaminant levels for TCLP are very high, the higher detection limits are not significant.

ICP Serial Dilution Results

The serial dilution was performed on sample 2SD21(0-1). Analytical results agreed within the 15% D validation guidelines for analyte concentrations greater than 50xIDL before dilution for all.

A TCLP serial dilution was not submitted. No action is recommended.

DATA VALIDATION REPORT

SDG No.: GRT16

Site: Groton, Naval Subase

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DATA VALIDATION REPORT

RE: SDG No.: GRT16
Site: Groton, Naval Subase

Volatiles: 14/soil/2LTB9(0-2), 2LTB22(6-8), 2LTB17(0-2), 2LT16(0-2), 2LTB23(4-8), 2LTB33(4-8), 2LTB13(0-2), 2LTB20(6-8), 2LTB19(2-4), 2LTB26(4-6), 2LTB29(10-12), 2LTB31(8-10), 2LTB39(10-12), 2LTB28(4-6)
12/aqueous/1093ER15, 1093ER19, 1093ER21, 1093ER17, 1093DIFB, 1093DWFB, 1093TB12, 1093TB13, 1093TB14, 1093TB15, 1093TB16, 1093TB17

Semivolatiles: 14/soil/2LTB9(0-2), 2LTB22(6-8), 2LTB17(0-2), 2LT16(0-2), 2LTB23(4-8), 2LTB33(4-8), 2LTB13(0-2), 2LTB20(6-8), 2LTB19(2-4), 2LTB26(4-6), 2LTB29(10-12), 2LTB31(8-10), 2LTB39(10-12), 2LTB28(4-6)
6/aqueous/1093ER15, 1093ER19, 1093ER21, 1093ER17, 1093DIFB, 1093DWFB

Pesticides: 35/soil and tissue/2LTB9(0-2), 2LTB22(8-10), 2LTB17(0-2), 2LT16(0-2), 2LTB23(4-8), 2LTB33 (4-8), 2LTB13(0-2), 2LTB20(6-8), 2LTB19(2-4), 2LTB29(10-12), 2LTB31(8-10), 2LTB28(4-6), 2LTB39(10-12), 2LC1, 2LC2, 2LC3, 2LC4, 2DSS16, 2DSS1, 2DSS13, 2DSS11, MCLL1, 3DSD4A, 2DSS2, 2DSS19, DSS1WM, DSS7IN, SD4AWM, SS11WM, SS13WM, SS13WMDUP, SS16IN, SS16WM, SD4AIN, 2LTB26(4-6), 2LTB28(4-6)
6/aqueous/1093ER15, 1093ER19, 1093ER21, 1093ER17, 1093DIFB, 1093DWFB

Metals: 14/soil/2LTB9(0-2), 2LTB22(6-8), 2LTB17(0-2), 2LT16(0-2), 2LTB23(4-8), 2LTB33(4-8), 2LTB13(0-2), 2LTB20(6-8), 2LTB19(2-4), 2LTB26(4-6), 2LTB29(10-12), 2LTB31(8-10), 2LTB39(10-12), 2LTB28(4-6)
6/aqueous/1093ER15, 1093ER19, 1093ER21, 1093DIFB, 1093DWFB

Full TCLP: 1/soil/2LTB26(4-6)
Conventional Chemistry: 2/soil/2LTB17(0-2), 2LTB19(4-6)
(TOC, Grain size, pH, Specific Gravity, Moisture content, CEC)
9/soil/2DSS16, 2DSS1, 2DSS13, 2DSS11, MCLL1, 3DSD4A, 2DSS2, 2DSS19, 3SD6(0-1)
(TOC, Grain size)

INTRODUCTION

The validation of volatile, semivolatile, pesticides and inorganic analytical data from SDG No. GRT16 was performed according to Navy Level C requirements, equivalent to DQO Level 4, as presented in the 'Navy Level C Review of Laboratory Data Generated under NEESA 20.2-047B', developed by META Environmental, Inc. In the cases where those guidelines differed from those of the U.S. EPA Region 1 Functional Guidelines for evaluating Organic Analyses and the U.S. EPA Region I Functional Guidelines for Evaluating Inorganic Analyses (6/88), the latter were used.

Because there are no data validation guidelines for the conventional chemistry parameters requested, the following methods were used for review of the associated data: pH Method 9045 SW-846, Cation Exchange Capacity Method 9081 SW-846, % Moisture Method 209F Standard Methods, Specific Gravity Method 213E Standard Methods, % Ash Method D482-80 ASTM and % Organic Carbon, Walkley Black.

Form I copies with the data validation results and recommendations for each fraction of each validated sample have been submitted.

The data submitted for GRT16 was found to be generally good. There were some qualifications of VOA and ABN data due to holding times, calibration, blank contamination, surrogate recoveries, matrix spike and matrix spike duplicate recoveries, internal standard areas and field duplicate results. There were some qualifications of PEST data due to holding times, calibration, blank contamination, surrogate recoveries, matrix spike and matrix spike duplicate recoveries, field duplicate results and pesticide GPC calibration. There were no qualifications necessary for the full organic TCLP data.

There were some qualifications of inorganic data due to uncertainty at the low end of calibration, blank contamination, ICP Interference Check results, matrix spike recoveries, Furnace AA results and laboratory and field duplicate precision. There was some qualification of the Conventional chemistry data due to holding times and duplicate precision. There was some qualification of inorganic TCLP data due to the lack of matrix spike recovery and duplicate precision information.

INTRODUCTION

NEESA requires the analysis of method blank spikes along with the analysis of samples. The results of the method blank spikes are to be plotted on control charts and submitted with the data package.

For the VOA and ABN fractions, the method blank spikes are essentially the same as the method blanks. The method blanks submitted by the laboratory may be evaluated as method blank spikes by plotting the surrogate recoveries on a control chart. In compliance with NEESA requirements, the laboratory did submit control charts which plotted the surrogate recoveries.

For the PEST fraction, a method blank spike must contain at least two pesticide compounds and/or one PCB compound, and the recovery results plotted on a control chart. In compliance with NEESA requirements, the laboratory did submit control charts which plotted the recoveries. It should be noted that the laboratory inadvertently omitted the PCB compound in the method blank spike submitted with this data package. No action is recommended.

For the METALS and Wet chemistry fractions, a blank spike is the same as the laboratory control sample. The recoveries of each furnace element and three ICP metals and one analyte for Wet Chemistry must be plotted on a control chart. In compliance with Neesa requirements, the laboratory did submit the control charts with plotted recoveries.

NEESA specifies that samples must be shipped within 24 hours of collection in order to ensure that the laboratory will meet the required holding times. Samples 1093ER14, 2LTB17(0-2), 1093ER16, 1093TB13, 2LTB9(0-2), 2LTB22(6-8), 2LTB22(8-10), 1093ER17, 2LTB23(4-8), 2LTB33(4-8), 1093ER19, 1093TB15, 2LTB19(2-4), 1093DIFB, 1093DWFB, 1093ER20, 2LTB26(4-6), 2LTB28(4-6), 1093TB16, 1093ER21, 2LTB29(10-12), 2LTB31(8-10), 2LTB39(10-12), 2LTB17(0-2), 2LTB19(4-6), 1093TB17, 2DSS11, 2DSS16, 2DSS1, 2DSS13, 2DSS11, MCLL1, 3DSD4A, 2DSS2 and 2DSS19 were not shipped within 24 hours. No action is recommended.

ORGANIC DATA

Evaluation of the volatile(VOA), semivolatile(ABN) and pesticide (PEST) organic data was based on the following parameters:

*	● Data completeness
	● Holding times
*	● GC/MS Tuning
	● Calibration
	● Blanks
	● Surrogate Recoveries
	● Matrix spike/matrix spike duplicate
	● Internal standard performance
	● Pesticide instrument performance
NA	● Compound identification
NA	● Compound quantitation

* All criteria were met for this parameter.

Data Completeness

The data package contained all of the forms required by the SOW for the VOA, ABN and PEST fraction samples.

It should be noted that changes were made to the PEST Form 1's. The following samples required changes: DSS1WM, 2LTB16(0-2)DL, 2LTB29(10-12), 2DSS13, SS11WMMS and SS11WMMSD.

DSS1WM All CRQL's and concentrations have been changed on the Form 1.

2LTB16(0-2)DL The concentration for Aroclor-1260 reported on the Form 1 was changed.

2LTB29(10-12) The concentration for Aroclor-1254 reported on the Form 1 was changed.

2DSS13 The concentration for 4,4'-DDD reported on the Form 1 was changed.

SS11WMMS All CRQL's and concentrations have been changed on the Form 1.

SS11WMMS All CRQL's and concentrations have been changed on the Form 1.

Holding Times

All of the VOA fraction samples were analyzed within the required holding times. No action is recommended.

The ABN fraction samples 2LTB16(0-2), 2LTB16(0-2)MS and 2LTB16(0-2)MSD were extracted 2 days outside of the required 10 days from the date of collection for soil samples. The ABN fraction sample 2LTB17(0-2) was extracted 3 days outside of the required 10 days from the date of collection for soil samples. The ABN fraction sample 1093DIFBRE was extracted 20 days outside of the required 7 days from the date of collection for aqueous samples. It is recommended to estimate the positive and non-detected results (J^1, UJ^1).

All of the ABN fraction samples were analyzed within the required 40 days from the date of extraction. No action is recommended.

The PEST fraction sample 2DSS1DL was extracted 48 days outside of the required 10 days from the time of collection for soil samples. It is recommended to estimate the positive and non-detected results (J^1, UJ^1).

The PEST fraction samples 2DSS11MSD, 2DSS11MS and 2DSS11 were analyzed 2 days, samples 2LTB16(0-2), 2DSS2 and 2DSS19 were analyzed 3 days, sample 2LTB13(0-2) was analyzed 4 days, sample 2LTB33(4-8)DL was analyzed 5 days, samples 2DSS2DL, 2DSS16, 2DSS1, 2DSS13, 3DSD4A and 2DSS19DL were analyzed 7 days and samples 2LTB16(0-2)DL, MCLL1DL, MCLL1, 2DSS13DL, 2DSS16DL and 3DSD4ADL were analyzed 8 days outside of the required 40 days from the date of extraction. It is recommended to estimate the positive and non-detected results (J1, UJ1).

GC/MS Tuning

All of the BFB and DFTPP tuning criteria were within the required limits.

Calibration

The following problems were noted with the initial and/or continuing calibration of the VOA and ABN systems.

Calibration

VOA Instrument DMS-HP (initial calibration date 07/1/93):

Compound	IC 07/01/93	CC 11/17/93	CC 11/19/93
Chloromethane		X	X
Vinyl Chloride		X	
4-methyl-2-pentanone		X	

Associated samples:	07/01/93	All listed
	11/17/93	2LTB19(2-4), 2LTB19(2-4)MS, 2LTB19(2-4)MSD
	11/19/93	2LTB13(0-2), 2LTB26(4-6), 2LTB31(8-10), 2LTB29(10-12) 2LTB39(10-12)

VOA Instrument CMS-HP (initial calibration date 08/30/93):

Compound	IC 08/30/93	CC 11/11/93	CC 11/12/93
Bromomethane		X	X
Acetone	X	X	
Carbon disulfide		X	X
1,2-Dichloroethane		X	X

Associated samples:	08/30/93	All listed
	11/11/93	2LTB16(0-2), 2LTB17(0-2), 2LTB9(0-2)
	11/12/93	2LTB22(6-8)

VOA Instrument CMS-HP (initial calibration date 11/15/93):

Compound	IC 11/15/93	CC 11/19/93	CC 11/22/93
Bromomethane			X
Carbon disulfide		X	

Associated samples:	11/15/93	All listed
	11/19/93	2LTB23(4-8), 2LTB23(4-8)MS, 2LTB23(4-8)MSD, 2LTB33(4-8), 2LTB20(6-8)
	11/22/93	2LTB28(4-6)

Calibration

VOA Instrument "GMS-HP" (initial calibration date 10/30/93):

Compound	IC 10/30/93	CC 11/09/93	CC 11/17/93
Methylene Chloride	XX	X	XX
Acetone	XX	X	X
Carbon Disulfide		X	X
4-methyl-2-pentanone		X	
2-hexanone		X	

Compound	CC 11/19/93
Methylene Chloride	X
Acetone	XX
Carbon Disulfide	
4-methyl-2-pentanone	
2-hexanone	

Associated samples:

10/30/93	All samples listed
11/09/93	1093ER15, 1093TB12, 1093ER15DL, 1093TB13
11/17/93	1093ER17, 1093TB14, 1093ER19, 1093TB15
11/19/93	1093ER17DL, 1093ER19DL, 1093DIFB, 1093DWFB, 1093TB16, 1093ER21, 1093TB17, 1093DIFBDL, 1093ER21DL

ABN Instrument "HMS-HP" (initial calibration date 11/17/93):

Compound	IC 11/17/93	CC 12/06/93	CC 12/07/93	CC 12/09/93
hexachlorocyclopentadiene		X		
2,4-dinitrophenol		X		
4-chlorophenyl-phenylether				
4,6-dinitro-2-methylphenol		X	X	
pentachlorophenol				
Di-n-butylphthalate				
bis(2-ethylhexyl)phthalate				
di-n-octylphthalate				
benzo(k)fluoranthene	X			

Calibration

ABN Instrument "HMS-HP" (initial calibration date 11/17/93): (continued)

Compound	CC 12/13/93	CC 12/14/93	CC 12/20/93
hexachlorocyclopentadiene			
2,4-dinitrophenol		X	
4-chlorophenyl-phenylether		X	X
4,6-dinitro-2-methylphenol			X
pentachlorophenol		X	
Di-n-butylphthalate		X	
bis(2-ethylhexyl)phthalate		X	
di-n-octylphthalate		X	X
benzo(k)fluoranthene			X

Associated samples:		
	11/17/93	All samples listed
	12/06/93	1093ER15, 1093ER17, 1093ER19, 1093DIFB, 1093DWFB, 1093ER21
	12/07/93	2LTB29(10-12), 2LTB31(8-10), 2LTB39(10-12), 2LTB22(6-8), 2LTB16(0-2), 2LTB16(0-2)MS, 2LTB16(0-2)MSD, 2LTB17(0-2), 2LTB20(6-8), 2LTB26(4-6), 2LTB28(4-6), 2LTB19(2-4)
	12/09/93	2LTB31(8-10)RE, 2LTB39(10-12), 2LTB9(0-2), 2LTB22(6-8)RE, 2LTB26(4-6)RE, 2LTB28(4-6)RE, 2LTB23(4-8)MS, 2LTB23(4-8)MSD, 2LTB33(4-8), 2LTB13(0-2)
	12/13/93	2LTB23(4-8), 2LTB33(4-8)RE
	12/14/93	1093DIFBRE
	12/20/93	SBLKHL

X - %RSD > 30% or %D >25%; Estimate (J^3) postitive results in the associated samples.

XX - %RSD > 50%or %D > 50%; Estimate positive results (J^4) and non-detects (UJ^4).

XXX- Surrogate %D >25% or %RSD > 30%; Estimate positive results (J26) for compounds associated with the out of control surrogates.

Blanks

The VOA, ABN and PEST fraction low and medium level laboratory method blanks, equipment rinsates, field blanks and trip blanks contained the following maximum quantities of contaminants:

LOW LEVEL:

Compound	Maximum	Action Level
Methylene Chloride	2 ug/L	20 ug/L or ug/kg
Acetone	150 ug/L	1500 ug/L or ug/kg
2-Butanone	24 ug/L	240 ug/L or ug/kg
Chloroform	9 ug/L	45 ug/L or ug/kg
Bromodichloromethane	5 ug/L	25 ug/L or ug/kg
Dibromochloromethane	1 ug/L	5 ug/L or ug/kg
Di-n-butylphthalate	18 ug/L	180 ug/L
bis(2-ethylhexyl)phthalate	6 ug/L	60 ug/L
di-n-octylphthalate	9 ug/L	90 ug/L
4,4'-DDD	1.5 ug/kg	7.5 ug/kg
4,4'-DDT	1.8 ug/kg	9.0 ug/kg

MEDIUM LEVEL:

Compound	Maximum	Action Level
Methylene Chloride	730 ug/kg	7300 ug/kg
Acetone	150 ug/kg	220,000 ug/kg
2-Butanone	24 ug/kg	36,000 ug/kg
Chloroform	9 ug/kg	6800 ug/kg
Bromodichloromethane	5 ug/kg	3800 ug/kg
Dibromochloromethane	1 ug/kg	750 ug/kg

It should be noted that the field sample DWFB, Drillers Water Field Blank was not used to blank qualify results. This water was the stored water from the site's facility that was used to wash (with Alconox or acid) the sampling equipment. A final dionized water (submitted as DIFB) wash was performed on all equipment which was submitted daily as the equipment rinsates.

Blank Actions

- Value < CRQL; report CRQL followed by "U" (U^6).
- Value > CRQL and < action level; report value followed by "U" (U^7).
- Value > CRQL and > action level; report value unqualified.

Blanks

The action level values were compared to the sample values after application of sample dilution factors, and the following actions are recommended. Methylene chloride in samples 2LTB16(0-2), 2LTB17(0-2), 2LTB9(0-2), 2LTB26(4-6), 2LTB28(4-6), 2LTB29(10-12) and 2LTB39(10-12), bis(2-etylhexyl)phthalate in samples 2LTB29(10-12), 2LTB33(4-8) and 2LTB33(4-8)RE, di-n-octylphthalate in sample 2LTB29(10-12), 4,4'-DDD in samples M2DSS2DL, SS13WMDUP, SS13WMDL, SS16WMDL, 2DSS13DL, 2DSS16DL and 3DSD4ADL and 4,4'-DDT in samples SD4AWM, SS11WM, SS13WMDUP, SS13WMDL, 2LTB19(2-4)DL, 2LTB26(4-6), 2LC1 and 2LC2 should be reported as the CRQL followed by "U" (U6).

Methylene Chloride in samples 2LTB13(0-2) and 2LTB31(8-10), acetone in samples 2LTB16(0-2), 2LTB17(0-2), 2LTB9(0-2), 2LTB13(0-2), 2LTB19(2-4), 2LTB22(6-8), 2LTB26(4-6), 2LTB28(4-6), 2LTB29(10-12), 2LTB31(8-10), 2LTB39(10-12), 2LTB19(2-4)MS and 2LTB19(2-4)MSD, 2-Butanone in samples 2LTB17(0-2) and 2LTB22(6-8), bis(2-ethylhexyl)phthalate in samples 2LTB19(2-4), 2LTB39(10-12) and 2LTB39(10-12)RE and 4,4'-DDT in samples DSS1WMDL, 2LTB9(0-2)DL, SS16WMDL, 2LTB28(4-6), 2LTB29(10-12)DL and 2LTB16(0-2) should be reported as the CRQL followed by "U" (U^7). Therefore, raising the detection limit for those compounds and the results are considered to be non-detected.

Methylene Chloride in the medium level samples 2LTB20(6-8), 2LTB23(4-8), 2LTB33(4-8), 2LTB23(4-8)MS and 2LTB23(4-8)MSD should be reported as the CRQL followed by "U" (U6).

Surrogate Recoveries

All of the VOA aqueous fraction surrogate recoveries were within the contract required recovery range (CRR). No action is recommended.

The VOA fraction surrogate Bromofluorobenzene was over-recovered in the soil sample 2LTB33(4-8). It is recommended to estimate positive results (J8) within the associated area of the chromatogram for the sample.

The ABN fraction surrogate 2-Fluorophenol was under-recovered in the soil sample 2LTB9(0-2). No action is recommended as validation guidelines require that at least two surrogates in a given fraction be out of control before corrective action is necessary.

Surrogate Recoveries

The ABN fraction surrogate phenol-d5 was recovered at < 10% in the aqueous sample 093DIFB. It is recommended to estimate positive results (J10) and reject non-detects (R4) within the associated area of the chromatogram for that sample.

The PEST surrogate TCX was under-recovered in the aqueous sample 1093ER19 and the PEST fraction surrogate DCB was under-recovered in the aqueous samples 1093DIFB, 1093DWFB, 1093ER15, 1093ER17, 1093ER19 and 1093ER21. It is recommended to estimate positive and non-detected results (J9, UJ9) within the associated areas of the chromatograms dependent upon the column used to report the concentrations.

The PEST surrogate TCX was under-recovered in the soil samples 2LTB26(4-6), 2DSS11, 2DSS11MSD, 2DSS19, 2LC1, 2LC3, 2LC4, 2LC2, DSS1WM, DSS7IN, M2DSS1, SD4AIN and SS16IN and the PEST fraction surrogate DCB was under-recovered in the soil samples 2LTB26(4-6), 2DSS11MSD, 2LC1, 2LC3, 2LC4, 2LTB16(0-2), 2LC2 and DSS1WM. It is recommended to estimate positive and non-detected results (J9, UJ9) within the associated areas of the chromatograms dependent upon the column used to report the concentrations.

The PEST surrogate TCX was recovered at <10% in the soil samples 2DSS16 and SS13WMDUP. The PEST surrogate DCB was recovered at <10% in the soil sample SS13WMDUP. It is recommended to estimate positive results (J10) and reject non-detects (R4) within the associated areas of the chromatograms dependent upon the column used to report the concentrations.

Matrix Spike/Matrix Spike Duplicate

The VOA and ABN fraction low and medium level soil MS/MSD recoveries and RPDs were within the advisory limits. No action is recommended.

The PEST fraction compound 4,4'-DDT was over-recovered in 2DSS11MS. It is recommended to estimate positive results (J11) in the unspiked sample. The PEST fraction compound 4,4'-DDT was under-recovered in sample 2DSS1MSD. It is recommended to estimate positive results (J12) and reject non-detects (R5) in the unspiked sample. The %RPD for 4,4'-DDT was high in the MS/MSD set. It is recommended to estimate positive results (J13) in the unspiked sample.

Matrix Spike/Matrix Spike Duplicate

It should be noted that PEST fraction sample 2LTB23(4-8)MS/MSD required a 100 fold dilution. The matrix spike was diluted out and therefore a Form III was not included in the package for these samples.

A comparison of the unspiked compounds present in the sample/MS/MSD sets of which the sample was not analyzed as a field duplicate yield the following information: The ABN fraction compound 2,4-Dimethylphenol was detected in the MS and MSD above the CRQL but not detected in the sample. It is recommended to estimate the positive and non-detected results (J24, UJ24) for this compound in the sample, MS and MSD. The PEST fraction compound Endosulfan I was detected in the MS and MSD above the CRQL but not detected in the sample. It is recommended to estimate the positive and non-detected results (J24, UJ24) for this compound in the sample, MS and MSD.

Field Duplicate Precision

A comparison of the compounds present in the VOA, ABN and PEST field duplicate pair 2LTB23(4-8) and 2LTB33(4-8) submitted yield the following information. The VOA compounds ethylbenzene, xylene (total) and toluene, the ABN compounds 4-methylphenol and naphthalene and the PEST compound endrin had RPDs of greater than 50%. It is recommended to estimate positive results (J14) in the sample and duplicate.

The ABN compound Pyrene and the PEST compound Endosulfan I were detected in one sample above the CRQL but were not detected in the duplicate sample. It is recommended to estimate positive and non-detected results (J15, UJ15) for these compounds in the sample and field duplicate sample.

A comparison of the compounds present in the VOA, ABN and PEST field duplicate pair 2LTB29(10-12) and 2LTB39(10-12) submitted yield the following information. The ABN compounds Fluoranthene, pyrene and benzo(a)anthracene and the PEST compound 4,4'-DDT had RPDs of greater than 50%. It is recommended to estimate positive results (J14) in the sample and duplicate.

The ABN compound phenanthrene and the PEST compounds Aroclor-1254 and endrin aldehyde were detected in one sample above the CRQL but were not detected in the duplicate sample. It is recommended to estimate positive and non-detected results (J15, UJ15) for these compounds in the sample and field duplicate sample.

Field Duplicate Precision

A comparison of the compounds present in the PEST field duplicate pair SS13WM and SS13WMDUP submitted yield the following information. The PEST compounds 4,4'-DDE, 4,4'-DDD and 4,4'-DDT had RPDs of greater than 50%. It is recommended to estimate positive results (J14) in the sample and duplicate.

Internal Standard Performance

All VOA aqueous and soil Internal Standard (IS) areas were within the CRR. No action is recommended.

All ABN aqueous Internal Standard (IS) areas were within the CRR. No action is recommended.

The ABN IS Chrysene-d12 was under-recovered in the soil samples 2LTB31(8-10) and 2LTB31(8-10)RE. The ABN IS Perylene-d12 was under-recovered in the soil samples 2LTB22(6-8), 2LTB26(4-6), 2LTB28(4-6), 2LTB31(8-10), 2LTB39(10-12), 2LTB22(6-8)RE, 2LTB26(4-6)RE, 2LTB28(4-6)RE, 2LTB31(8-10)RE, 2LTB33(4-8), 2LTB39(10-12)RE and 2LTB33(4-8)RE. It is recommended to estimate positive results (J16) and non-detects (UJ16) for all compounds quantitated from these internal standards in the associated samples.

Pesticide Instrument Performance

All DDT retention times were greater than twelve minutes. All continuing calibration standard compound retention times were within the established RT windows. All DDT and endrin percent breakdowns were less than twenty percent each and thirty percent total.

The following samples had a shift in retention time of >+/- 0.05 minutes for TCX (Tetrachloro-m-xylene) and/or a shift in retention time of >0.10 minutes for DCB (Decachlorobiphenyl):

Sample	Date/Column	TCX	DCB
2LTB23(4-8)	12/21/93/DB608		X
2LTB23(4-8)MSD	12/21/93/DB608		X
2LTB33(4-8)	12/21/93/DB608		X
2LTB23(4-8)	12/21/93/DB1701	X	X
2LTB23(4-8)MS	12/21/93/DB1701		X

Pesticide Instrument Performance

The following samples had a shift in retention time of >+/- 0.05 minutes for TCX (Tetrachloro-m-xylene) and/or a shift in retention time of >0.10 minutes for DCB (Decachlorobiphenyl):

Sample	Date/Column	TCX	DCB
2LTB29(10-12)DL	12/29-30/93/DB608		X
MMCLL1	12/29-30/93/DB608	X	X
2LTB33(4-8)DL	12/29-30/93/DB608	X	X
2DSS16DL	12/29-30/93/DB608		X
MMCLL1DL	12/29-30/93/DB608	X	X
DSS1WMDL	12/29-30/93/DB608		X
2LTB29(10-12)DL	12/29-30/93/DB1701		X
2DSS19DL	12/29-30/93/DB1701	X	
MMCLL1	12/29-30/93/DB1701	X	X
2LTB33(4-8)DL	12/29-30/93/DB1701	X	X
2DSS16DL	12/29-30/93/DB1701	X	X
MMCLL1DL	12/29-30/93/DB1701	X	X
SS16WMDL	12/29-30/93/DB1701	X	X
DSS1WMDL	12/29-30/93/DB1701	X	X

The chromatograms of the samples affected were checked for peaks within an expanded window. No action is recommended. The pesticide instrument resolution summary reported resolution values of >/= 60% and all peaks on the RESC chromatograms are 10 - 100% full scale.

All initial calibration compound %RSDs were < 20% for all single component compounds and the surrogates were <30%. The pesticide initial calibration for multicomponent analytes had a minimum of three peaks reported per compound and the representative peaks were 25 - 100 % scale in the chromatograms. The laboratory followed the correct analytical sequence. The following pesticide calibration verification compounds did not meet the RPD criteria of < 25%:

COMPOUND	DATE (TIME)	%RPD	COLUMN	SAMPLES AFFECTED
Endosulfan I	12/26/93 17:25	40.0	DB608	2DSS19, M2DSS2,
Dieldrin	12/26/93 17:25	35.0	DB608	2LTB17(0-2),
Endrin	12/26/93 17:25	40.0	DB608	2LTB16(0-2),
4,4'-DDT	12/26/93 17:25	50.0	DB608	PBLK2625, 2LC3,
Methoxychlor	12/26/93 17:25	47.0	DB608	2LC1, 2LC4

Pesticide Instrument Performance

The following pesticide calibration verification compounds did not meet the RPD criteria of < 25%:

COMPOUND	DATE (TIME)	%RPD	COLUMN	SAMPLES AFFECTED
Hept. Epoxide	12/26/93 18:17	40.0	DB608	2DSS19, M2DSS2, 2LTB17(0-2), 2LTB16(0-2), PBLK2625, 2LC3, 2LC1, 2LC4
4,4'-DDE	12/26/93 18:17	35.0	DB608	
Endosulfan II	12/26/93 18:17	35.0	DB608	
End. sulfate	12/26/93 18:17	35.0	DB608	
Endrin ketone	12/26/93 18:17	30.0	DB608	
End. Aldehyde	12/26/93 18:17	35.0	DB608	
Alpha-chlor.	12/26/93 18:17	40.0	DB608	
Gamma-chlor.	12/26/93 18:17	40.0	DB608	
decachloro-biphenyl	12/26/93 18:17	35.0	DB608	
Endosulfan I	12/26/93 17:25	30.0	DB1701	2DSS19, M2DSS2, 2LTB17(0-2), 2LTB16(0-2), PBLK2625, 2LC3, 2LC1, 2LC4
4,4'-DDT	12/26/93 17:25	50.0	DB1701	
Methoxychlor	12/26/93 17:25	42.0	DB1701	
Decachloro-biphenyl	12/26/93 17:25	30.0	DB1701	
Endosulfan II	12/26/93 18:17	30.0	DB1701	2DSS19, M2DSS2, 2LTB17(0-2), 2LTB16(0-2), PBLK2625, 2LC3, 2LC1, 2LC4
Endrin ketone	12/26/93 18:17	30.0	DB1701	
End. Aldehyde	12/26/93 18:17	45.0	DB1701	
Alpha-chlor.	12/26/93 18:17	30.0	DB1701	
Gamma-chlor.	12/26/93 18:17	30.0	DB1701	

It is recommended to estimate positive results (J27) for compounds in associated samples from the column with the out of control criteria.

It should be noted that the pesticide florisil cartridge check IND recoveries were 80-120% for all compounds.

The recovery for GPC calibration pesticide matrix compound 4,4'-DDT was greater than the recommended 80 - 110% for the calibration standard analyzed 11/30/93. It is recommended to estimate positive results (J29) for this compound in the following associated samples: 2LTB28(4-6), 2LTB29(10-12)DL, 2LTB39(10-12)DL, 2LTB28(4-6), 2LTB26(4-6), 2LTB29(10-12), 2LTB31(8-10), 2LTB39(10-12), 2LTB9(0-2)DL, 2LTB22(8-10), 2LTB9(0-2), 2LTB19(2-4) and 2LTB19(2-4)DL.

It is recommended to estimate positive results (J28) for pesticide compounds which have concentration values differing by > 25% in its two analyses.

Compound Identification

This section is not applicable as raw data was not reviewed as part of the Level C review.

Compound Quantitation

It should be noted that for all VOA, ABN and PEST compounds detected above the calibration range, it is recommended to estimate positive results (J23). VOA, ABN and PEST quantitation calculations were not checked as raw data was not reviewed as part of the Level C review.

Tentatively Identified Compounds

This section is not applicable as raw data was not reviewed as part of the Level C review.

Data Assessment

This package contains re-extraction, re-analysis or dilution. After reviewing the associated QC, the following recommendations are made:

VOA: 1093ER15, 1093ER15DL

Use positive result for the compound acetone from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

1093ER17, 1093ER17DL

Use positive result for the compound acetone from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

1093ER19, 1093ER19DL

Use positive result for the compound acetone from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

Data Assessment

VOA: 1093DIFB, 1093DIFBDL

Use positive result for the compound acetone from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

1093ER21, 1093ER21DL

Use positive result for the compound acetone from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

ABN: 1093DIFB, 1093DIFBRE

Use non-detected results for the compounds phenol, 2-chlorophenol, 2-methylphenol, 4-methylphenol, 2-nitrophenol, 2,4-dimethylphenol, 2,4-dichlorophenol, 4-chloro-3-methylphenol, 2,4,6-trichlorophenol, 2,4,5-trichlorophenol, 2,4-dinitrophenol, 4-nitrophenol and 4,6-dinitro-2-methylphenol from the reanalysis.

Use all other positive and non-detected results from the original analysis.

2LTB22(6-8), 2LTB22(6-8)RE

Use all positive and non-detected results from the original analysis.

2LTB26(4-6), 2LTB26(4-6)RE

Use all positive and non-detected results from the original analysis.

2LTB28(4-6), 2LTB28(4-6)RE

Use all positive and non-detected results from the original analysis.

Data Assessment

ABN: 2LTB31(8-10), 2LTB31(8-10)RE

Use all positive and non-detected results from the original analysis.

2LTB33(4-8), 2LTB33(4-8)RE

Use all positive and non-detected results from the original analysis.

2LTB39(10-12), 2LTB39(10-12)RE

Use all positive and non-detected results from the original analysis.

PEST: DSS1WM, DSS1WMDL

Use all positive and non-detected results from the undiluted analysis.

2LTB16(0-2), 2LTB16(0-2)DL

Use all positive and non-detected results from the original analysis.

3DSD4A, 3DSD4ADL

Use positive result for the compound 4,4'-DDT from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

SS13WM, SS13WMDL

Use all positive and non-detected results from the undiluted analysis.

Data Assessment

PEST: SS16WM, SS16WMDL

Use all positive and non-detected results from the undiluted analysis.

2LTB9(0-2), 2LTB9(0-2)DL

Use positive result for the compound 4,4'-DDD from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

MMCLL1, MMCLL1DL

Use positive result for the compound 4,4'-DDT from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

M2DSS1, M2DSS1DL

Use positive result for the compound 4,4'-DDT from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

M2DSS2, M2DSS2DL

Use all positive and non-detected results from the original analysis.

2LTB19(2-4), 2LTB19(2-4)DL

Use positive results for the compounds 4,4'-DDD, 4,4'-DDE and Aroclor-1254 from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

Data Assessment

PEST: 2LTB28(4-6), 2LTB28(4-6)DL

Use positive results for the compounds 4,4'-DDE and Aroclor-1254 from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

2LTB29(10-12), 2LTB29(10-12)DL

Use positive result for the compound 4,4'-DDD from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

2LTB33(4-8), 2LTB33(4-8)DL

Use positive result for the compound Aroclor-1254 from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

2LTB39(10-12), 2LTB39(10-12)DL

Use positive results for the compounds 4,4'-DDD and 4,4'-DDT from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

2DSS13, 2DSS13DL

Use positive result for the compound 4,4'-DDT from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

Data Assessment

PEST: 2DSS16, 2DSS16DL

Use positive result for the compound 4,4'-DDT from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

2DSS19, 2DSS19DL

Use positive results for the compounds 4,4'-DDT and 4,4'-DDE from the diluted analysis.

Use all other positive and non-detected results from the undiluted analysis.

2LC3, 2LC3DL

Use positive result for the compound endrin from the undiluted analysis.

Use all other positive and non-detected results from the diluted analysis.

INORGANIC DATA

The inorganic data were evaluated based on the following parameters:

*	●	Data Completeness
	●	Laboratory blanks
	●	CRDL standard
	●	Matrix spike results
	●	Duplicate analysis results
*	●	Calibration verification results
	●	Interference check standard results
*	●	Laboratory control sample results
	●	Holding times
	●	Furnace AA results
*	●	ICP serial dilution results
*	●	Detection limits
NA	●	Calculation checks

* - all criteria were met for this parameter.

Overall Comments

There was some qualification of inorganic TAL data due to uncertainty at the low end of calibration, blank contamination, ICP Interference Check results, matrix spike recoveries, Furnace AA results and laboratory and field duplicate precision.

There was some qualification of the Conventional chemistry data due to holding times and duplicate precision. There was some qualification of inorganic TCLP data due to the lack of matrix spike recovery and duplicate precision information.

The data package contained all required forms and raw data.

Holding Times

Holding times were reviewed and found to meet criteria for all metals parameters.

It should be noted that there are no established holding times for soil samples for many wet chemistry parameters. Guidelines for aqueous samples should be used if possible. In the case of cation exchange capacity and specific gravity, there

Holding Times

are no holding times listed in the method. In the case of pH, analysis should be done as soon as possible for aqueous samples. Because there is no established holding time for soils, the validator used the holding time of 48 hours from the time of collection which would allow shipping time and the laboratory to do the analysis as soon as possible. The pH results for 2LTB17(0-2) and 2LTB19(4-6) shall be estimated (J1) as analysis took place 3 days outside of this advisory holding time.

Calibration

Initial and continuing calibration verifications were reviewed. Frequency and recovery requirements for calibration standards were met for all analyses.

The 2xCRDL TCLP Arsenic standard (20 ug/L) was over-recovered at 204% and 252%. Therefore, all positive sample results less than 3xCRDL level of 30 ug/L should be estimated due to uncertainty at the low end(J^2). The 2xCRDL TCLP Selenium standard (10 ug/L) was over-recovered at 280% and 239%. Therefore, all positive sample results less than 3xCRDL level of 15 ug/L should be estimated due to uncertainty at the low end(J^2). The 2xCRDL TCLP Lead standard (6 ug/L) was over-recovered at 347% and 223%. Therefore, all positive sample results less than 3xCRDL level of 9 ug/L should be estimated due to uncertainty at the low end(J^2). As the Arsenic, Selenium and Lead were non-detected in the TCLP sample, the results are not qualified.

The Copper 2xCRDL standard (50 ug/L, 10 mg/kg) was over-recovered at 219%. Therefore, all positive samples less than 3xCRDL of 75 ug/L or 15 mg/kg shall be estimated (J2). The Zinc 2xCRDL standards (40 ug/L, 8 mg/kg) were over-recovered at 209% and 138%. Therefore, all positive samples less than 3xCRDL of 60 ug/L or 12 mg/kg shall be estimated (J2). The Antimony 2xCRDL standard (120 ug/L, 24 mg/kg) was over-recovered at 132%. Therefore, all positive samples less than 3xCRDL of 180 ug/L or 36 mg/kg shall be estimated (J2). The Selenium CRDL standard of the 12/16/93 instrument run (5 ug/L, 1 mg/kg) was over-recovered at 125%. Therefore, all positive samples, analyzed on the 16th, less than 2xCRDL of 10 ug/L or 2 mg/kg shall be estimated (J2).

Blanks

Blank frequency and results were reviewed. Frequency requirements were met for all analytes.

The preparation blanks, calibration blanks, TCLP blanks and equipment rinsates contained low levels of several metals.

It should be noted that the field sample DWFB, Drillers Water Field Blank was not used to blank qualify results. This water was the stored water from the site's facility that was used to wash (with Alconox or acid) the sampling equipment. A final dionized water (submitted as DIFB) wash was performed on all equipment which was submitted daily as the equipment rinseates.

The following tables list the concentrations of each metal found in the calibration blanks, prep blanks and all field QC blanks and their associated IDL. Associated with these tables are maximum concentration tables with the resultant action levels. The action level is calculated as 5x the maximum concentration found in any blank. Sample results less than 5x the maximum concentration found in any blank may be due to contamination or instrumental problems, and thus may not be indicative of the actual concentration of the native sample.

Concentration (ug/L unless otherwise noted)

Element	IDL				
Aluminum	14.3	20.1	-26.1		
Antimony	16.4	27.5	16.7	20.6	17.7
Arsenic	0.9	1.2 1.2ER15	1.0 0.9ER19	1.4 1.0ER21	0.99DIFB
Barium	1.6	10.9 14.5TBLK	7.6	10.8	8.1
Calcium	14.0	5.88mg/kg 14ER17	28.1	85.4	116ER15
Cobalt	1.9	2.0	2.2		
Copper	1.3	3.4 8.3	2.6 3.0	2.6 5.0	20.3 -0.45MG/KG

Blanks

	Concentration (ug/L unless otherwise noted)				
Element	IDL				
Iron	4.8	-20.6 4.9 10.3 544ER21	26.2 -15.7 191ER15	-7.3 34.2 8.4ER17	-5.6 -6.2 107ER19
Lead(TCLP)	11.7	-14.1	12.1TBLK		
Magnesium	13.3	24.9 41.0ER15	13.4	24.9	18.2
Manganese	1.0	2.8 3.3ER15	1.6 1.9ER19	2.8 10.3ER21	1.8
Mercury	0.1	0.1*	0.45ER15		
Potassium	201.6	219DIFB			
Selenium	1.1	1.1	1.9	1.5	
Silver	1.9	2.0			
Sodium	16.0	27.8 29.0	16.7 70.9MG/KG	22.6 142DIFB	63.4
Thallium	1.3	1.9	1.4	1.5	1.8ER17
Zinc	1.8	4.0 2.1 2.0ER19	2.0 5.1	2.7 3.2	3.2 5.2
Cyanide	1.9	1.1			
Boron	11.9	22.6	14.0	19.6	

* Mercury instrument run contained LCS and blank analysis only. No samples are affected.

Blanks

The following blank action table reflects the highest blank level that affects all samples. The table does not include the Equipment Rinsate blank levels which affect specific samples.

Concentration (mg/kg)

Element	Highest Level	Action Level
Aluminum	5.22	26.1
Antimony	5.50	27.5
Arsenic	0.28	1.4
Barium	2.18	10.9
Calcium	17.10	85.5
Cobalt	0.44	2.2
Copper	4.10	20.5
Lead(TCLP)	2.82	14.1
Iron	6.84	34.2
Magnesium	4.98	24.9
Manganese	0.56	2.8
Selenium	0.38	1.9
Silver	0.40	2.0
Sodium	70.89	354.4
Potassium	43.8	219.0
Thallium	0.38	1.9
Zinc	1.04	5.2
Boron	4.52	22.6

The following blank action table reflects the highest blank level that affects the TCLP sample results.

Concentration (ug/L)

Element	Highest Level	Action Level
Barium	14.53	72.7
Lead	14.10	70.5
Silver	2.00	10.0

The action level values were compared to the sample value after application of sample dilution factors, and sample results less than the action level were reported as not detected (U3).

Blanks

The following blank action table reflects the highest blank level that affects samples associated with Equipment Rinsate 15 (those sampled on 11/03/93 through 11/05/93) and whose action levels are greater than those established by laboratory contaminants:

Concentration (mg/kg)

Element	Highest Level	Action Level
Calcium	23.2	116.0
Iron	38.2	191.0
Magnesium	8.2	41.0
Manganese	0.66	3.3
Mercury	0.068	0.34

The following blank action table reflects the highest blank level that affects samples associated with Equipment Rinsate 17 (those sampled on 11/5/93 through 11/9/93) and whose action levels are greater than those established by laboratory contaminants:

Concentration (mg/kg)

Element	Highest Level	Action Level
Cyanide	0.055	0.275

The following blank action table reflects the highest blank level that affects samples associated with Equipment Rinsate 19 (those sampled on 11/9/93 through 11/11/93) and whose action levels are greater than those established by laboratory contaminants:

Concentration (mg/kg)

Element	Highest Level	Action Level
Iron	21.4	107.0

Blanks

The following blank action table reflects the highest blank level that affects samples associated with Equipment Rinsate 21 (those sampled on 11/11/93 through 11/14/93) and whose action levels are greater than those established by laboratory contaminants:

Concentration (mg/kg)

Element	Highest Level	Action Level
Iron	108.8	544.0
Manganese	2.06	10.3

The action level values were compared to the sample value after application of sample dilution factors, and sample results less than the action level were reported as not detected (U3).

ICP Interference Check Results

The ICP interference check sample results were reviewed and all recoveries met required criteria. The ICS solutions were analyzed at the proper frequency. Antimony, Arsenic (TCLP analysis only), Barium, Manganese, Lead (TCLP analysis only), Sodium, Copper, Vanadium and Zinc were detected in the ICSA solution above the 2xIDL level but should not be present.

For the TCLP analysis, the raw data was reviewed for interferent levels. As interferent levels were low, there is no qualification made.

Due to high levels of Iron in some soil samples qualifications were made. Analyte levels were estimated if they were less than ten times that of the estimated interference.

Sample	ICSA Level	Sample Level	Qualifications
2LTB19(2-4)	34,000 mg/kg	26,400 mg/kg	J4 Sb, Ba, V
2LTB20(6-8)	"	29,500 mg/kg	J4 Sb, Ba, Na
2LTB22(6-8)	"	157,000 mg/kg	J4 Sb, Ba, Na, V
2LTB23(4-8)	"	21,500 mg/kg	J4 Sb
2LTB28(4-6)	"	64,400 mg/kg	J4 Sb, Ba, Cu, Na, V
2LTB29(10-12)	"	67,300 mg/kg	J4 Sb, Ba, V

ICP Interference Check Results

Sample	ICSA Level	Sample Level	Qualifications
2LTB31(8-10)	34,000 mg/kg	146,000 mg/kg	J4 Sb, Ba, Na, V
2LTB33(4-8)	"	32,000 mg/kg	J4 Sb
2LTB39(10-12)	"	83,300 mg/kg	J4 Sb, Ba, V

Matrix Spike Recoveries

A Metals and Cyanide matrix spike was performed on sample 2LTB23(4-8). Cadmium, Chromium, Manganese and Nickel were over-recovered. Therefore, the detected Cadmium, Chromium, Manganese and Nickel results will be estimated (J5) and the non-detects accepted without qualification. The Antimony, Arsenic and Selenium matrix spikes were under-recovered. Therefore, all Antimony, Arsenic and Selenium results will be estimated (J5, UJ5).

The Mercury TCLP matrix spike was performed on sample 2LTB26(4-6) and was found to be within control limits. A metals matrix spike was not performed. Due to a lack of accuracy data, the results will be estimated (UJ5, J5).

Field Duplicates

The following field duplicate pairs were identified: 2LTB23(4-8) and 2LTB33(4-8) and 2LTB29(10-12) and 2LTB39(10-12). In the case of samples 2LTB23(4-8) and 2LTB33(4-8), all analyte RPDs were less than the 50% validation criteria for soils except for Barium, Chromium and Copper. For samples 2LTB29(10-12) and 2LTB39(10-12), all analyte RPDs were less than the 50% validation criteria for soils except for Zinc.

For inorganics, field duplicate actions are applied to all other samples of the same matrix type. Therefore, all positive Barium, Chromium, Copper and Zinc results will be estimated (J7).

Laboratory Duplicates

A Metals and Cyanide laboratory duplicate was performed on sample 2LTB23(4-8). Duplicate Precision for all analytes except Barium, Copper and Manganese met the required validation criteria of <35% RPD for soils. Positive Barium, Copper and Manganese results are therefore estimated(J6).

The Mercury TCLP laboratory duplicate was performed on sample 2LTB26(4-6) and was found to be within control limits. A metals duplicate was not performed. Due to a lack of precision data, the positive results will be estimated (J6).

In the grain size analysis, a duplicate was performed on sample 2DSS11. All RPDs were within the 35% validation criteria for soils except for peroxide digestible matter (72%) and Sand and Gravel between 4.75 and 2.00 mm (105%). A grain size duplicate was also performed on sample 2LTB19(4-6). All RPDs were within the 35% validation criteria for soils except for Gravel greater than 4.75mm (58%). Therefore, the positive results for sand and gravel >4.75 mm, peroxide digestible matter and Sand and Gravel between 4.75 and 2.00 mm are estimated (J6) for all samples.

Laboratory Control Sample Results

The solid laboratory control sample (LCS) results were reviewed, and the criteria were met for all parameters.

The aqueous LCS results were reviewed. It should be noted that the recovery for Lead LCS #2 was reported as 894.8%. The LCS true value was listed as 50 ug/L and the found value 447.4 ug/L. The LCS ICP true value should be 500 ug/L with a found recovery of 89.5%. The validator editted the form 7.

Furnace AA Results

The furnace raw data was reviewed and duplicate injections and one-point analytical spikes were performed for all samples. All duplicate injections agreed within +/- 20%.

Furnace AA Results

The following table is comprised of samples whose spike recoveries did not meet the 85 - 115% criteria but did not require an MSA and their qualifications:

Sample	Analyte	Recovery	Qualification
2LTB9(0-2)	Arsenic	<84%	Estimate J10
93DWFB	Arsenic	125%	Estimate J10
2LTB22(6-8)	Selenium	84%	Estimate UJ10
2LTB13(0-2)	Selenium	123%	U No Qualification
2LTB20(6-8)	Selenium	78%	Estimate UJ10
2LTB19(2-4)	Selenium	84%	Estimate J10
2LTB28(4-6)	Selenium	83%	Estimate UJ10
93ER17	Selenium	116%	U No Qualification
93ER19	Selenium	122%	U No Qualification
93ER21	Selenium	115%	U No Qualification
93DWFB	Selenium	117%	U No Qualification
2LTB23(4-8)	Thallium	84.8%	Estimate UJ10
2LTB13(0-2)	Thallium	123%	U No Qualification
2LTB20(6-8)	Thallium	73%	Estimate UJ10
2LTB26(4-6)	Thallium	130%	U No Qualification
2LTB28(4-6)	Thallium	79.5%	Estimate UJ10
2LTB31(8-10)	Thallium	77%	Estimate UJ10
2LTB9(0-2)	Thallium	134%	U No Qualification
93ER15	Thallium	83%	Estimate UJ10
93ER17	Thallium	81%	Estimate UJ10
93DWFB	Thallium	60%	Estimate UJ10
93DWFB	Lead	127%	U No Qualification

The following samples/analytes required quantitation by MSA which was not performed: Arsenic for 2LTB16(0-2) and Arsenic for sample 2LTB33(4-8). The arsenic results for those samples will be estimated (J11).

It should be noted that sample 2LTB29(10-12) was analyzed several times for Selenium with results ranging from undetected to 5.0 ppb with no laboratory explanation to explain the discrepancy. Therefore, the result has been estimated (UJ15).

Instrument Detection Limits

Instrument detection limits (IDLs) were reviewed and found to be less than the contract required detection limits (CRDL). In the case of Lead, two instruments were used. The IDL for the TJA01 was 11.7 ug/L, greater than the CRDL of 3ug/L. However, the only results reported from the instrument analysis were greater than five times the IDL. Therefore, the data is accepted.

The TCLP analysis was performed on the TJA01 ICP with the following IDL's: Arsenic 34.5 ug/L (CRDL 10 ug/L), Lead 11.7 ug/L (CRDL 3 ug/L) and Selenium 21.8 ug/L (CRDL 5 ug/L). As the maximum contaminant levels for TCLP are very high, the higher detection limits are not significant.

ICP Serial Dilution Results

The serial dilution was performed on sample 2LTB23(4-8). Analytical results agreed within the 15% D validation guidelines for analyte concentrations greater than 50xIDL before dilution for all analytes. Therefore, no qualifications are made.

Calculation Checks

This section is not applicable as raw data was not reviewed as part of the Level C Review.

DATA VALIDATION REPORT

SDG No.: GRT13, GRT14 and GRT16 Dioxin Analysis

Site: Groton, Naval Subase

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Prepared by:

Organic Section Prepared by:,

CTJ for Lorie MacKinnon

Lorie MacKinnon
Data Validator

DATA VALIDATION REPORT

RE: SDG No.: GRT13, GRT 14 and GRT16 Dioxin Analysis
Site: Groton, Naval Subase

Dioxins: 6/soil/6TB21(0-2), 6TB20(4-6), 2LTB23(4-8), 2LTB33(4-8), 3SD6(0-1), 2LTB13(0-2)
4/aqueous/1093ER9, 1093ER17, 1093DIFB, 1093DWFB

INTRODUCTION

The validation of dioxin organic analytical data from SDG 13, 14 and 16 soil samples collected from the Naval Submarine site in Groton, CT was evaluated based on Environmental Services Assistance Team EPA region I Dioxin Data Validation Standard Operating Practices (Draft 4/91) and SW-846 Method 8280 Analysis of polychlorinated Dibenzo-p-dioxins and polychlorinated Dibenzofurans.

Form I copies with the data validation results and recommendations for each fraction of each validated sample have been submitted.

The dioxin data submitted was found to be generally good. There was some qualifications of dioxin data due to holding times, field duplicate results and recovery standard results.

It should be noted that NEESA specifies that samples be shipped within 24 hours of collection ensuring that the laboratory is able to meet holding times which begin at the time of collection. The samples for dioxin analysis were stored at PACE, New England and shipped to Southwest Labs of Oklahoma for extraction and analysis after all samples were collected. It should be noted that SW Labs used the date of receipt from PACE laboratories (not the original laboratory date of receipt from the field). Therefore no holding time excursions were noted in their narrative when one had occurred.

NEESA requires the analysis of method blank spikes along with the analysis of samples. The results of the method blank spikes are to be plotted on control charts and submitted with the data package. There is no requirement for Dioxin control charting.

ORGANIC DATA

Evaluation of the Dioxin organic data was based on the following parameters:

* ● Data completeness
  ● Holding Times
* ● Window Defining Mix
* ● Chromatographic resolution
* ● Instrument sensitivity
* ● GC/MS initial calibration
* ● Continuing calibration
* ● Identification criteria
* ● Blanks
* ● Matrix spike recoveries
  ● Duplicate sample RPD
  ● Field duplicate precision results
  ● Recovery Standard results
* ● Toxicity equivalency factor and isomer specificity
* ● Internal standard performance
* ● Dilutions and reanalyses
* ● Second column confirmation
* ● EMPC and EDL

* All criteria were met for this parameter.

Data Completeness

The data package contained all of the forms required by the method for the dioxin sample analysis.

Holding Times

The method holding times of 30 days from time of collection for extraction and 45 days from time of collection for analysis were used when evaluating this data. Sample 6TB21(0-2) was sampled on 10/06/93 and was not shipped to Southwest laboratories until 11/12/93. It was extracted 11/15/93, 10 days outside of the 30 day extraction holding time. It is recommended to estimate (UJ1, J1) all results for that fraction. All other samples were extracted and analyzed within the required holding times.

Window Defining Mix

The window defining mix was analyzed at the required frequency.

It should be noted that the RT window for congener HxCDD analyzed in the window defining mix on 11/24/93 was incorrectly reported on form 5DFA. The validator editted the form and checked all associated data for identifications within the correct windows. No action is recommended.

Chromatographic Resolution

The CC3 standards analyzed during both the initial and continuing procedures were reviewed and the resolution between the 13C12-2,3,7,8-TCDD and 13C12-1,2,3,4-TCDD isomer peaks was less than 25%. Also, the resolution between the 1,2,3,4,7,8-HxCDD and 1,2,3,6,7,8-HxCDD isomer peaks was less than 50%. Therefore, no action is necessary.

Instrument Sensitivity

The CC1 standard was analyzed at the end of each 12 hour period and met all retention time, ion abundance ratio, and signal-to-noise criteria with the following exceptions. In the CC1 of 11/20 18:24, the ion abundance ratio for 12378-PeCDD was outside of the theoretical Ion abundance window control limits. In the CC1 of 11/23 20:51, the ion abundance ratio for 12378-PeCDF was outside of the theoretical Ion abundance window control limits. There were no 12378-PeCDD or 12378-PeCDF hits for those analysis dates, therefore, no action is recommended.

GC/MS Initial and Continuing Calibration

The following criteria for the initial calibration of the GC/MS system were acceptable:

GC resolution
Relative ion abundance criteria
Isomer retention times within RT windows established by the window defining mix
MS sensitivity
RRF %Ds < 15%
No action is recommended.

GC/MS Initial and Continuing Calibration

The % D for all compounds in the continuing standards was < 30 % and continuing calibration frequency requirements were met. No action is recommended.

Identification Criteria

For all positive identifications reported, all qualitative identifications were met, including: retention times, signal-to-noise ratio, presence of primary ions, and the ion abundance ratios. No action is recommended.

Recovery Standard Response

The area counts of the recovery standards 13C-1234-TCDD and 13C-123789-HxCDD were checked against their respective areas in the CC3 standards. The recovery standard % areas of the following samples did not meet the control limits of 50 - 100 %:
1234-TCDD in samples 1093-ER17, 6TB21(0-2), 1093-DIFB and 1093-DWFB, 1234-TCDD and 123789-HxCDD in samples 2LTB13(0-2), 2LTB33(4-8), 1093-ER9 and 3SD6(0-1) and 123789-HxCDD in sample 2LTB23(4-8). The associated areas are therefore estimated (J2, UJ2).

Blanks

One method blank per extraction batch was analyzed. Also, several equipment rinsates, as well as dionized water field blanks were submitted for analysis. All blanks were free from contamination and no actions are recommended.

Matrix Spike Sample

A matrix spike and matrix spike duplicate was performed on sample 2LTB23(4-8). All % recoveries and RPDs were within the recommended limits of 50 - 150%. No action is recommended.

Duplicate Sample

A duplicate sample analysis was not performed as specified in the method, but instead an MSD was performed per client request. No action is recommended.

Laboratory Control Sample

Solid and aqueous Laboratory Control samples were analyzed for each extraction batch and matrix. All recoveries were found to be within laboratory established control limits.

Field Duplicate Precision

This package contains the field duplicate pair of 2LTB23(4-8) and 2LTB33(4-8). A comparison of the compounds present in the field duplicate samples yield the following information. The congeners 123478-HxCDF, 123678-HxCDF, 1234678-HpCDF and OCDD were detected in 2LTB33(4-8), but were not detected in 2LTB23(4-8). It is recommended ot estimate the positive and non-detected results (J3, UJ3) for these congeners in the sample and field duplicate sample.

Internal Standard Performance

The internal standard (IS) and cleanup standard recoveries were within the required criteria of 25 to 150 %.

Toxicity Equivalency Factor and Isomer Specificity

All Toxicity Equivalency Factor (TEF) calculations were done properly. No action is recommended.

Dilutions and Reanalyses

Dilutions and reanalyses were not required. No action is recommended.

Duplicate Sample

A duplicate sample analysis was not performed as specified in the method, but instead an MSD was performed per client request. No action is recommended.

Laboratory Control Sample

Solid and aqueous Laboratory Control samples were analyzed for each extraction batch and matrix. All recoveries were found to be within laboratory established control limits.

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This package contains the field duplicate pair of 2LTB23(4-8) and 2LTB33(4-8). A comparison of the compounds present in the field duplicate samples yield the following information. The congeners 123478-HxCDF, 123678-HxCDF, 1234678-HpCDF and OCDD were detected in 2LTB33(4-8), but were not detected in 2LTB23(4-8). It is recommended ot estimate the positive and non-detected results (J3, UJ3) for these congeners in the sample and field duplicate sample.

Internal Standard Performance

The internal standard (IS) and cleanup standard recoveries were within the required criteria of 25 to 150 %.

Toxicity Equivalency Factor and Isomer Specificity

All Toxicity Equivalency Factor (TEF) calculations were done properly. No action is recommended.

Dilutions and Reanalyses

Dilutions and reanalyses were not required. No action is recommended.

Dioxin Validatation Footnotes

UJ1, J1 Holding times have been exceeded: Estimate positive results (J1) and non-detects (UJ1).

UJ2, J2 Recovery standard was outside of control limit window. Estimate positive results (J2) and non-detected results (UJ2) for associated isomers.

UJ3, J3 One value was non-detect and the other value greater than the EDL for this compound in the field duplicate pair. Estimate the positive (J3) and non-detected (UJ3) results for that compound.

ATTACHMENT C

LABORATORY ANALYTICAL RESULTS

GI311F

PCDD/PCDF SAMPLE DATA SUMMARY

EPA SAMPLE NO.

2LTB13(0-2)

Lab Name: SWL-TULSA Contract:_____

Lab Code: SWLO Case No.: PACENE SAS No.:_____ SDG. NO.: 16369

Matrix: WATER (Soil/Water/Waste/Ash) Lab Sample ID.: 16369.10

Sample wt/vol: 9 (g/ml) g Lab File ID: GI311D

Water Sample Prep_____ (Sepf/Cont) Date Received: 11/13/93

Concentrated Extract Volume: 100 (uL) Date Extracted: 11/15/93

Injection Volume: 2 (uL) % Solids: 90 Date Analyzed: 11/20/93

GC Column: ULTRA 2 ID: .32 (mm) Dilution Factor: 1

CONCENTRATION UNITS: (ng/L of ug/Kg) ug/Kg

ANALYTE	SELECTED IONS	PEAK RT	ION RATIO #	CONCENTRATION	Q	EMPC/EDL
2378-TCDD	320/322			ND	U	.183
2378-TCDF	304/306			ND	U	.068
12378-PeCDF	340/342			ND	U	.222
12378-PeCDD	356/358			ND	U	.290
23478-PeCDF	340/342			ND	U	.080
123478-HxCDF	374/376			ND	U	.334
123678-HxCDF	374/376			ND	U	.055
123478-HXCDD	390/392			ND	U	.127
123678-HxCDD	390/392			ND	U	.157
123789-HxCDD	390/392			ND	U	.314
234678-HxCDF	374/376			ND	U	.120
123789-HxCDF	374/376			ND	U	.062
1234678-HpCDF	408/410			ND	U	.301
1234678-HpCDD	424/426			ND	U	.464
1234789-HpCDF	408/410			ND	U	.219
OCDD	458/460	35.70	.78	1.592		
OCDF	442/444			ND	U	.379

NOTE: Concentrations, EMPCs, and EDLs are calculated on dry weight basis.

INTERNAL STANDARD	SELECTED IONS	PEAK RT	ION RATIO #	ION RATIO LIMITS	% REC #	RECOVERY LIMITS
13C-2378-TCDF	316/318	23.59	.800	0.65-0.89	53	25-150
13C-2378-TCDD	332/334	23.94	.806	0.65-0.89	44	25-150
13C-123678-HxCDD	402/404	28.62	1.266	1.05-1.43	45	25-150
13C-1234678-HpCDF	420/422	30.65	1.046	0.88-1.20	54	25-150
13C-OCDD	470/472	35.69	.924	0.76-1.01	48	25-150
37Cl-2378-TCDD	328/NA	23.96	N/A	N/A	68	25-150

CKD 1/4/94 RO

Column to be used to flag values outside QC limits.

3

FORM I PCDD-1

GI311D 1DFB
GI311F PCDD/PCDF TOXICITY EQUIVALENCE SUMMARY

EPA SAMPLE NO.

2LTB13(D-2)

Lab Name: SWL-TULSA Contract:_____

Lab Code:__SWLO____ Case No.: _PACENE_ SAS No.:_____ SDG. NO.: 16369

Matrix:__WATER__ (Soil/Water/Waste/Ash) Lab Sample ID.:___16369.10

Sample wt/vol: 9 (g/ml) g Lab File ID:_____GI311D

Water Sample Prep.:_____ (Sepf/Cont) Date Received:____11/13/93

Concentrated Extract Volume: 100 (uL) Date Extracted:___11/15/93

Injection Volume: 2 (uL) % Solids: 90 Date Analyzed:____11/20/93

GC Column: ___ULTRA 2 ID:__.32 (mm) Dilution Factor:__ 1

CONCENTRATION UNITS: (ng/L of ug/Kg) ug/Kg

ANALYTE	CONCENTRATION		TEF		TEF-ADJUSTED CONCENTRATION
2378-TCDD	ND	x	1.0	=	.0000
2378-TCDF	ND	x	0.1	=	.0000
12378-PeCDF	ND	x	0.05	=	.0000
12378-PeCDD	ND	x	0.5	=	.0000
23478-PeCDF	ND	x	0.5	=	.0000
123478-HxCDF	ND	x	0.1	=	.0000
123678-HxCDF	ND	x	0.1	=	.0000
123478-HXCDD	ND	x	0.1	=	.0000
123678-HxCDD	ND	x	0.1	=	.0000
123789-HxCDD	ND	x	0.1	=	.0000
234678-HxCDF	ND	x	0.1	=	.0000
123789-HxCDF	ND	x	0.1	=	.0000
1234678-HpCDF	ND	x	0.01	=	.0000
1234678-HpCDD	ND	x	0.01	=	.0000
1234789-HpCDF	ND	x	0.01	=	.0000
OCDD	1.592	x	0.001	=	.0016
OCDF	ND	x	0.001	=	.0000
			TOTAL	=	.0016

NOTE: Do not include EMPC or edl values in the TEF-adjusted Concentration.

If the Total Toxic Equivalent Concentration of the sample is greater than 7 ng/L for an aqueous sample, grater than 0.7 ug/Kg for any solid matrix, or grater than 7 ug/kg for a chemical waste sample, then second column confirmation of the results may be required.

GI361D
GI361F

1DFA

PCDD/PCDF SAMPLE DATA SUMMARY

EPA SAMPLE NO.

2LTB23(4-8)

Lab Name: SWL-TULSA Contract:_____

Lab Code:__SWLO____ Case No.: _PACENE_ SAS No.:_____ SDG. NO.: 16369

Matrix:__WATER__ (Soil/Water/Waste/Ash) Lab Sample ID.:___16369.05

Sample wt/vol: 8 (g/ml) g Lab File ID:_____GI361D

Water Sample Prep_____ (Sepf/Cont) Date Received:____11/13/93

Concentrated Extract Volume: 100 (uL) Date Extracted:___11/22/93

Injection Volume: 2 (uL) % Solids: 85 Date Analyzed:____11/24/93

GC Column: ____ULTRA 2 ID:__.32 (mm) Dilution Factor:__ 1

CONCENTRATION UNITS: (ng/L of ug/Kg) ug/Kg

ANALYTE	SELECTED IONS	PEAK RT	ION RATIO #	CONCENTRATION	Q	EMPC/EDL
2378-TCDD	320/322			ND	U	.210
2378-TCDF	304/306			ND	U	.422
12378-PeCDF	340/342			ND	U	.178
12378-PeCDD	356/358			ND	U	.458
23478-PeCDF	340/342			ND	U	.079
123478-HxCDF	374/376			ND	U	.256
123678-HxCDF	374/376			ND	U	.742
123478-HXCDD	390/392			ND	U	1.153
123678-HxCDD	390/392			ND	U	1.169
123789-HxCDD	390/392			ND	U	1.698
234678-HxCDF	374/376			ND	U	1.086
123789-HxCDF	374/376			ND	U	.374
1234678-HpCDF	408/410			ND	U	.254
1234678-HpCDD	424/426			ND	U	.653
1234789-HpCDF	408/410			ND	U	.918
OCDD	458/460			ND	U	1.982
OCDF	442/444			ND	U	.992

NOTE: Concentrations, EMPCs, and EDLs are calculated on dry weight basis.

INTERNAL STANDARD	SELECTED IONS	PEAK RT	ION RATIO #	ION RATIO LIMITS	% REC #	RECOVERY LIMITS
13C-2378-TCDF	316/318	23.48	.858	0.65-0.89	72	25-150
13C-2378-TCDD	332/334	23.82	.849	0.65-0.89	65	25-150
13C-123678-HxCDD	402/404	28.47	1.113	1.05-1.43	75	25-150
13C-1234678-HpCDF	420/422	30.47	1.049	0.88-1.20	77	25-150
13C-OCDD	470/472	35.38	.999	0.76-1.01	60	25-150
37Cl-2378-TCDD	328/NA	23.84	N/A	N/A	81	25-150

Column to be used to flag values outside QC limits.

FORM I PCDD-1

GI361D 1DFB EPA SAMPLE NO.

GI361F PCDD/PCDF TOXICITY EQUIVALENCE SUMMARY

2LTBZ3(4-8)

Lab Name: SWL-TULSA Contract:_____

Lab Code:__SWLO____ Case No.: _PACENE_ SAS No.:_____ SDG. NO.: 16369

Matrix:__WATER__ (Soil/Water/Waste/Ash) Lab Sample ID.:___16369.05

Sample wt/vol: 8 (g/ml) g Lab File ID:_____GI361D

Water Sample Prep.:_____ (Sepf/Cont) Date Received:____11/13/93

Concentrated Extract Volume: 100 (uL) Date Extracted:___11/22/93

Injection Volume: 2 (uL) % Solids: 85 Date Analyzed:____11/24/93

GC Column: ___ULTRA 2 ID:__.32 (mm) Dilution Factor:__ 1

CONCENTRATION UNITS: (ng/L of ug/Kg) ug/Kg

ANALYTE	CONCENTRATION	TEF		TEF-ADJUSTED CONCENTRATION
2378-TCDD	ND	x 1.0	=	.0000
2378-TCDF	ND	x 0.1	=	.0000
12378-PeCDF	ND	x 0.05	=	.0000
12378-PeCDD	ND	x 0.5	=	.0000
23478-PeCDF	ND	x 0.5	=	.0000
123478-HxCDF	ND	x 0.1	=	.0000
123678-HxCDF	ND	x 0.1	=	.0000
123478-HXCDD	ND	x 0.1	=	.0000
123678-HxCDD	ND	x 0.1	=	.0000
123789-HxCDD	ND	x 0.1	=	.0000
234678-HxCDF	ND	x 0.1	=	.0000
123789-HxCDF	ND	x 0.1	=	.0000
1234678-HpCDF	ND	x 0.01	=	.0000
1234678-HpCDD	ND	x 0.01	=	.0000
1234789-HpCDF	ND	x 0.01	=	.0000
OCDD	ND	x 0.001	=	.0000
OCDF	ND	x 0.001	=	.0000
		TOTAL	=	.0000

NOTE: Do not include EMPC or edl values in the TEF-adjusted Concentration.

If the Total Toxic Equivalent Concentration of the sample is greater than 7 ng/L for an aqueous sample, grater than 0.7 ug/Kg for any solid matrix, or grater than 7 ug/kg for a chemical waste sample, then second column confirmation of the results may be required.

GI309D 1DFA
GI309F PCDD/PCDF SAMPLE DATA SUMMARY

EPA SAMPLE NO.

2LTB33-(4-8)

DUP OF 2LTB23-(4-8)

Lab Name: SWL-TULSA Contract:_____

Lab Code: SWLO Case No.: PACENE SAS No.:_____ SDG. NO.: 16369

Matrix: WATER (Soil/Water/Waste/Ash) Lab Sample ID.: 16369.08

Sample wt/vol: 9 (g/ml) g Lab File ID: GI3090

Water Sample Prep_____ (Sepf/Cont) Date Received: 11/13/93

Concentrated Extract Volume: 100 (uL) Date Extracted: 11/15/93

Injection Volume: 2 (uL) % Solids: 93 Date Analyzed: 11/20/93

GC Column: ULTRA 2 ID: .32 (mm) Dilution Factor: 1

CONCENTRATION UNITS: (ng/L or ug/Kg) ug/Kg

ANALYTE	SELECTED IONS	PEAK RT	ION RATIO #	CONCENTRATION	Q	EMPC/EDL
2378-TCDD	320/322			ND	U	.039
2378-TCDF	304/306			ND	U	.189
12378-PeCDF	340/342			ND	U	.148
12378-PeCDD	356/358			ND	U	.113
23478-PeCDF	340/342			ND	U	.095
123478-HxCDF	374/376	28.00	1.29	.306		
123678-HxCDF	374/376	28.09	1.08	.153		
123478-HXCDD	390/392			ND	U	.115
123678-HxCDD	390/392			ND	U	.214
123789-HxCDD	390/392			ND	U	.298
234678-HxCDF	374/376			ND	U	.085
123789-HxCDF	374/376			ND	U	.411
1234678-HpCDF	408/410	30.66	1.10	.246		
1234678-HpCDD	424/426			ND	U	.447
1234789-HpCDF	408/410			ND	U	.137
OCDD	458/460	35.69	.99	1.626		
OCDF	442/444			ND	U	1.029

NOTE: Concentrations, EMPCs, and EDLs are calculated on dry weight basis.

INTERNAL STANDARD	SELECTED IONS	PEAK RT	ION RATIO #	ION RATIO LIMITS	% REC #	RECOVERY LIMITS
13C-2378-TCDF	316/318	23.60	.769	0.65-0.89	59	25-150
13C-2378-TCDD	332/334	23.95	.712	0.65-0.89	60	25-150
13C-123678-HxCDD	402/404	28.63	1.269	1.05-1.43	48	25-150
13C-1234678-HpCDF	420/422	30.66	1.051	0.88-1.20	52	25-150
13C-OCDD	470/472	35.69	.937	0.76-1.01	46	25-150
37Cl-2378-TCDD	328/NA	23.95	N/A	N/A	70	25-150

Column to be used to flag values outside QC limits.

FORM I PCDD-1

GI309D
GI309F

1DFB

PCDD/PCDF TOXICITY EQUIVALENCE SUMMARY

EPA SAMPLE NO.

2LTB33-(4-8)

DUP. OF 2LTB23 (4-8)

Lab Name: SWL-TULSA

Contract:_____

Lab Code: SWLO

Case No.: PACENE

SAS No.:_____

SDG. NO.: 16369

Matrix: WATER (Soil/Water/Waste/Ash)

Lab Sample ID.: 16369.08

Sample wt/vol: 9 (g/ml) g

Lab File ID: GI309D

Water Sample Prep.:_____ (Sepf/Cont)

Date Received: 11/13/93

Concentrated Extract Volume: 100 (uL)

Date Extracted: 11/15/93

Injection Volume: 2 (uL) % Solids: 93

Date Analyzed: 11/20/93

GC Column: ULTRA 2 ID: .32 (mm)

Dilution Factor: 1

CONCENTRATION UNITS: (ng/L of ug/Kg) ug/Kg

ANALYTE	CONCENTRATION		TEF		TEF-ADJUSTED CONCENTRATION
2378-TCDD	ND	x	1.0	=	.0000
2378-TCDF	ND	x	0.1	=	.0000
12378-PeCDF	ND	x	0.05	=	.0000
12378-PeCDD	ND	x	0.5	=	.0000
23478-PeCDF	ND	x	0.5	=	.0000
123478-HxCDF	.306	x	0.1	=	.0306
123678-HxCDF	.153	x	0.1	=	.0153
123478-HXCDD	ND	x	0.1	=	.0000
123678-HxCDD	ND	x	0.1	=	.0000
123789-HxCDD	ND	x	0.1	=	.0000
234678-HxCDF	ND	x	0.1	=	.0000
123789-HxCDF	ND	x	0.1	=	.0000
1234678-HpCDF	.246	x	0.01	=	.0025
1234678-HpCDD	ND	x	0.01	=	.0000
1234789-HpCDF	ND	x	0.01	=	.0000
OCDD	1.626	x	0.001	=	.0016
OCDF	ND	x	0.001	=	.0000
			TOTAL	=	.0499

NOTE: Do not include EMPC or edl values in the TEF-adjusted Concentration.

If the Total Toxic Equivalent Concentration of the sample is greater than 7 ng/L for an aqueous sample, grater than 0.7 ug/Kg for any solid matrix, or grater than 7 ug/kg for a chemical waste sample, then second column confirmation of the results may be required.

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB16 (0-2) *
****

Sample Collection Date: 11/04/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38304-011
Lab Receipt Date: 11/06/93
Sample Analysis Date: 11/11/93

Analyte	Lab Result or DL		Validation Data
1,1,1-Trichloroethane	U	12.00	
1,1,2,2-Tetrachloroethane	U	12.00	
1,1,2-Trichloroethane	U	12.00	
1,1-Dichloroethane	U	12.00	
1,1-Dichloroethene	U	12.00	
1,2-Dichloroethane	U	12.00	
1,2-Dichloroethene (total)	U	12.00	
1,2-Dichloropropane	U	12.00	
2-Butanone	U	12.00	
2-Hexanone	U	12.00	
4-Methyl-2-pentanone	U	12.00	
Acetone		65.00	65.00 UJ
Benzene	U	12.00	
Bromodichloromethane	U	12.00	
Bromoform	U	12.00	
Bromomethane	U	12.00	
Carbon Disulfide	U	12.00	
Carbon Tetrachloride	U	12.00	
Carbon disulfide	U	12.00	
Chlorobenzene	U	12.00	
Chloroethane	U	12.00	
Chloroform	U	12.00	
Chloromethane	U	12.00	
Dibromochloromethane	U	12.00	
Ethylbenzene	J	5.00	
Methyl ethyl ketone	U	12.00	
Methylene chloride	BJ	8.00	12.00 U
Styrene	U	12.00	
Tetrachloroethene	U	12.00	
Toluene		16.00	
Trichloroethene	U	12.00	
Vinyl Chloride	U	12.00	
Xylene (total)	U	12.00	
cis-1,3-Dichloropropene	U	12.00	
trans-1,3-Dichloropropene	U	12.00	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB17 (0-2) *
****

Sample Collection Date: 11/03/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38304-012
Lab Receipt Date: 11/06/93
Sample Analysis Date: 11/11/93

Analyte	Lab Result or DL		Validation Data	
1,1,1-Trichloroethane	U	11.00		
1,1,2,2-Tetrachloroethane	U	11.00		
1,1,2-Trichloroethane	U	11.00		
1,1-Dichloroethane	U	11.00		
1,1-Dichloroethene	U	11.00		
1,2-Dichloroethane	U	11.00		
1,2-Dichloroethene (total)	U	11.00		
1,2-Dichloropropane	U	11.00		
2-Butanone	B	12.00	12.00	U
2-Hexanone	U	11.00		
4-Methyl-2-pentanone	U	11.00		
Acetone		71.00	71.00	UJ
Benzene	U	11.00		
Bromodichloromethane	U	11.00		
Bromoform	U	11.00		
Bromomethane	U	11.00		
Carbon Disulfide	U	11.00		
Carbon Tetrachloride	U	11.00		
Carbon disulfide	U	11.00		
Chlorobenzene	U	11.00		
Chloroethane	U	11.00		
Chloroform	U	11.00		
Chloromethane	U	11.00		
Dibromochloromethane	U	11.00		
Ethylbenzene	U	11.00		
Methyl ethyl ketone	B	12.00		
Methylene chloride	BJ	7.00	11.00	U
Styrene	U	11.00		
Tetrachloroethene	U	11.00		
Toluene	J	10.00		
Trichloroethene	U	11.00		
Vinyl Chloride	U	11.00		
Xylene (total)	U	11.00		
cis-1,3-Dichloropropene	U	11.00		
trans-1,3-Dichloropropene	U	11.00		

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB18 (0-2) *
****

Sample Collection Date: 11/02/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38259-001
Lab Receipt Date: 11/04/93
Sample Analysis Date: 11/11/93

Analyte	Lab Result or DL		Validation Data
1,1,1-Trichloroethane	U	10.00	
1,1,2,2-Tetrachloroethane	U	10.00	
1,1,2-Trichloroethane	U	10.00	
1,1-Dichloroethane	U	10.00	
1,1-Dichloroethene	U	10.00	
1,2-Dichloroethane	U	10.00	
1,2-Dichloroethene (total)	U	10.00	
1,2-Dichloropropane	U	10.00	
2-Butanone	B	13.00	
2-Hexanone	U	10.00	
4-Methyl-2-pentanone	U	10.00	
Acetone		75.00	
Benzene	U	10.00	
Bromodichloromethane	U	10.00	
Bromoform	U	10.00	
Bromomethane	U	10.00	
Carbon Disulfide	U	10.00	
Carbon Tetrachloride	U	10.00	
Carbon disulfide	U	10.00	
Chlorobenzene	U	10.00	
Chloroethane	U	10.00	
Chloroform	U	10.00	
Chloromethane	U	10.00	
Dibromochloromethane	U	10.00	
Ethylbenzene	U	10.00	
Methyl ethyl ketone	B	13.00	
Methylene chloride	BJ	8.00	
Styrene	U	10.00	
Tetrachloroethene	U	10.00	
Toluene	J	4.00	
Trichloroethene	U	10.00	
Vinyl Chloride	U	10.00	
Xylene (total)	J	8.00	
cis-1,3-Dichloropropene	U	10.00	
trans-1,3-Dichloropropene	U	10.00	

NAVAL SUBMARINE BASE - NEW LONDON

AREA-A LANDFILL

CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****

* SAMPLE ID: 2LTB19 (2-4) *

****

Sample Collection Date: 11/10/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38407-002
Lab Receipt Date: 11/13/93
Sample Analysis Date: 11/17/93

Analyte	Lab Result or DL		Validation Data
1,1,1-Trichloroethane	U	11.00	
1,1,2,2-Tetrachloroethane	U	11.00	
1,1,2-Trichloroethane	U	11.00	
1,1-Dichloroethane	U	11.00	
1,1-Dichloroethene	U	11.00	
1,2-Dichloroethane	U	11.00	
1,2-Dichloroethene (total)	U	11.00	
1,2-Dichloropropane	U	11.00	
2-Butanone	U	11.00	
2-Hexanone	U	11.00	
4-Methyl-2-pentanone	U	11.00	
Acetone		44.00	44.00 U
Benzene	U	11.00	
Bromodichloromethane	U	11.00	
Bromoform	U	11.00	
Bromomethane	U	11.00	
Carbon Disulfide	U	11.00	
Carbon Tetrachloride	U	11.00	
Carbon disulfide	U	11.00	
Chlorobenzene	U	11.00	
Chloroethane	U	11.00	
Chloroform	U	11.00	
Chloromethane	U	11.00	
Dibromochloromethane	U	11.00	
Ethylbenzene	U	11.00	
Methyl ethyl ketone	U	11.00	
Methylene chloride	B	25.00	
Styrene	U	11.00	
Tetrachloroethene	U	11.00	
Toluene	U	11.00	
Trichloroethene	U	11.00	
Vinyl Chloride	U	11.00	
Xylene (total)	J	7.00	
cis-1,3-Dichloropropene	U	11.00	
trans-1,3-Dichloropropene	U	11.00	

NAVAL SUBMARINE BASE - NEW LONDON

AREA-A LANDFILL

CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****

* SAMPLE ID: 2LTB9 (0-2) *

****

Sample Collection Date: 11/05/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38328-003

Lab Receipt Date: 11/09/93

Sample Analysis Date: 11/11/93

Analyte	Lab Result or DL		Validation Data	
1,1,1-Trichloroethane	U	10.00		
1,1,2,2-Tetrachloroethane	U	10.00		
1,1,2-Trichloroethane	U	10.00		
1,1-Dichloroethane	U	10.00		
1,1-Dichloroethene	U	10.00		
1,2-Dichloroethane	U	10.00		
1,2-Dichloroethene (total)	U	10.00		
1,2-Dichloropropane	U	10.00		
2-Butanone	U	10.00		
2-Hexanone	U	10.00		
4-Methyl-2-pentanone	U	10.00		
Acetone		19.00	19.00	UJ
Benzene	U	10.00		
Bromodichloromethane	U	10.00		
Bromoform	U	10.00		
Bromomethane	U	10.00		
Carbon Disulfide	U	10.00		
Carbon Tetrachloride	U	10.00		
Carbon disulfide	U	10.00		
Chlorobenzene	U	10.00		
Chloroethane	U	10.00		
Chloroform	U	10.00		
Chloromethane	U	10.00		
Dibromochloromethane	U	10.00		
Ethylbenzene	U	10.00		
Methyl ethyl ketone	U	10.00		
Methylene chloride	BJ	7.00	10.00	U
Styrene	U	10.00		
Tetrachloroethene	U	10.00		
Toluene	J	8.00		
Trichloroethene	U	10.00		
Vinyl Chloride	U	10.00		
Xylene (total)	U	10.00		
cis-1,3-Dichloropropene	U	10.00		
trans-1,3-Dichloropropene	U	10.00		

NAVAL SUBMARINE BASE - NEW LONDON

AREA-A LANDFILL

CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****

* SAMPLE ID: 2LTB13 (0-2) *

****

Sample Collection Date: 11/09/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38369-007
Lab Receipt Date: 11/11/93
Sample Analysis Date: 11/19/93

Analyte	Lab Result or DL		Validation Data	
1,1,1-Trichloroethane	U	11.00		
1,1,2,2-Tetrachloroethane	U	11.00		
1,1,2-Trichloroethane	U	11.00		
1,1-Dichloroethane	U	11.00		
1,1-Dichloroethene	U	11.00		
1,2-Dichloroethane	U	11.00		
1,2-Dichloroethene (total)	U	11.00		
1,2-Dichloropropane	U	11.00		
2-Butanone	U	11.00		
2-Hexanone	U	11.00		
4-Methyl-2-pentanone	U	11.00		
Acetone		24.00	24.00	U
Benzene	U	11.00		
Bromodichloromethane	U	11.00		
Bromoform	U	11.00		
Bromomethane	U	11.00		
Carbon Disulfide	U	11.00		
Carbon Tetrachloride	U	11.00		
Carbon disulfide	U	11.00		
Chlorobenzene	U	11.00		
Chloroethane	U	11.00		
Chloroform	U	11.00		
Chloromethane	U	11.00		
Dibromochloromethane	U	11.00		
Ethylbenzene	U	11.00		
Methyl ethyl ketone	U	11.00		
Methylene chloride	B	12.00	12.00	U
Styrene	U	11.00		
Tetrachloroethene	U	11.00		
Toluene	U	11.00		
Trichloroethene	U	11.00		
Vinyl Chloride	U	11.00		
Xylene (total)	U	11.00		
cis-1,3-Dichloropropene	U	11.00		
trans-1,3-Dichloropropene	U	11.00		

NAVAL SUBMARINE BASE - NEW LONDON

AREA-A LANDFILL

CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****

* SAMPLE ID: 2LTB20 (6-8) *

****

Sample Collection Date: 11/09/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38369-008
Lab Receipt Date: 11/11/93
Sample Analysis Date: 11/19/93

Analyte	Lab Result or DL		Validation Data
1,1,1-Trichloroethane	U	3000.00	
1,1,2,2-Tetrachloroethane	U	3000.00	
1,1,2-Trichloroethane	U	3000.00	
1,1-Dichloroethane	U	3000.00	
1,1-Dichloroethene	U	3000.00	
1,2-Dichloroethane	U	3000.00	
1,2-Dichloroethene (total)	U	3000.00	
1,2-Dichloropropane	U	3000.00	
2-Butanone	U	3000.00	
2-Hexanone	U	3000.00	
4-Methyl-2-pentanone	U	3000.00	
Acetone	U	3000.00	
Benzene	U	3000.00	
Bromodichloromethane	U	3000.00	
Bromoform	U	3000.00	
Bromomethane	U	3000.00	
Carbon Disulfide	U	3000.00	
Carbon Tetrachloride	U	3000.00	
Carbon disulfide	U	3000.00	
Chlorobenzene	U	3000.00	
Chloroethane	U	3000.00	
Chloroform	U	3000.00	
Chloromethane	U	3000.00	
Dibromochloromethane	U	3000.00	
Ethylbenzene		7700.00	
Methyl ethyl ketone	U	3000.00	
Methylene chloride	BJ	2100.00	3000.00 U
Styrene	U	3000.00	
Tetrachloroethene	U	3000.00	
Toluene	U	3000.00	
Trichloroethene	U	3000.00	
Vinyl Chloride	U	3000.00	
Xylene (total)		8800.00	
cis-1,3-Dichloropropene	U	3000.00	
trans-1,3-Dichloropropene	U	3000.00	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB22 (6-8) *
****

Sample Collection Date: 11/05/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38328-004
Lab Receipt Date: 11/09/93
Sample Analysis Date: 11/12/93

Analyte	Lab Result or DL		Validation Data	
1,1,1-Trichloroethane	U	17.00		
1,1,2,2-Tetrachloroethane	U	17.00		
1,1,2-Trichloroethane	U	17.00		
1,1-Dichloroethane	U	17.00		
1,1-Dichloroethene	U	17.00		
1,2-Dichloroethane	U	17.00		
1,2-Dichloroethene (total)	U	17.00		
1,2-Dichloropropane	U	17.00		
2-Butanone		19.00	19.00	U
2-Hexanone	U	17.00		
4-Methyl-2-pentanone	U	17.00		
Acetone		80.00	80.00	UJ
Benzene	U	17.00		
Bromodichloromethane	U	17.00		
Bromoform	U	17.00		
Bromomethane	U	17.00		
Carbon Disulfide	U	17.00		
Carbon Tetrachloride	U	17.00		
Carbon disulfide	U	17.00		
Chlorobenzene	U	17.00		
Chloroethane	U	17.00		
Chloroform	U	17.00		
Chloromethane	U	17.00		
Dibromochloromethane	U	17.00		
Ethylbenzene	U	17.00		
Methyl ethyl ketone		19.00		
Methylene chloride	B	22.00		
Styrene	U	17.00		
Tetrachloroethene	U	17.00		
Toluene		27.00		
Trichloroethene	U	17.00		
Vinyl Chloride	U	17.00		
Xylene (total)	U	17.00		
cis-1,3-Dichloropropene	U	17.00		
trans-1,3-Dichloropropene	U	17.00		

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB23 (4-8) *
****

Sample Collection Date: 11/08/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38369-005
Lab Receipt Date: 11/11/93
Sample Analysis Date: 11/19/93

Analyte	Lab Result or DL		Validation Data	
1,1,1-Trichloroethane	U	3300.00		
1,1,2,2-Tetrachloroethane	U	3300.00		
1,1,2-Trichloroethane	U	3300.00		
1,1-Dichloroethane	U	3300.00		
1,1-Dichloroethene	U	3300.00		
1,2-Dichloroethane	U	3300.00		
1,2-Dichloroethene (total)	U	3300.00		
1,2-Dichloropropane	U	3300.00		
2-Butanone	U	3300.00		
2-Hexanone	U	3300.00		
4-Methyl-2-pentanone	U	3300.00		
Acetone	U	3300.00		
Benzene	U	3300.00		
Bromodichloromethane	U	3300.00		
Bromoform	U	3300.00		
Bromomethane	U	3300.00		
Carbon Disulfide	U	3300.00		
Carbon Tetrachloride	U	3300.00		
Carbon disulfide	U	3300.00		
Chlorobenzene	U	3300.00		
Chloroethane	U	3300.00		
Chloroform	U	3300.00		
Chloromethane	U	3300.00		
Dibromochloromethane	U	3300.00		
Ethylbenzene		14000.00		J
Methyl ethyl ketone	U	3300.00		
Methylene chloride	BJ	2000.00	3300.00	U
Styrene	U	3300.00		
Tetrachloroethene	U	3300.00		
Toluene	J	1800.00		J
Trichloroethene	U	3300.00		
Vinyl Chloride	U	3300.00		
Xylene (total)		75000.00		J
cis-1,3-Dichloropropene	U	3300.00		
trans-1,3-Dichloropropene	U	3300.00		

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB26 (4-6) *
****

Sample Collection Date: 11/12/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38416-003
Lab Receipt Date: 11/16/93
Sample Analysis Date: 11/19/93

Analyte	Lab Result or DL		Validation Data	
1,1,1-Trichloroethane	U	11.00		
1,1,2,2-Tetrachloroethane	U	11.00		
1,1,2-Trichloroethane	U	11.00		
1,1-Dichloroethane	U	11.00		
1,1-Dichloroethene	U	11.00		
1,2-Dichloroethane	U	11.00		
1,2-Dichloroethene (total)	U	11.00		
1,2-Dichloropropane	U	11.00		
2-Butanone	U	11.00		
2-Hexanone	U	11.00		
4-Methyl-2-pentanone	U	11.00		
Acetone		57.00	57.00	U
Benzene	U	11.00		
Bromodichloromethane	U	11.00		
Bromoform	U	11.00		
Bromomethane	U	11.00		
Carbon Disulfide	U	11.00		
Carbon Tetrachloride	U	11.00		
Carbon disulfide	U	11.00		
Chlorobenzene	U	11.00		
Chloroethane	U	11.00		
Chloroform	U	11.00		
Chloromethane	U	11.00		
Dibromochloromethane	U	11.00		
Ethylbenzene	U	11.00		
Methyl ethyl ketone	U	11.00		
Methylene chloride	B	11.00	11.00	U
Styrene	U	11.00		
Tetrachloroethene	U	11.00		
Toluene		19.00		
Trichloroethene	U	11.00		
Vinyl Chloride	U	11.00		
Xylene (total)	U	11.00		
cis-1,3-Dichloropropene	U	11.00		
trans-1,3-Dichloropropene	U	11.00		

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****
* SA- .E ID: 2LTB28 (4-6) *
****

Sample Collection Date: 11/12/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38416-004
Lab Receipt Date: 11/16/93
Sample Analysis Date: 11/22/93

Analyte	Lab Result or DL		Validation Data
1,1,1-Trichloroethane	U	12.00	
1,1,2,2-Tetrachloroethane	U	12.00	
1,1,2-Trichloroethane	U	12.00	
1,1-Dichloroethane	U	12.00	
1,1-Dichloroethene	U	12.00	
1,2-Dichloroethane	U	12.00	
1,2-Dichloroethene (total)	U	12.00	
1,2-Dichloropropane	U	12.00	
2-Butanone	U	12.00	
2-Hexanone	U	12.00	
4-Methyl-2-pentanone	U	12.00	
Acetone		37.00	37.00 U
Benzene	U	12.00	
Bromodichloromethane	U	12.00	
Bromoform	U	12.00	
Bromomethane	U	12.00	
Carbon Disulfide	U	12.00	
Carbon Tetrachloride	U	12.00	
Carbon disulfide	U	12.00	
Chlorobenzene	U	12.00	
Chloroethane	U	12.00	
Chloroform	U	12.00	
Chloromethane	U	12.00	
Dibromochloromethane	U	12.00	
Ethylbenzene	U	12.00	
Methyl ethyl ketone	U	12.00	
Methylene chloride	BJ	10.00	12.00 U
Styrene	U	12.00	
Tetrachloroethene	U	12.00	
Toluene		13.00	
Trichloroethene	U	12.00	
Vinyl Chloride	U	12.00	
Xylene (total)	U	12.00	
cis-1,3-Dichloropropene	U	12.00	
trans-1,3-Dichloropropene	U	12.00	

NAVAL SUBMARINE BASE - NEW LONDON

AREA-A LANDFILL

CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****

* SAMPLE ID: 2LTB29 (10-12) *

****

Sample Collection Date: 11/14/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38442-004

Lab Receipt Date: 11/17/93

Sample Analysis Date: 11/19/93

Analyte		Lab Result or DL	Validation Data
1,1,1-Trichloroethane	U	12.00	
1,1,2,2-Tetrachloroethane	U	12.00	
1,1,2-Trichloroethane	U	12.00	
1,1-Dichloroethane	U	12.00	
1,1-Dichloroethene	U	12.00	
1,2-Dichloroethane	U	12.00	
1,2-Dichloroethene (total)	U	12.00	
1,2-Dichloropropane	U	12.00	
2-Butanone	U	12.00	
2-Hexanone	U	12.00	
4-Methyl-2-pentanone	U	12.00	
Acetone		44.00	44.00 U
Benzene	U	12.00	
Bromodichloromethane	U	12.00	
Bromoform	U	12.00	
Bromomethane	U	12.00	
Carbon Disulfide	U	12.00	
Carbon Tetrachloride	U	12.00	
Carbon disulfide	U	12.00	
Chlorobenzene	U	12.00	
Chloroethane	U	12.00	
Chloroform	U	12.00	
Chloromethane	U	12.00	
Dibromochloromethane	U	12.00	
Ethylbenzene	U	12.00	
Methyl ethyl ketone	U	12.00	
Methylene chloride	BJ	12.00	12.00 U
Styrene	U	12.00	
Tetrachloroethene	U	12.00	
Toluene	J	12.00	
Trichloroethene	U	12.00	
Vinyl Chloride	U	12.00	
Xylene (total)	U	12.00	
cis-1,3-Dichloropropene	U	12.00	
trans-1,3-Dichloropropene	U	12.00	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB31 (8-10) *
****

Sample Collection Date: 11/14/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38442-005
Lab Receipt Date: 11/17/93
Sample Analysis Date: 11/19/93

Analyte	Lab Result or DL		Validation Data	
1,1,1-Trichloroethane	U	13.00		
1,1,2,2-Tetrachloroethane	U	13.00		
1,1,2-Trichloroethane	U	13.00		
1,1-Dichloroethane	U	13.00		
1,1-Dichloroethene	U	13.00		
1,2-Dichloroethane	U	13.00		
1,2-Dichloroethene (total)	U	13.00		
1,2-Dichloropropane	U	13.00		
2-Butanone	U	13.00		
2-Hexanone	U	13.00		
4-Methyl-2-pentanone	U	13.00		
Acetone		63.00	63.00	U
Benzene	U	13.00		
Bromodichloromethane	U	13.00		
Bromoform	U	13.00		
Bromomethane	U	13.00		
Carbon Disulfide	U	13.00		
Carbon Tetrachloride	U	13.00		
Carbon disulfide	U	13.00		
Chlorobenzene	U	13.00		
Chloroethane	U	13.00		
Chloroform	U	13.00		
Chloromethane	U	13.00		
Dibromochloromethane	U	13.00		
Ethylbenzene	U	13.00		
Methyl ethyl ketone	U	13.00		
Methylene chloride	B	16.00	16.00	U
Styrene	U	13.00		
Tetrachloroethene	U	13.00		
Toluene		19.00		
Trichloroethene	U	13.00		
Vinyl Chloride	U	13.00		
Xylene (total)	U	13.00		
cis-1,3-Dichloropropene	U	13.00		
trans-1,3-Dichloropropene	U	13.00		

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB33 (4-8) *
****

Sample Collection Date: 11/08/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38369-006
Lab Receipt Date: 11/11/93
Sample Analysis Date: 11/19/93

Analyte	Lab Result or DL		Validation Data	
1,1,1-Trichloroethane	U	4500.00		
1,1,2,2-Tetrachloroethane	U	4500.00		
1,1,2-Trichloroethane	U	4500.00		
1,1-Dichloroethane	U	4500.00		
1,1-Dichloroethene	U	4500.00		
1,2-Dichloroethane	U	4500.00		
1,2-Dichloroethene (total)	U	4500.00		
1,2-Dichloropropane	U	4500.00		
2-Butanone	U	4500.00		
2-Hexanone	U	4500.00		
4-Methyl-2-pentanone	U	4500.00		
Acetone	U	4500.00		
Benzene	U	4500.00		
Bromodichloromethane	U	4500.00		
Bromoform	U	4500.00		
Bromomethane	U	4500.00		
Carbon Disulfide	U	4500.00		
Carbon Tetrachloride	U	4500.00		
Carbon disulfide	U	4500.00		
Chlorobenzene	U	4500.00		J
Chloroethane	U	4500.00		
Chloroform	U	4500.00		
Chloromethane	U	4500.00		
Dibromochloromethane	U	4500.00		
Ethylbenzene		28000.00		
Methyl ethyl ketone	U	4500.00		
Methylene chloride	BJ	3200.00	4500.00	U
Styrene	U	4500.00		
Tetrachloroethene	U	4500.00		
Toluene	J	3200.00		J
Trichloroethene	U	4500.00		
Vinyl Chloride	U	4500.00		
Xylene (total)		140000.00		J
cis-1,3-Dichloropropene	U	4500.00		
trans-1,3-Dichloropropene	U	4500.00		

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB39 (10-12) *
****

Sample Collection Date: 11/14/93 Method: 8240/2 Units: UG/KG Laboratory ID: 38442-006
Lab Receipt Date: 11/17/93
Sample Analysis Date: 11/19/93

Analyte	Lab Result or DL		Validation Data
1,1,1-Trichloroethane	U	12.00	
1,1,2,2-Tetrachloroethane	U	12.00	
1,1,2-Trichloroethane	U	12.00	
1,1-Dichloroethane	U	12.00	
1,1-Dichloroethene	U	12.00	
1,2-Dichloroethane	U	12.00	
1,2-Dichloroethene (total)	U	12.00	
1,2-Dichloropropane	U	12.00	
2-Butanone	U	12.00	
2-Hexanone	U	12.00	
4-Methyl-2-pentanone	U	12.00	
Acetone		35.00	35.00 U
Benzene	U	12.00	
Bromodichloromethane	U	12.00	
Bromoform	U	12.00	
Bromomethane	U	12.00	
Carbon Disulfide	U	12.00	
Carbon Tetrachloride	U	12.00	
Carbon disulfide	U	12.00	
Chlorobenzene	U	12.00	
Chloroethane	U	12.00	
Chloroform	U	12.00	
Chloromethane	U	12.00	
Dibromochloromethane	U	12.00	
Ethylbenzene	U	12.00	
Methyl ethyl ketone	U	12.00	
Methylene chloride	BJ	11.00	12.00 U
Styrene	U	12.00	
Tetrachloroethene	U	12.00	
Toluene	U	12.00	
Trichloroethene	U	12.00	
Vinyl Chloride	U	12.00	
Xylene (total)	U	12.00	
cis-1,3-Dichloropropene	U	12.00	
trans-1,3-Dichloropropene	U	12.00	

NAVAL SUBMARINE BASE - NEW LONDON

AREA-A LANDFILL

CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****

* SAMPLE ID: 2LTB16 (0-2) *

****

Sample Collection Date: 11/04/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38304-013

Lab Receipt Date: 11/06/93

Sample Analysis Date: 12/07/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	9300	UJ	1,2-Dichlorobenzene	U	9300	UJ
1,3-Dichlorobenzene	U	9300	UJ	1,4-Dichlorobenzene	U	9300	UJ
2,2'-oxybis(1-Chloropropane)	U	9300	UJ	2,4,5-Trichlorophenol	U	23000	UJ
2,4,6-Trichlorophenol	U	9300	UJ	2,4-Dichlorophenol	U	9300	UJ
2,4-Dimethylphenol	U	9300	UJ	2,4-Dinitrophenol	U	23000	UJ
2,4-Dinitrotoluene	U	9300	UJ	2,6-Dinitrotoluene	U	9300	UJ
2-Chloronaphthalene	U	9300	UJ	2-Chlorophenol	U	9300	UJ
2-Methylnaphthalene	U	9300	UJ	2-Methylphenol	U	9300	UJ
2-Nitroaniline	U	23000	UJ	2-Nitrophenol	U	9300	UJ
3,3'-Dichlorobenzidine	U	9300	UJ	3-Nitroaniline	U	23000	UJ
4,6-Dinitro-2-methylphenol	U	23000	UJ	4-Bromophenyl-phenylether	U	9300	UJ
4-Chloro-3-methylphenol	U	9300	UJ	4-Chloroaniline	U	9300	UJ
4-Chlorophenyl-phenylether	U	9300	UJ	4-Methylphenol	U	9300	UJ
4-Nitroaniline	U	23000	UJ	4-Nitrophenol	U	23000	UJ
Acenaphthene	U	9300	UJ	Acenaphthylene	U	9300	UJ
Anthracene	U	9300	UJ	Benzo(a)anthracene	U	9300	UJ
Benzo(a)pyrene	U	9300	UJ	Benzo(b)fluoranthene	U	9300	UJ
Benzo(g,h,i)perylene	U	9300	UJ	Benzo(k)fluoranthene	U	9300	UJ
Butylbenzylphthalate	U	9300	UJ	Carbazole	U	9300	UJ
Chrysene	U	9300	UJ	Di-n-butylphthalate	U	9300	UJ
Di-n-octylphthalate	U	9300	UJ	Dibenz(a,h)anthracene	U	9300	UJ
Dibenzofuran	U	9300	UJ	Diethylphthalate	U	9300	UJ
Dimethylphthalate	U	9300	UJ	Fluoranthene	U	9300	UJ
Fluorene	U	9300	UJ	Hexachlorobenzene	U	9300	UJ
Hexachlorobutadiene	U	9300	UJ	Hexachlorocyclopentadiene	U	9300	UJ
Hexachloroethane	U	9300	UJ	Indeno(1,2,3-cd)pyrene	U	9300	UJ
Isophorone	U	9300	UJ	N-Nitroso-di-n-propylamine	U	9300	UJ
N-Nitrosodiphenylamine (1)	U	9300	UJ	Naphthalene	U	9300	UJ
Nitrobenzene	U	9300	UJ	Pentachlorophenol	U	23000	UJ
Phenanthrene	U	9300	UJ	Phenol	U	9300	UJ
Pyrene	U	9300	UJ	bis(2-Chloroethoxy)methane	U	9300	UJ
bis(2-Chloroethyl)ether	U	9300	UJ	bis(2-Ethylhexyl)phthalate	U	9300	UJ

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB17 (0-2) *
****

Sample Collection Date: 11/03/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38304-014
Lab Receipt Date: 11/06/93
Sample Analysis Date: 12/07/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	11000	UJ	1,2-Dichlorobenzene	U	11000	UJ
1,3-Dichlorobenzene	U	11000	UJ	1,4-Dichlorobenzene	U	11000	UJ
2,2'-oxybis(1-Chloropropane)	U	11000	UJ	2,4,5-Trichlorophenol	U	27000	UJ
2,4,6-Trichlorophenol	U	11000	UJ	2,4-Dichlorophenol	U	11000	UJ
2,4-Dimethylphenol	U	11000	UJ	2,4-Dinitrophenol	U	27000	UJ
2,4-Dinitrotoluene	U	11000	UJ	2,6-Dinitrotoluene	U	11000	UJ
2-Chloronaphthalene	U	11000	UJ	2-Chlorophenol	U	11000	UJ
2-Methylnaphthalene	U	11000	UJ	2-Methylphenol	U	11000	UJ
2-Nitroaniline	U	27000	UJ	2-Nitrophenol	U	11000	UJ
3,3'-Dichlorobenzidine	U	11000	UJ	3-Nitroaniline	U	27000	UJ
4,6-Dinitro-2-methylphenol	U	27000	UJ	4-Bromophenyl-phenylether	U	11000	UJ
4-Chloro-3-methylphenol	U	11000	UJ	4-Chloroaniline	U	11000	UJ
4-Chlorophenyl-phenylether	U	11000	UJ	4-Methylphenol	U	11000	UJ
4-Nitroaniline	U	27000	UJ	4-Nitrophenol	U	27000	UJ
Acenaphthene	U	11000	UJ	Acenaphthylene	U	11000	UJ
Anthracene	U	11000	UJ	Benzo(a)anthracene	U	11000	UJ
Benzo(a)pyrene	U	11000	UJ	Benzo(b)fluoranthene	U	11000	UJ
Benzo(g,h,i)perylene	U	11000	UJ	Benzo(k)fluoranthene	U	11000	UJ
Butylbenzylphthalate	U	11000	UJ	Carbazole	U	11000	UJ
Chrysene	U	11000	UJ	Di-n-butylphthalate	U	11000	UJ
Di-n-octylphthalate	U	11000	UJ	Dibenz(a,h)anthracene	U	11000	UJ
Dibenzofuran	U	11000	UJ	Diethylphthalate	U	11000	UJ
Dimethylphthalate	U	11000	UJ	Fluoranthene	U	11000	UJ
Fluorene	U	11000	UJ	Hexachlorobenzene	U	11000	UJ
Hexachlorobutadiene	U	11000	UJ	Hexachlorocyclopentadiene	U	11000	UJ
Hexachloroethane	U	11000	UJ	Indeno(1,2,3-cd)pyrene	U	11000	UJ
Isophorone	U	11000	UJ	N-Nitroso-di-n-propylamine	U	11000	UJ
N-Nitrosodiphenylamine (1)	U	11000	UJ	Naphthalene	U	11000	UJ
Nitrobenzene	U	11000	UJ	Pentachlorophenol	U	27000	UJ
Phenanthrene	U	11000	UJ	Phenol	U	11000	UJ
Pyrene	U	11000	UJ	bis(2-Chloroethoxy)methane	U	11000	UJ
bis(2-Chloroethyl)ether	U	11000	UJ	bis(2-Ethylhexyl)phthalate	U	11000	UJ

NAVAL SUBMARINE BASE - NEW LONDON

AREA-A LANDFILL

CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB18 (0-2) *
****

Sample Collection Date: 11/02/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38259-002
Lab Receipt Date: 11/04/93
Sample Analysis Date: 12/07/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	9900		1,2-Dichlorobenzene	U	9900	
1,3-Dichlorobenzene	U	9900		1,4-Dichlorobenzene	U	9900	
2,2'-oxybis(1-Chloropropane)	U	9900		2,4,5-Trichlorophenol	U	25000	
2,4,6-Trichlorophenol	U	9900		2,4-Dichlorophenol	U	9900	
2,4-Dimethylphenol	U	9900		2,4-Dinitrophenol	U	25000	
2,4-Dinitrotoluene	U	9900		2,6-Dinitrotoluene	U	9900	
2-Chloronaphthalene	U	9900		2-Chlorophenol	U	9900	
2-Methylnaphthalene	U	9900		2-Methylphenol	U	9900	
2-Nitroaniline	U	25000		2-Nitrophenol	U	9900	
3,3'-Dichlorobenzidine	U	9900		3-Nitroaniline	U	25000	
4,6-Dinitro-2-methylphenol	U	25000		4-Bromophenyl-phenylether	U	9900	
4-Chloro-3-methylphenol	U	9900		4-Chloroaniline	U	9900	
4-Chlorophenyl-phenylether	U	9900		4-Methylphenol	U	9900	
4-Nitroaniline	U	25000		4-Nitrophenol	U	25000	
Acenaphthene	U	9900		Acenaphthylene	U	9900	
Anthracene	U	9900		Benzo(a)anthracene	U	9900	
Benzo(a)pyrene	U	9900		Benzo(b)fluoranthene	U	9900	
Benzo(g,h,i)perylene	U	9900		Benzo(k)fluoranthene	U	9900	
Butylbenzylphthalate	U	9900		Carbazole	U	9900	
Chrysene	U	9900		Di-n-butylphthalate	U	9900	
Di-n-octylphthalate	U	9900		Dibenz(a,h)anthracene	U	9900	
Dibenzofuran	U	9900		Diethylphthalate	U	9900	
Dimethylphthalate	U	9900		Fluoranthene	U	9900	
Fluorene	U	9900		Hexachlorobenzene	U	9900	
Hexachlorobutadiene	U	9900		Hexachlorocyclopentadiene	U	9900	
Hexachloroethane	U	9900		Indeno(1,2,3-cd)pyrene	U	9900	
Isophorone	U	9900		N-Nitroso-di-n-propylamine	U	9900	
N-Nitrosodiphenylamine (1)	U	9900		Naphthalene	U	9900	
Nitrobenzene	U	9900		Pentachlorophenol	U	25000	
Phenanthrene	U	9900		Phenol	U	9900	
Pyrene	U	9900		bis(2-Chloroethoxy)methane	U	9900	
bis(2-Chloroethyl)ether	U	9900		bis(2-Ethylhexyl)phthalate	J	5300	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB19 (2-4) *
****

Sample Collection Date: 11/10/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38407-003
Lab Receipt Date: 11/13/93
Sample Analysis Date: 12/07/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	350		1,2-Dichlorobenzene	U	350	
1,3-Dichlorobenzene	U	350		1,4-Dichlorobenzene	U	350	
2,2'-oxybis(1-Chloropropane)	U	350		2,4,5-Trichlorophenol	U	850	
2,4,6-Trichlorophenol	U	350		2,4-Dichlorophenol	U	350	
2,4-Dimethylphenol	U	350		2,4-Dinitrophenol	U	850	
2,4-Dinitrotoluene	U	350		2,6-Dinitrotoluene	U	350	
2-Chloronaphthalene	U	350		2-Chlorophenol	U	350	
2-Methylnaphthalene		430		2-Methylphenol	U	350	
2-Nitroaniline	U	850		2-Nitrophenol	U	350	
3,3'-Dichlorobenzidine	U	350		3-Nitroaniline	U	850	
4,6-Dinitro-2-methylphenol	U	850		4-Bromophenyl-phenylether	U	350	
4-Chloro-3-methylphenol	U	350		4-Chloroaniline	U	350	
4-Chlorophenyl-phenylether	U	350		4-Methylphenol	J	340	
·Nitroaniline	U	850		4-Nitrophenol	U	850	
Acenaphthene		620		Acenaphthylene	U	350	
Anthracene		500		Benzo(a)anthracene		950	
Benzo(a)pyrene		750		Benzo(b)fluoranthene		860	
Benzo(g,h,i)perylene	J	260		Benzo(k)fluoranthene		540	
Butylbenzylphthalate	U	350		Carbazole		410	
Chrysene		920		Di-n-butylphthalate	U	350	
Di-n-octylphthalate	U	350		Dibenz(a,h)anthracene	U	350	
Dibenzofuran		490		Diethylphthalate	U	350	
Dimethylphthalate	U	350		Fluoranthene		1800	
Fluorene		790		Hexachlorobenzene	U	350	
Hexachlorobutadiene	U	350		Hexachlorocyclopentadiene	U	350	
Hexachloroethane	U	350		Indeno(1,2,3-cd)pyrene	J	230	
Isophorone	U	350		N-Nitroso-di-n-propylamine	U	350	
N-Nitrosodiphenylamine (1)	U	350		Naphthalene		1000	
Nitrobenzene	U	350		Pentachlorophenol	U	850	
Phenanthrene		1800		Phenol	U	350	
Pyrene		1700		bis(2-Chloroethoxy)methane	U	350	
bis(2-Chloroethyl)ether	U	350		bis(2-Ethylhexyl)phthalate		480	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB9 (0-2) *
****

Sample Collection Date: 11/05/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38328-005
Lab Receipt Date: 11/09/93
Sample Analysis Date: 12/09/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	350		1,2-Dichlorobenzene	U	350	
1,3-Dichlorobenzene	U	350		1,4-Dichlorobenzene	U	350	
2,2'-oxybis(1-Chloropropane)	U	350		2,4,5-Trichlorophenol	U	860	
2,4,6-Trichlorophenol	U	350		2,4-Dichlorophenol	U	350	
2,4-Dimethylphenol	U	350		2,4-Dinitrophenol	U	860	
2,4-Dinitrotoluene	U	350		2,6-Dinitrotoluene	U	350	
2-Chloronaphthalene	U	350		2-Chlorophenol	U	350	
2-Methylnaphthalene	U	350		2-Methylphenol	U	350	
2-Nitroaniline	U	860		2-Nitrophenol	U	350	
3,3'-Dichlorobenzidine	U	350		3-Nitroaniline	U	860	
4,6-Dinitro-2-methylphenol	U	860		4-Bromophenyl-phenylether	U	350	
4-Chloro-3-methylphenol	U	350		4-Chloroaniline	U	350	
4-Chlorophenyl-phenylether	U	350		4-Methylphenol	U	350	
4-Nitroaniline	U	860		4-Nitrophenol	U	860	
Acenaphthene	U	350		Acenaphthylene	U	350	
Anthracene	U	350		Benzo(a)anthracene	J	200	
Benzo(a)pyrene	J	190		Benzo(b)fluoranthene	J	180	
Benzo(g,h,i)perylene	U	350		Benzo(k)fluoranthene	J	210	J
Butylbenzylphthalate	U	350		Carbazole	U	350	
Chrysene	J	190		Di-n-butylphthalate	U	350	
Di-n-octylphthalate	U	350		Dibenz(a,h)anthracene	U	350	
Dibenzofuran	U	350		Diethylphthalate	U	350	
Dimethylphthalate	U	350		Fluoranthene	J	300	
Fluorene	U	350		Hexachlorobenzene	U	350	
Hexachlorobutadiene	U	350		Hexachlorocyclopentadiene	U	350	
Hexachloroethane	U	350		Indeno(1,2,3-cd)pyrene	U	350	
Isophorone	U	350		N-Nitroso-di-n-propylamine	U	350	
N-Nitrosodiphenylamine (1)	U	350		Naphthalene	U	350	
Nitrobenzene	U	350		Pentachlorophenol	U	860	
Phenanthrene	U	350		Phenol	U	350	
Pyrene	J	310		bis(2-Chloroethoxy)methane	U	350	
bis(2-Chloroethyl)ether	U	350		bis(2-Ethylhexyl)phthalate	U	350	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB13 (0-2) *
****

Sample Collection Date: 11/09/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38369-011
Lab Receipt Date: 11/11/93
Sample Analysis Date: 12/09/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	350		1,2-Dichlorobenzene	U	350	
1,3-Dichlorobenzene	U	350		1,4-Dichlorobenzene	U	350	
2,2'-oxybis(1-Chloropropane)	U	350		2,4,5-Trichlorophenol	U	840	
2,4,6-Trichlorophenol	U	350		2,4-Dichlorophenol	U	350	
2,4-Dimethylphenol	U	350		2,4-Dinitrophenol	U	840	
2,4-Dinitrotoluene	U	350		2,6-Dinitrotoluene	U	350	
2-Chloronaphthalene	U	350		2-Chlorophenol	U	350	
2-Methylnaphthalene	U	350		2-Methylphenol	U	350	
2-Nitroaniline	U	840		2-Nitrophenol	U	350	
3,3'-Dichlorobenzidine	U	350		3-Nitroaniline	U	840	
4,6-Dinitro-2-methylphenol	U	840		4-Bromophenyl-phenylether	U	350	
4-Chloro-3-methylphenol	U	350		4-Chloroaniline	U	350	
4-Chlorophenyl-phenylether	U	350		4-Methylphenol	U	350	
-Nitroaniline	U	840		4-Nitrophenol	U	840	
Acenaphthene	U	350		Acenaphthylene	U	350	
Anthracene	U	350		Benzo(a)anthracene	U	350	
Benzo(a)pyrene	U	350		Benzo(b)fluoranthene	U	350	
Benzo(g,h,i)perylene	U	350		Benzo(k)fluoranthene	U	350	
Butylbenzylphthalate	U	350		Carbazole	U	350	
Chrysene	U	350		Di-n-butylphthalate	U	350	
Di-n-octylphthalate	U	350		Dibenz(a,h)anthracene	U	350	
Dibenzofuran	U	350		Diethylphthalate	U	350	
Dimethylphthalate	U	350		Fluoranthene	U	350	
Fluorene	U	350		Hexachlorobenzene	U	350	
Hexachlorobutadiene	U	350		Hexachlorocyclopentadiene	U	350	
Hexachloroethane	U	350		Indeno(1,2,3-cd)pyrene	U	350	
Isophorone	U	350		N-Nitroso-di-n-propylamine	U	350	
N-Nitrosodiphenylamine (1)	U	350		Naphthalene	U	350	
Nitrobenzene	U	350		Pentachlorophenol	U	840	
Phenanthrene	U	350		Phenol	U	350	
Pyrene	U	350		bis(2-Chloroethoxy)methane	U	350	
bis(2-Chloroethyl)ether	U	350		bis(2-Ethylhexyl)phthalate	U	350	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB20 (6-8) *
****

Sample Collection Date: 11/09/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38369-012
Lab Receipt Date: 11/11/93
Sample Analysis Date: 12/07/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	12000		1,2-Dichlorobenzene	U	12000	
1,3-Dichlorobenzene	U	12000		1,4-Dichlorobenzene	U	12000	
2,2'-oxybis(1-Chloropropane)	U	12000		2,4,5-Trichlorophenol	U	31000	
2,4,6-Trichlorophenol	U	12000		2,4-Dichlorophenol	U	12000	
2,4-Dimethylphenol	U	12000		2,4-Dinitrophenol	U	31000	
2,4-Dinitrotoluene	U	12000		2,6-Dinitrotoluene	U	12000	
2-Chloronaphthalene	U	12000		2-Chlorophenol	U	12000	
2-Methylnaphthalene	U	12000		2-Methylphenol	U	12000	
2-Nitroaniline	U	31000		2-Nitrophenol	U	12000	
3,3'-Dichlorobenzidine	U	12000		3-Nitroaniline	U	31000	
4,6-Dinitro-2-methylphenol	U	31000		4-Bromophenyl-phenylether	U	12000	
4-Chloro-3-methylphenol	U	12000		4-Chloroaniline	U	12000	
4-Chlorophenyl-phenylether	U	12000		4-Methylphenol	U	12000	
4-Nitroaniline	U	31000		4-Nitrophenol	U	31000	
Acenaphthene	J	8400		Acenaphthylene	U	12000	
Anthracene		19000		Benzo(a)anthracene		23000	
Benzo(a)pyrene		15000		Benzo(b)fluoranthene		15000	
Benzo(g,h,i)perylene	U	12000		Benzo(k)fluoranthene		14000	J
Butylbenzylphthalate	U	12000		Carbazole	J	9800	
Chrysene		19000		Di-n-butylphthalate	U	12000	
Di-n-octylphthalate	U	12000		Dibenz(a,h)anthracene	U	12000	
Dibenzofuran		13000		Diethylphthalate	U	12000	
Dimethylphthalate	U	12000		Fluoranthene		47000	
Fluorene		17000		Hexachlorobenzene	U	12000	
Hexachlorobutadiene	U	12000		Hexachlorocyclopentadiene	U	12000	
Hexachloroethane	U	12000		Indeno(1,2,3-cd)pyrene	U	12000	
Isophorone	U	12000		N-Nitroso-di-n-propylamine	U	12000	
N-Nitrosodiphenylamine (1)	U	12000		Naphthalene		20000	
Nitrobenzene	U	12000		Pentachlorophenol	U	31000	
Phenanthrene		61000		Phenol	U	12000	
Pyrene		40000		bis(2-Chloroethoxy)methane	U	12000	
bis(2-Chloroethyl)ether	U	12000		bis(2-Ethylhexyl)phthalate	U	12000	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB22 (6-8) *
****

Sample Collection Date: 11/05/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38328-006
Lab Receipt Date: 11/09/93
Sample Analysis Date: 12/07/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	2200		1,2-Dichlorobenzene	U	2200	
1,3-Dichlorobenzene	U	2200		1,4-Dichlorobenzene	U	2200	
2,2'-oxybis(1-Chloropropane)	U	2200		2,4,5-Trichlorophenol	U	5400	
2,4,6-Trichlorophenol	U	2200		2,4-Dichlorophenol	U	2200	
2,4-Dimethylphenol	U	2200		2,4-Dinitrophenol	U	5400	
2,4-Dinitrotoluene	U	2200		2,6-Dinitrotoluene	U	2200	
2-Chloronaphthalene	U	2200		2-Chlorophenol	U	2200	
2-Methylnaphthalene	U	2200		2-Methylphenol	U	2200	
2-Nitroaniline	U	5400		2-Nitrophenol	U	2200	
3,3'-Dichlorobenzidine	U	2200		3-Nitroaniline	U	5400	
4,6-Dinitro-2-methylphenol	U	5400		4-Bromophenyl-phenylether	U	2200	
4-Chloro-3-methylphenol	U	2200		4-Chloroaniline	U	2200	
4-Chlorophenyl-phenylether	U	2200		4-Methylphenol	U	2200	
4-Nitroaniline	U	5400		4-Nitrophenol	U	5400	
Acenaphthene	U	2200		Acenaphthylene	U	2200	
Anthracene	U	2200		Benzo(a)anthracene		2400	
Benzo(a)pyrene	J	2100	J	Benzo(b)fluoranthene		2400	J
Benzo(g,h,i)perylene	U	2200	UJ	Benzo(k)fluoranthene	J	1700	J
Butylbenzylphthalate	U	2200		Carbazole	U	2200	
Chrysene		2600		Di-n-butylphthalate	U	2200	
Di-n-octylphthalate	U	2200	UJ	Dibenz(a,h)anthracene	U	2200	UJ
Dibenzofuran	U	2200		Diethylphthalate	U	2200	
Dimethylphthalate	U	2200		Fluoranthene		4100	
Fluorene	U	2200		Hexachlorobenzene	U	2200	
Hexachlorobutadiene	U	2200		Hexachlorocyclopentadiene	U	2200	
Hexachloroethane	U	2200		Indeno(1,2,3-cd)pyrene	U	2200	UJ
Isophorone	U	2200		N-Nitroso-di-n-propylamine	U	2200	
N-Nitrosodiphenylamine (1)	U	2200		Naphthalene	U	2200	
Nitrobenzene	U	2200		Pentachlorophenol	U	5400	
Phenanthrene		3700		Phenol	U	2200	
Pyrene		4900		bis(2-Chloroethoxy)methane	U	2200	
bis(2-Chloroethyl)ether	U	2200		bis(2-Ethylhexyl)phthalate	U	2200	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB22 (6-8)RE *
****

Sample Collection Date: 11/05/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38328-006R
Lab Receipt Date: 11/09/93
Sample Analysis Date: 12/09/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	2200		1,2-Dichlorobenzene	U	2200	
1,3-Dichlorobenzene	U	2200		1,4-Dichlorobenzene	U	2200	
2,2'-oxybis(1-Chloropropane)	U	2200		2,4,5-Trichlorophenol	U	5400	
2,4,6-Trichlorophenol	U	2200		2,4-Dichlorophenol	U	2200	
2,4-Dimethylphenol	U	2200		2,4-Dinitrophenol	U	5400	
2,4-Dinitrotoluene	U	2200		2,6-Dinitrotoluene	U	2200	
2-Chloronaphthalene	U	2200		2-Chlorophenol	U	2200	
2-Methylnaphthalene	U	2200		2-Methylphenol	U	2200	
2-Nitroaniline	U	5400		2-Nitrophenol	U	2200	
3,3'-Dichlorobenzidine	U	2200		3-Nitroaniline	U	5400	
4,6-Dinitro-2-methylphenol	U	5400		4-Bromophenyl-phenylether	U	2200	
4-Chloro-3-methylphenol	U	2200		4-Chloroaniline	U	2200	
4-Chlorophenyl-phenylether	U	2200		4-Methylphenol	U	2200	
4-Nitroaniline	U	5400		4-Nitrophenol	U	5400	
Acenaphthene	U	2200		Acenaphthylene	U	2200	
Anthracene	U	2200		Benzo(a)anthracene		2400	
Benzo(a)pyrene	J	2200	J	Benzo(b)fluoranthene		2700	J
Benzo(g,h,i)perylene	U	2200	UJ	Benzo(k)fluoranthene	J	1500	J
Butylbenzylphthalate	U	2200		Carbazole	U	2200	
Chrysene		2400		Di-n-butylphthalate	U	2200	
Di-n-octylphthalate	U	2200	UJ	Dibenz(a,h)anthracene	U	2200	UJ
Dibenzofuran	U	2200		Diethylphthalate	U	2200	
Dimethylphthalate	U	2200		Fluoranthene		4100	
Fluorene	U	2200		Hexachlorobenzene	U	2200	
Hexachlorobutadiene	U	2200		Hexachlorocyclopentadiene	U	2200	
Hexachloroethane	U	2200		Indeno(1,2,3-cd)pyrene	U	2200	UJ
Isophorone	U	2200		N-Nitroso-di-n-propylamine	U	2200	
N-Nitrosodiphenylamine (1)	U	2200		Naphthalene	U	2200	
Nitrobenzene	U	2200		Pentachlorophenol	U	5400	
Phenanthrene		3700		Phenol	U	2200	
Pyrene		5800		bis(2-Chloroethoxy)methane	U	2200	
bis(2-Chloroethyl)ether	U	2200		bis(2-Ethylhexyl)phthalate	U	2200	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB23 (4-8) *
****

Sample Collection Date: 11/08/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38369-009
Lab Receipt Date: 11/11/93
Sample Analysis Date: 12/13/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	1500		1,2-Dichlorobenzene	U	1500	
1,3-Dichlorobenzene	U	1500		1,4-Dichlorobenzene	U	1500	
2,2'-oxybis(1-Chloropropane)	U	1500		2,4,5-Trichlorophenol	U	3500	
2,4,6-Trichlorophenol	U	1500		2,4-Dichlorophenol	U	1500	
2,4-Dimethylphenol	U	1500	UJ	2,4-Dinitrophenol	U	3500	
2,4-Dinitrotoluene	U	1500		2,6-Dinitrotoluene	U	1500	
2-Chloronaphthalene	U	1500		2-Chlorophenol	U	1500	
2-Methylnaphthalene	U	1500		2-Methylphenol	U	1500	
2-Nitroaniline	U	3500		2-Nitrophenol	U	1500	
3,3'-Dichlorobenzidine	U	1500		3-Nitroaniline	U	3500	
4,6-Dinitro-2-methylphenol	U	3500		4-Bromophenyl-phenylether	U	1500	
4-Chloro-3-methylphenol	U	1500		4-Chloroaniline	U	1500	
'-Chlorophenyl-phenylether	U	1500		4-Methylphenol		2000	J
-Nitroaniline	U	3500		4-Nitrophenol	U	3500	
Acenaphthene	U	1500		Acenaphthylene	U	1500	
Anthracene	U	1500		Benzo(a)anthracene	U	1500	
Benzo(a)pyrene	U	1500		Benzo(b)fluoranthene	U	1500	
Benzo(g,h,i)perylene	U	1500		Benzo(k)fluoranthene	U	1500	
Butylbenzylphthalate	U	1500		Carbazole	U	1500	
Chrysene	U	1500		Di-n-butylphthalate	U	1500	
Di-n-octylphthalate	U	1500		Dibenz(a,h)anthracene	U	1500	
Dibenzofuran	U	1500		Diethylphthalate	U	1500	
Dimethylphthalate	U	1500		Fluoranthene	U	1500	
Fluorene	U	1500		Hexachlorobenzene	U	1500	
Hexachlorobutadiene	U	1500		Hexachlorocyclopentadiene	U	1500	
Hexachloroethane	U	1500		Indeno(1,2,3-cd)pyrene	U	1500	
Isophorone	U	1500		N-Nitroso-di-n-propylamine	U	1500	
N-Nitrosodiphenylamine (1)	U	1500		Naphthalene	J	920	J
Nitrobenzene	U	1500		Pentachlorophenol	U	3500	
Phenanthrene	U	1500		Phenol	U	1500	
Pyrene	U	1500	UJ	bis(2-Chloroethoxy)methane	U	1500	
bis(2-Chloroethyl)ether	U	1500		bis(2-Ethylhexyl)phthalate	U	1500	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB26 (4-6) *
****

Sample Collection Date: 11/12/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38416-005
Lab Receipt Date: 11/16/93
Sample Analysis Date: 12/07/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	720		1,2-Dichlorobenzene	U	720	
1,3-Dichlorobenzene	U	720		1,4-Dichlorobenzene	U	720	
2,2'-oxybis(1-Chloropropane)	U	720		2,4,5-Trichlorophenol	U	1700	
2,4,6-Trichlorophenol	U	720		2,4-Dichlorophenol	U	720	
2,4-Dimethylphenol	U	720		2,4-Dinitrophenol	U	1700	
2,4-Dinitrotoluene	U	720		2,6-Dinitrotoluene	U	720	
2-Chloronaphthalene	U	720		2-Chlorophenol	U	720	
2-Methylnaphthalene	J	370		2-Methylphenol	U	720	
2-Nitroaniline	U	1700		2-Nitrophenol	U	720	
3,3'-Dichlorobenzidine	U	720		3-Nitroaniline	U	1700	
4,6-Dinitro-2-methylphenol	U	1700		4-Bromophenyl-phenylether	U	720	
4-Chloro-3-methylphenol	U	720		4-Chloroaniline	U	720	
4-Chlorophenyl-phenylether	U	720		4-Methylphenol	U	720	
4-Nitroaniline	U	1700		4-Nitrophenol	U	1700	
Acenaphthene		750		Acenaphthylene	U	720	
Anthracene		1600		Benzo(a)anthracene		2800	
Benzo(a)pyrene		2100	J	Benzo(b)fluoranthene		2400	J
Benzo(g,h,i)perylene	J	590	J	Benzo(k)fluoranthene		1600	J
Butylbenzylphthalate	U	720		Carbazole		970	
Chrysene		2500		Di-n-butylphthalate	U	720	
Di-n-octylphthalate	U	720	UJ	Dibenz(a,h)anthracene	U	720	UJ
Dibenzofuran	J	690		Diethylphthalate	U	720	
Dimethylphthalate	U	720		Fluoranthene		4800	
Fluorene		1400		Hexachlorobenzene	U	720	
Hexachlorobutadiene	U	720		Hexachlorocyclopentadiene	U	720	
Hexachloroethane	U	720		Indeno(1,2,3-cd)pyrene	J	640	J
Isophorone	U	720		N-Nitroso-di-n-propylamine	U	720	
N-Nitrosodiphenylamine (1)	U	720		Naphthalene	J	390	
Nitrobenzene	U	720		Pentachlorophenol	U	1700	
Phenanthrene		5700		Phenol	U	720	
Pyrene		4600		bis(2-Chloroethoxy)methane	U	720	
bis(2-Chloroethyl)ether	U	720		bis(2-Ethylhexyl)phthalate	U	720	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB26 (4-6)RE *
****

Sample Collection Date: 11/12/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38416-005R
Lab Receipt Date: 11/16/93
Sample Analysis Date: 12/09/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	720		1,2-Dichlorobenzene	U	720	
1,3-Dichlorobenzene	U	720		1,4-Dichlorobenzene	U	720	
2,2'-oxybis(1-Chloropropane)	U	720		2,4,5-Trichlorophenol	U	1700	
2,4,6-Trichlorophenol	U	720		2,4-Dichlorophenol	U	720	
2,4-Dimethylphenol	U	720		2,4-Dinitrophenol	U	1700	
2,4-Dinitrotoluene	U	720		2,6-Dinitrotoluene	U	720	
2-Chloronaphthalene	U	720		2-Chlorophenol	U	720	
2-Methylnaphthalene	J	390		2-Methylphenol	U	720	
2-Nitroaniline	U	1700		2-Nitrophenol	U	720	
3,3'-Dichlorobenzidine	U	720		3-Nitroaniline	U	1700	
4,6-Dinitro-2-methylphenol	U	1700		4-Bromophenyl-phenylether	U	720	
4-Chloro-3-methylphenol	U	720		4-Chloroaniline	U	720	
4-Chlorophenyl-phenylether	U	720		4-Methylphenol	U	720	
Nitroaniline	U	1700		4-Nitrophenol	U	1700	
Acenaphthene		760		Acenaphthylene	U	720	
Anthracene		1700		Benzo(a)anthracene		2900	
Benzo(a)pyrene		2100	J	Benzo(b)fluoranthene		2500	J
Benzo(g,h,i)perylene	J	580	J	Benzo(k)fluoranthene		1500	J
Butylbenzylphthalate	U	720		Carbazole		1000	
Chrysene		2300		Di-n-butylphthalate	U	720	
Di-n-octylphthalate	U	720	UJ	Dibenz(a,h)anthracene	U	720	UJ
Dibenzofuran		750		Diethylphthalate	U	720	
Dimethylphthalate	U	720		Fluoranthene		5600	
Fluorene		1400		Hexachlorobenzene	U	720	
Hexachlorobutadiene	U	720		Hexachlorocyclopentadiene	U	720	
Hexachloroethane	U	720		Indeno(1,2,3-cd)pyrene	J	660	J
Isophorone	U	720		N-Nitroso-di-n-propylamine	U	720	
N-Nitrosodiphenylamine (1)	U	720		Naphthalene	J	420	
Nitrobenzene	U	720		Pentachlorophenol	U	1700	
Phenanthrene		5300		Phenol	U	720	
Pyrene		4700		bis(2-Chloroethoxy)methane	U	720	
bis(2-Chloroethyl)ether	U	720		bis(2-Ethylhexyl)phthalate	U	720	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB28 (4-6) *
****

Sample Collection Date: 11/12/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38416-006
Lab Receipt Date: 11/16/93
Sample Analysis Date: 12/07/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	380		1,2-Dichlorobenzene	U	380	
1,3-Dichlorobenzene	U	380		1,4-Dichlorobenzene	U	380	
2,2'-oxybis(1-Chloropropane)	U	380		2,4,5-Trichlorophenol	U	930	
2,4,6-Trichlorophenol	U	380		2,4-Dichlorophenol	U	380	
2,4-Dimethylphenol	U	380		2,4-Dinitrophenol	U	930	
2,4-Dinitrotoluene	U	380		2,6-Dinitrotoluene	U	380	
2-Chloronaphthalene	U	380		2-Chlorophenol	U	380	
2-Methylnaphthalene	U	380		2-Methylphenol	U	380	
2-Nitroaniline	U	930		2-Nitrophenol	U	380	
3,3'-Dichlorobenzidine	U	380		3-Nitroaniline	U	930	
4,6-Dinitro-2-methylphenol	U	930		4-Bromophenyl-phenylether	U	380	
4-Chloro-3-methylphenol	U	380		4-Chloroaniline	U	380	
4-Chlorophenyl-phenylether	U	380		4-Methylphenol	U	380	
4-Nitroaniline	U	930		4-Nitrophenol	U	930	
Acenaphthene	U	380		Acenaphthylene	J	220	
Anthracene	U	380		Benzo(a)anthracene		610	
Benzo(a)pyrene		620	J	Benzo(b)fluoranthene		840	J
Benzo(g,h,i)perylene	J	230	J	Benzo(k)fluoranthene		530	J
Butylbenzylphthalate	U	380		Carbazole	U	380	
Chrysene		810		Di-n-butylphthalate	U	380	
Di-n-octylphthalate	U	380	UJ	Dibenz(a,h)anthracene	U	380	UJ
Dibenzofuran	U	380		Diethylphthalate	U	380	
Dimethylphthalate	U	380		Fluoranthene		1000	
Fluorene	U	380		Hexachlorobenzene	U	380	
Hexachlorobutadiene	U	380		Hexachlorocyclopentadiene	U	380	
Hexachloroethane	U	380		Indeno(1,2,3-cd)pyrene	J	240	J
Isophorone	U	380		N-Nitroso-di-n-propylamine	U	380	
N-Nitrosodiphenylamine (1)	U	380		Naphthalene	U	380	
Nitrobenzene	U	380		Pentachlorophenol	U	930	
Phenanthrene		570		Phenol	U	380	
Pyrene		1200		bis(2-Chloroethoxy)methane	U	380	
bis(2-Chloroethyl)ether	U	380		bis(2-Ethylhexyl)phthalate	U	380	

NAVAL SUBMARINE BASE - NEW LONDON

AREA-A LANDFILL

CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****

* SAMPLE ID: 2LTB28 (4-6)RE *

****

Sample Collection Date: 11/12/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38416-006R

Lab Receipt Date: 11/16/93

Sample Analysis Date: 12/09/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	380		1,2-Dichlorobenzene	U	380	
1,3-Dichlorobenzene	U	380		1,4-Dichlorobenzene	U	380	
2,2'-oxybis(1-Chloropropane)	U	380		2,4,5-Trichlorophenol	U	930	
2,4,6-Trichlorophenol	U	380		2,4-Dichlorophenol	U	380	
2,4-Dimethylphenol	U	380		2,4-Dinitrophenol	U	930	
2,4-Dinitrotoluene	U	380		2,6-Dinitrotoluene	U	380	
2-Chloronaphthalene	U	380		2-Chlorophenol	U	380	
2-Methylnaphthalene	U	380		2-Methylphenol	U	380	
2-Nitroaniline	U	930		2-Nitrophenol	U	380	
3,3'-Dichlorobenzidine	U	380		3-Nitroaniline	U	930	
4,6-Dinitro-2-methylphenol	U	930		4-Bromophenyl-phenylether	U	380	
4-Chloro-3-methylphenol	U	380		4-Chloroaniline	U	380	
4-Chlorophenyl-phenylether	U	380		4-Methylphenol	U	380	
Nitroaniline	U	930		4-Nitrophenol	U	930	
Acenaphthene	U	380		Acenaphthylene	J	240	
Anthracene	U	380		Benzo(a)anthracene		600	
Benzo(a)pyrene		610	J	Benzo(b)fluoranthene		820	J
Benzo(g,h,i)perylene	J	260	J	Benzo(k)fluoranthene		550	J
Butylbenzylphthalate	U	380		Carbazole	U	380	
Chrysene		740		Di-n-butylphthalate	U	380	
Di-n-octylphthalate	U	380	UJ	Dibenz(a,h)anthracene	U	380	UJ
Dibenzofuran	U	380		Diethylphthalate	U	380	
Dimethylphthalate	U	380		Fluoranthene		1000	
Fluorene	U	380		Hexachlorobenzene	U	380	
Hexachlorobutadiene	U	380		Hexachlorocyclopentadiene	U	380	
Hexachloroethane	U	380		Indeno(1,2,3-cd)pyrene	J	270	J
Isophorone	U	380		N-Nitroso-di-n-propylamine	U	380	
N-Nitrosodiphenylamine (1)	U	380		Naphthalene	U	380	
Nitrobenzene	U	380		Pentachlorophenol	U	930	
Phenanthrene		600		Phenol	U	380	
Pyrene		1300		bis(2-Chloroethoxy)methane	U	380	
bis(2-Chloroethyl)ether	U	380		bis(2-Ethylhexyl)phthalate	U	380	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB29 (10-12) *
****

Sample Collection Date: 11/14/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38442-007
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/07/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	400		1,2-Dichlorobenzene	U	400	
1,3-Dichlorobenzene	U	400		1,4-Dichlorobenzene	U	400	
2,2'-oxybis(1-Chloropropane)	U	400		2,4,5-Trichlorophenol	U	970	
2,4,6-Trichlorophenol	U	400		2,4-Dichlorophenol	U	400	
2,4-Dimethylphenol	U	400		2,4-Dinitrophenol	U	970	
2,4-Dinitrotoluene	U	400		2,6-Dinitrotoluene	U	400	
2-Chloronaphthalene	U	400		2-Chlorophenol	U	400	
2-Methylnaphthalene	U	400		2-Methylphenol	U	400	
2-Nitroaniline	U	970		2-Nitrophenol	U	400	
3,3'-Dichlorobenzidine	U	400		3-Nitroaniline	U	970	
4,6-Dinitro-2-methylphenol	U	970		4-Bromophenyl-phenylether	U	400	
4-Chloro-3-methylphenol	U	400		4-Chloroaniline	U	400	
4-Chlorophenyl-phenylether	U	400		4-Methylphenol	U	400	
4-Nitroaniline	U	970		4-Nitrophenol	U	970	
Acenaphthene	U	400		Acenaphthylene	U	400	
Anthracene	U	400		Benzo(a)anthracene		510	J
Benzo(a)pyrene		530		Benzo(b)fluoranthene		550	
Benzo(g,h,i)perylene	J	320		Benzo(k)fluoranthene	J	400	J
Butylbenzylphthalate	U	400		Carbazole	U	400	
Chrysene		520		Di-n-butylphthalate	U	400	
Di-n-octylphthalate	J	240	400 U	Dibenz(a,h)anthracene	U	400	
Dibenzofuran	U	400		Diethylphthalate	U	400	
Dimethylphthalate	U	400		Fluoranthene		520	J
Fluorene	U	400		Hexachlorobenzene	U	400	
Hexachlorobutadiene	U	400		Hexachlorocyclopentadiene	U	400	
Hexachloroethane	U	400		Indeno(1,2,3-cd)pyrene	J	310	
Isophorone	U	400		N-Nitroso-di-n-propylamine	U	400	
N-Nitrosodiphenylamine (1)	U	400		Naphthalene	U	400	
Nitrobenzene	U	400		Pentachlorophenol	U	970	
Phenanthrene	U	400	UJ	Phenol	U	400	
Pyrene		650	J	bis(2-Chloroethoxy)methane	U	400	
bis(2-Chloroethyl)ether	U	400		bis(2-Ethylhexyl)phthalate	J	370	400 U

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB31 (8-10) *
****

Sample Collection Date: 11/14/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38442-008
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/07/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	420		1,2-Dichlorobenzene	U	420	
1,3-Dichlorobenzene	U	420		1,4-Dichlorobenzene	U	420	
2,2'-oxybis(1-Chloropropane)	U	420		2,4,5-Trichlorophenol	U	1000	
2,4,6-Trichlorophenol	U	420		2,4-Dichlorophenol	U	420	
2,4-Dimethylphenol	U	420		2,4-Dinitrophenol	U	1000	
2,4-Dinitrotoluene	U	420		2,6-Dinitrotoluene	U	420	
2-Chloronaphthalene	U	420		2-Chlorophenol	U	420	
2-Methylnaphthalene	U	420		2-Methylphenol	U	420	
2-Nitroaniline	U	1000		2-Nitrophenol	U	420	
3,3'-Dichlorobenzidine	U	420	UJ	3-Nitroaniline	U	1000	
4,6-Dinitro-2-methylphenol	U	1000		4-Bromophenyl-phenylether	U	420	
4-Chloro-3-methylphenol	U	420		4-Chloroaniline	U	420	
4-Chlorophenyl-phenylether	U	420		4-Methylphenol	U	420	
Nitroaniline	U	1000		4-Nitrophenol	U	1000	
Acenaphthene	U	420		Acenaphthylene	U	420	
Anthracene	U	420		Benzo(a)anthracene	J	400	J
Benzo(a)pyrene		450	J	Benzo(b)fluoranthene		440	J
Benzo(g,h,i)perylene	U	420	UJ	Benzo(k)fluoranthene		480	J
Butylbenzylphthalate	U	420	UJ	Carbazole	U	420	
Chrysene		540	J	Di-n-butylphthalate	U	420	
Di-n-octylphthalate	U	420	UJ	Dibenz(a,h)anthracene	U	420	UJ
Dibenzofuran	U	420		Diethylphthalate	U	420	
Dimethylphthalate	U	420		Fluoranthene		570	
Fluorene	U	420		Hexachlorobenzene	U	420	
Hexachlorobutadiene	U	420		Hexachlorocyclopentadiene	U	420	
Hexachloroethane	U	420		Indeno(1,2,3-cd)pyrene	U	420	UJ
Isophorone	U	420		N-Nitroso-di-n-propylamine	U	420	
N-Nitrosodiphenylamine (1)	U	420		Naphthalene	U	420	
Nitrobenzene	U	420		Pentachlorophenol	U	1000	
Phenanthrene	J	390		Phenol	U	420	
Pyrene		890	J	bis(2-Chloroethoxy)methane	U	420	
bis(2-Chloroethyl)ether	U	420		bis(2-Ethylhexyl)phthalate	U	420	UJ

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB31 (8-10)RE *
****

Sample Collection Date: 11/14/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38442-008R
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/09/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	420		1,2-Dichlorobenzene	U	420	
1,3-Dichlorobenzene	U	420		1,4-Dichlorobenzene	U	420	
2,2'-oxybis(1-Chloropropane)	U	420		2,4,5-Trichlorophenol	U	1000	
2,4,6-Trichlorophenol	U	420		2,4-Dichlorophenol	U	420	
2,4-Dimethylphenol	U	420		2,4-Dinitrophenol	U	1000	
2,4-Dinitrotoluene	U	420		2,6-Dinitrotoluene	U	420	
2-Chloronaphthalene	U	420		2-Chlorophenol	U	420	
2-Methylnaphthalene	U	420		2-Methylphenol	U	420	
2-Nitroaniline	U	1000		2-Nitrophenol	U	420	
3,3'-Dichlorobenzidine	U	420	UJ	3-Nitroaniline	U	1000	
4,6-Dinitro-2-methylphenol	U	1000		4-Bromophenyl-phenylether	U	420	
4-Chloro-3-methylphenol	U	420		4-Chloroaniline	U	420	
4-Chlorophenyl-phenylether	U	420		4-Methylphenol	U	420	
4-Nitroaniline	U	1000		4-Nitrophenol	U	1000	
Acenaphthene	U	420		Acenaphthylene	U	420	
Anthracene	U	420		Benzo(a)anthracene	J	400	J
Benzo(a)pyrene		450	J	Benzo(b)fluoranthene		460	J
Benzo(g,h,i)perylene	U	420	UJ	Benzo(k)fluoranthene		450	J
Butylbenzylphthalate	U	420	UJ	Carbazole	U	420	
Chrysene		500	J	Di-n-butylphthalate	U	420	
Di-n-octylphthalate	U	420	UJ	Dibenz(a,h)anthracene	U	420	UJ
Dibenzofuran	U	420		Diethylphthalate	U	420	
Dimethylphthalate	U	420		Fluoranthene		560	
Fluorene	U	420		Hexachlorobenzene	U	420	
Hexachlorobutadiene	U	420		Hexachlorocyclopentadiene	U	420	
Hexachloroethane	U	420		Indeno(1,2,3-cd)pyrene	U	420	UJ
Isophorone	U	420		N-Nitroso-di-n-propylamine	U	420	
N-Nitrosodiphenylamine (1)	U	420		Naphthalene	U	420	
Nitrobenzene	U	420		Pentachlorophenol	U	1000	
Phenanthrene	J	390		Phenol	U	420	
Pyrene		980	J	bis(2-Chloroethoxy)methane	U	420	
bis(2-Chloroethyl)ether	U	420		bis(2-Ethylhexyl)phthalate	U	420	UJ

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB33 (4-8) *
****

Sample Collection Date: 11/08/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38369-010
Lab Receipt Date: 11/11/93
Sample Analysis Date: 12/09/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	370		1,2-Dichlorobenzene	U	370	
1,3-Dichlorobenzene	U	370		1,4-Dichlorobenzene	U	370	
2,2'-oxybis(1-Chloropropane)	U	370		2,4,5-Trichlorophenol	U	900	
2,4,6-Trichlorophenol	U	370		2,4-Dichlorophenol	U	370	
2,4-Dimethylphenol	J	190		2,4-Dinitrophenol	U	900	
2,4-Dinitrotoluene	U	370		2,6-Dinitrotoluene	U	370	
2-Chloronaphthalene	U	370		2-Chlorophenol	U	370	
2-Methylnaphthalene	J	310		2-Methylphenol	U	370	
2-Nitroaniline	U	900		2-Nitrophenol	U	370	
3,3'-Dichlorobenzidine	U	370		3-Nitroaniline	U	900	
4,6-Dinitro-2-methylphenol	U	900		4-Bromophenyl-phenylether	U	370	
4-Chloro-3-methylphenol	U	370		4-Chloroaniline	U	370	
-Chlorophenyl-phenylether	U	370		4-Methylphenol		820	J
-Nitroaniline	U	900		4-Nitrophenol	U	900	
Acenaphthene	U	370		Acenaphthylene	U	370	
Anthracene	U	370		Benzo(a)anthracene	U	370	
Benzo(a)pyrene	U	370	UJ	Benzo(b)fluoranthene	J	170	J
Benzo(g,h,i)perylene	U	370	UJ	Benzo(k)fluoranthene	J	130	J
Butylbenzylphthalate	U	370		Carbazole	U	370	
Chrysene	U	370		Di-n-butylphthalate	U	370	
Di-n-octylphthalate	U	370	UJ	Dibenz(a,h)anthracene	U	370	UJ
Dibenzofuran	U	370		Diethylphthalate	U	370	
Dimethylphthalate	U	370		Fluoranthene	J	230	
Fluorene	U	370		Hexachlorobenzene	U	370	
Hexachlorobutadiene	U	370		Hexachlorocyclopentadiene	U	370	
Hexachloroethane	U	370		Indeno(1,2,3-cd)pyrene	U	370	UJ
Isophorone	U	370		N-Nitroso-di-n-propylamine	U	370	
N-Nitrosodiphenylamine (1)	U	370		Naphthalene	J	350	J
Nitrobenzene	U	370		Pentachlorophenol	U	900	
Phenanthrene	J	310		Phenol	U	370	
Pyrene		450	J	bis(2-Chloroethoxy)methane	U	370	
bis(2-Chloroethyl)ether	U	370		bis(2-Ethylhexyl)phthalate	J	280	370 U

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB33 (4-8)RE *
****

Sample Collection Date: 11/08/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38369-010R
Lab Receipt Date: 11/11/93
Sample Analysis Date: 12/13/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	370		1,2-Dichlorobenzene	U	370	
1,3-Dichlorobenzene	U	370		1,4-Dichlorobenzene	U	370	
2,2'-oxybis(1-Chloropropane)	U	370		2,4,5-Trichlorophenol	U	900	
2,4,6-Trichlorophenol	U	370		2,4-Dichlorophenol	U	370	
2,4-Dimethylphenol	J	44		2,4-Dinitrophenol	U	900	
2,4-Dinitrotoluene	U	370		2,6-Dinitrotoluene	U	370	
2-Chloronaphthalene	U	370		2-Chlorophenol	U	370	
2-Methylnaphthalene	J	290		2-Methylphenol	U	370	
2-Nitroaniline	U	900		2-Nitrophenol	U	370	
3,3'-Dichlorobenzidine	U	370		3-Nitroaniline	U	900	
4,6-Dinitro-2-methylphenol	U	900		4-Bromophenyl-phenylether	U	370	
4-Chloro-3-methylphenol	U	370		4-Chloroaniline	U	370	
4-Chlorophenyl-phenylether	U	370		4-Methylphenol		690	
4-Nitroaniline	U	900		4-Nitrophenol	U	900	
Acenaphthene	U	370		Acenaphthylene	U	370	
Anthracene	U	370		Benzo(a)anthracene	U	370	
Benzo(a)pyrene	U	370	UJ	Benzo(b)fluoranthene	J	180	J
Benzo(g,h,i)perylene	U	370	UJ	Benzo(k)fluoranthene	J	110	J
Butylbenzylphthalate	U	370		Carbazole	U	370	
Chrysene	U	370		Di-n-butylphthalate	U	370	
Di-n-octylphthalate	U	370	UJ	Dibenz(a,h)anthracene	U	370	UJ
Dibenzofuran	U	370		Diethylphthalate	U	370	
Dimethylphthalate	U	370		Fluoranthene	J	300	
Fluorene	U	370		Hexachlorobenzene	U	370	
Hexachlorobutadiene	U	370		Hexachlorocyclopentadiene	U	370	
Hexachloroethane	U	370		Indeno(1,2,3-cd)pyrene	U	370	UJ
Isophorone	U	370		N-Nitroso-di-n-propylamine	U	370	
N-Nitrosodiphenylamine (1)	U	370		Naphthalene	J	350	
Nitrobenzene	U	370		Pentachlorophenol	U	900	
Phenanthrene	J	350		Phenol	U	370	
Pyrene		380		bis(2-Chloroethoxy)methane	U	370	
bis(2-Chloroethyl)ether	U	370		bis(2-Ethylhexyl)phthalate	J	270	370 U

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB39 (10-12) *
****

Sample Collection Date: 11/14/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38442-009
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/07/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	410		1,2-Dichlorobenzene	U	410	
1,3-Dichlorobenzene	U	410		1,4-Dichlorobenzene	U	410	
2,2'-oxybis(1-Chloropropane)	U	410		2,4,5-Trichlorophenol	U	990	
2,4,6-Trichlorophenol	U	410		2,4-Dichlorophenol	U	410	
2,4-Dimethylphenol	U	410		2,4-Dinitrophenol	U	990	
2,4-Dinitrotoluene	U	410		2,6-Dinitrotoluene	U	410	
2-Chloronaphthalene	U	410		2-Chlorophenol	U	410	
2-Methylnaphthalene	U	410		2-Methylphenol	U	410	
2-Nitroaniline	U	990		2-Nitrophenol	U	410	
3,3'-Dichlorobenzidine	U	410		3-Nitroaniline	U	990	
4,6-Dinitro-2-methylphenol	U	990		4-Bromophenyl-phenylether	U	410	
4-Chloro-3-methylphenol	U	410		4-Chloroaniline	U	410	
4-Chlorophenyl-phenylether	U	410		4-Methylphenol	U	410	
4-Nitroaniline	U	990		4-Nitrophenol	U	990	
Acenaphthene	U	410		Acenaphthylene	U	410	
Anthracene	U	410		Benzo(a)anthracene		930	J
Benzo(a)pyrene		780	J	Benzo(b)fluoranthene		780	J
Benzo(g,h,i)perylene	J	310	J	Benzo(k)fluoranthene		630	J
Butylbenzylphthalate	U	410		Carbazole	U	410	
Chrysene		830		Di-n-butylphthalate	U	410	
Di-n-octylphthalate	U	410	UJ	Dibenz(a,h)anthracene	U	410	UJ
Dibenzofuran	U	410		Diethylphthalate	U	410	
Dimethylphthalate	U	410		Fluoranthene		990	J
Fluorene	U	410		Hexachlorobenzene	U	410	
Hexachlorobutadiene	U	410		Hexachlorocyclopentadiene	U	410	
Hexachloroethane	U	410		Indeno(1,2,3-cd)pyrene	J	330	J
Isophorone	U	410		N-Nitroso-di-n-propylamine	U	410	
N-Nitrosodiphenylamine (1)	U	410		Naphthalene	U	410	
Nitrobenzene	U	410		Pentachlorophenol	U	990	
Phenanthrene		460	J	Phenol	U	410	
Pyrene		1300	J	bis(2-Chloroethoxy)methane	U	410	
bis(2-Chloroethyl)ether	U	410		bis(2-Ethylhexyl)phthalate		600	600 U

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR SEMI-VOLATILE ORGANIC COMPOUNDS

****
* SAMPLE ID: 2LT839 (10-12)RE *
****

Sample Collection Date: 11/14/93 Method: 8270/2 Units: UG/KG Laboratory ID: 38442-009R
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/09/93

Analyte	Lab Result or DL		Validation Data	Analyte	Lab Result or DL		Validation Data
1,2,4-Trichlorobenzene	U	410		1,2-Dichlorobenzene	U	410	
1,3-Dichlorobenzene	U	410		1,4-Dichlorobenzene	U	410	
2,2'-oxybis(1-Chloropropane)	U	410		2,4,5-Trichlorophenol	U	990	
2,4,6-Trichlorophenol	U	410		2,4-Dichlorophenol	U	410	
2,4-Dimethylphenol	U	410		2,4-Dinitrophenol	U	990	
2,4-Dinitrotoluene	U	410		2,6-Dinitrotoluene	U	410	
2-Chloronaphthalene	U	410		2-Chlorophenol	U	410	
2-Methylnaphthalene	U	410		2-Methylphenol	U	410	
2-Nitroaniline	U	990		2-Nitrophenol	U	410	
3,3'-Dichlorobenzidine	U	410		3-Nitroaniline	U	990	
4,6-Dinitro-2-methylphenol	U	990		4-Bromophenyl-phenylether	U	410	
4-Chloro-3-methylphenol	U	410		4-Chloroaniline	U	410	
4-Chlorophenyl-phenylether	U	410		4-Methylphenol	U	410	
4-Nitroaniline	U	990		4-Nitrophenol	U	990	
Acenaphthene	U	410		Acenaphthylene	U	410	
Anthracene	U	410		Benzo(a)anthracene		920	
Benzo(a)pyrene		780	J	Benzo(b)fluoranthene		990	J
Benzo(g,h,i)perylene	J	290	J	Benzo(k)fluoranthene		430	J
Butylbenzylphthalate	U	410		Carbazole	U	410	
Chrysene		840		Di-n-butylphthalate	U	410	
Di-n-octylphthalate	U	410	UJ	Dibenz(a,h)anthracene	U	410	UJ
Dibenzofuran	U	410		Diethylphthalate	U	410	
Dimethylphthalate	U	410		Fluoranthene		940	
Fluorene	U	410		Hexachlorobenzene	U	410	
Hexachlorobutadiene	U	410		Hexachlorocyclopentadiene	U	410	
Hexachloroethane	U	410		Indeno(1,2,3-cd)pyrene	J	300	J
Isophorone	U	410		N-Nitroso-di-n-propylamine	U	410	
N-Nitrosodiphenylamine (1)	U	410		Naphthalene	U	410	
Nitrobenzene	U	410		Pentachlorophenol	U	990	
Phenanthrene		480		Phenol	U	410	
Pyrene		1300		bis(2-Chloroethoxy)methane	U	410	
bis(2-Chloroethyl)ether	U	410		bis(2-Ethylhexyl)phthalate		600	600 U

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LC1 *
****

Sample Collection Date: 11/15/93 Method: 3550,8080/2 Laboratory ID: 38442-010
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/26/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data	
4,4'-DDD	U	3.30		UJ
4,4'-DDE	U	3.30		
4,4'-DDT	J	3.20	3.30	J
Aldrin	U	1.70		
Aroclor-1016	U	33.00		
Aroclor-1221	U	67.00		
Aroclor-1232	U	33.00		
Aroclor-1242	U	33.00		
Aroclor-1248	U	33.00		
Aroclor-1254	U	33.00		
Aroclor-1260	U	33.00		UJ
Dieldrin	U	3.30		
Endosulfan I	U	1.70		
Endosulfan II	U	3.30		UJ
Endosulfan sulfate	U	3.30		UJ
Endrin	JP	.79		J
Endrin aldehyde		9.40		J
Endrin ketone	U	3.30		UJ
Heptachlor	U	1.70		
Heptachlor epoxide	J	.51		J
Methoxychlor	U	17.00		UJ
Toxaphene	U	170.00		UJ
alpha-BHC	U	1.70		
alpha-Chlordane	U	1.70		
beta-BHC	U	1.70		
delta-BHC	U	1.70		
gamma-BHC (Lindane)	U	1.70		
gamma-Chlordane	U	1.70		

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LC2 *
****

Sample Collection Date: 11/15/93 Method: 3550,8080/2 Laboratory ID: 38442-011
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/31/93 Concentration Units: UG/KG

Analyte		Lab Result or DL	Validation Data	
4,4'-DDD	U	30.00		UJ
4,4'-DDE	U	30.00		UJ
4,4'-DDT	JP	8.30	30.00	UJ
Aldrin	U	15.00		UJ
Aroclor-1016	U	300.00		UJ
Aroclor-1221	U	610.00		UJ
Aroclor-1232	U	300.00		UJ
Aroclor-1242	U	300.00		UJ
Aroclor-1248	U	300.00		UJ
Aroclor-1254	U	300.00		UJ
Aroclor-1260		490.00		J
Dieldrin	U	30.00		UJ
Endosulfan I	U	15.00		UJ
Endosulfan II	U	30.00		UJ
Endosulfan sulfate	U	30.00		UJ
Endrin	U	30.00		UJ
Endrin aldehyde	U	30.00		UJ
Endrin ketone	U	30.00		UJ
Heptachlor	U	15.00		UJ
Heptachlor epoxide	JP	4.20		J
Methoxychlor	U	150.00		UJ
Toxaphene	U	1500.00		UJ
alpha-BHC	U	15.00		UJ
alpha-Chlordane	U	15.00		UJ
beta-BHC	U	15.00		UJ
delta-BHC	U	15.00		UJ
gamma-BHC (Lindane)	U	15.00		UJ
gamma-Chlordane	U	15.00		UJ

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LC3 *
****

Sample Collection Date: 11/15/93 Method: 3550,8080/2 Laboratory ID: 38442-012
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/26/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data
4,4'-DDD	U	3.30	
4,4'-DDE	U	3.30	UJ
4,4'-DDT	P	37.00	J
Aldrin	U	1.70	UJ
Aroclor-1016	U	33.00	UJ
Aroclor-1221	U	67.00	UJ
Aroclor-1232	U	33.00	UJ
Aroclor-1242	U	33.00	UJ
Aroclor-1248	U	33.00	UJ
Aroclor-1254	U	33.00	UJ
Aroclor-1260	U	33.00	
Dieldrin	P	39.00	J
Endosulfan I	P	11.00	J
Endosulfan II	P	59.00	J
Endosulfan sulfate	U	3.30	
Endrin	P	15.00	J
Endrin aldehyde	U	3.30	
Endrin ketone	P	7.50	J
Heptachlor	U	1.70	UJ
Heptachlor epoxide	P	27.00	J
Methoxychlor	U	17.00	
Toxaphene	U	170.00	
alpha-BHC		1.70	J
alpha-Chlordane	U	1.70	UJ
beta-BHC	U	1.70	UJ
delta-BHC	U	1.70	UJ
gamma-BHC (Lindane)	U	1.70	UJ
gamma-Chlordane	U	1.70	UJ

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LC3DL *
****

Sample Collection Date: 11/15/93 Method: 3550,8080/2 Laboratory ID: 38442-012DL
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/31/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data
4,4'-DDD	U	170.00	
4,4'-DDE	U	170.00	
4,4'-DDT	D	550.00	
Aldrin	U	86.00	
Aroclor-1016	U	1700.00	
Aroclor-1221	U	3400.00	
Aroclor-1232	U	1700.00	
Aroclor-1242	U	1700.00	
Aroclor-1248	U	1700.00	
Aroclor-1254	U	1700.00	
Aroclor-1260	U	1700.00	
Dieldrin	DJP	160.00	J
Endosulfan I	DJP	78.00	J
Endosulfan II	DP	440.00	J
Endosulfan sulfate	U	170.00	
Endrin	U	170.00	
Endrin aldehyde	U	170.00	
Endrin ketone	DJP	130.00	J
Heptachlor	U	86.00	
Heptachlor epoxide	DP	300.00	J
Methoxychlor	U	860.00	
Toxaphene	U	8600.00	
alpha-BHC	DJP	21.00	J
alpha-Chlordane	U	86.00	
beta-BHC	U	86.00	
delta-BHC	U	86.00	
gamma-BHC (Lindane)	U	86.00	
gamma-Chlordane	U	86.00	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LC4 *
****

Sample Collection Date: 11/15/93 Method: 3550,8080/2 Laboratory ID: 38442-013
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/26/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data
4,4'-DDD	P	12.00	
4,4'-DDE	P	5.00	
4,4'-DDT	P	4.30	
Aldrin	U	1.70	
Aroclor-1016	U	33.00	
Aroclor-1221	U	67.00	
Aroclor-1232	U	33.00	
Aroclor-1242	U	33.00	
Aroclor-1248	U	33.00	
Aroclor-1254	U	33.00	
Aroclor-1260		340.00	
Dieldrin	U	3.30	
Endosulfan I	U	1.70	
Endosulfan II	U	3.30	
Endosulfan sulfate	U	3.30	
Endrin	P	3.50	
Endrin aldehyde	U	3.30	
Endrin ketone	P	3.60	
Heptachlor	U	1.70	
Heptachlor epoxide	P	2.20	
Methoxychlor	U	17.00	
Toxaphene	U	170.00	
alpha-BHC	U	1.70	
alpha-Chlordane	U	1.70	
beta-BHC	U	1.70	
delta-BHC	U	1.70	
gamma-BHC (Lindane)	U	1.70	
gamma-Chlordane	JP	1.10	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB16 (0-2) *
****

Sample Collection Date: 11/04/93 Method: 3550,8080/2 Laboratory ID: 38304-013
Lab Receipt Date: 11/06/93
Sample Analysis Date: 12/26/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data	
4,4'-DDD	PB	79.00		J
4,4'-DDE	P	20.00		J
4,4'-DDT	P	7.30	7.30	UJ
Aldrin	JP	.56		J
Aroclor-1016	U	37.00		UJ
Aroclor-1221	U	74.00		UJ
Aroclor-1232	U	37.00		UJ
Aroclor-1242	U	37.00		UJ
Aroclor-1248	U	37.00		UJ
Aroclor-1254	PJ	150.00		J
Aroclor-1260		230.00		J
Dieldrin		4.40		J
Endosulfan I	U	1.90		UJ
Endosulfan II	U	3.70		UJ
Endosulfan sulfate	U	3.70		UJ
Endrin	JP	2.40		J
Endrin aldehyde	U	3.70		UJ
Endrin ketone	U	3.70		UJ
Heptachlor	U	1.90		UJ
Heptachlor epoxide	U	1.90		UJ
Methoxychlor	U	19.00		UJ
Toxaphene	U	190.00		UJ
alpha-BHC	U	1.90		UJ
alpha-Chlordane	P	39.00		J
beta-BHC	U	1.90		UJ
delta-BHC	U	1.90		UJ
gamma-BHC (Lindane)	U	1.90		UJ
gamma-Chlordane		61.00		J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB16 (0-2)DL *
****

Sample Collection Date: 11/04/93 Method: 3550,8080/2 Laboratory ID: 38304-013DL
Lab Receipt Date: 11/06/93
Sample Analysis Date: 12/31/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data
4,4'-DDD	DP	83.00	J
4,4'-DDE	DJ	27.00	J
4,4'-DDT	U	37.00	UJ
Aldrin	U	19.00	UJ
Aroclor-1016	U	370.00	UJ
Aroclor-1221	U	740.00	UJ
Aroclor-1232	U	370.00	UJ
Aroclor-1242	U	370.00	UJ
Aroclor-1248	U	370.00	UJ
Aroclor-1254	U	190.00	UJ
Aroclor-1260	U	350.00	UJ
Dieldrin	U	37.00	UJ
Endosulfan I	U	19.00	UJ
Endosulfan II	U	37.00	UJ
Endosulfan sulfate	U	37.00	UJ
Endrin	U	37.00	UJ
Endrin aldehyde	U	37.00	UJ
Endrin ketone	U	37.00	UJ
Heptachlor	U	19.00	UJ
Heptachlor epoxide	U	19.00	UJ
Methoxychlor	U	190.00	UJ
Toxaphene	U	1900.00	UJ
alpha-BHC	U	19.00	UJ
alpha-Chlordane	DP	51.00	J
beta-BHC	U	19.00	UJ
delta-BHC	U	19.00	UJ
gamma-BHC (Lindane)	U	19.00	UJ
gamma-Chlordane	DP	74.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB17 (0-2) *
****

Sample Collection Date: 11/03/93 Method: 3550,8080/2 Laboratory ID: 38304-014
Lab Receipt Date: 11/06/93
Sample Analysis Date: 12/26/93 Concentration Units: UG/KG

Analyte		Lab Result or DL	Validation Data
4,4'-DDD	B	110.00	
4,4'-DDE	P	28.00	J
4,4'-DDT	P	12.00	J
Aldrin	U	1.90	
Aroclor-1016	U	36.00	
Aroclor-1221	U	73.00	
Aroclor-1232	U	36.00	
Aroclor-1242	U	36.00	
Aroclor-1248	U	36.00	
Aroclor-1254		87.00	J
Aroclor-1260	U	36.00	
Dieldrin	P	4.50	J
Endosulfan I	U	1.90	
Endosulfan II	JP	2.00	J
Endosulfan sulfate	U	3.60	
Endrin	JP	.89	J
Endrin aldehyde	P	19.00	J
Endrin ketone	U	3.60	
Heptachlor	U	1.90	
Heptachlor epoxide	U	1.90	
Methoxychlor	U	19.00	J
Toxaphene	U	190.00	
alpha-BHC	U	1.90	
alpha-Chlordane		16.00	J
beta-BHC	U	1.90	
delta-BHC	U	1.90	
gamma-BHC (Lindane)	U	1.90	
gamma-Chlordane		11.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB18 (0-2) *
****

Sample Collection Date: 11/02/93 Method: 3550,8080/2 Laboratory ID: 38259-002
Lab Receipt Date: 11/04/93
Sample Analysis Date: 12/08/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data
4,4'-DDD	PE	110.00	
4,4'-DDE	E	65.00	
4,4'-DDT	U	3.50	
Aldrin	U	1.80	
Aroclor-1016	U	35.00	
Aroclor-1221	U	72.00	
Aroclor-1232	U	35.00	
Aroclor-1242	U	35.00	
Aroclor-1248	U	35.00	
Aroclor-1254		490.00	
Aroclor-1260	U	35.00	
Dieldrin	U	3.50	
Endosulfan I	U	1.80	
Endosulfan II	U	3.50	
Endosulfan sulfate	U	3.50	
Endrin	U	3.50	
Endrin aldehyde	U	3.50	
Endrin ketone	U	3.50	
Heptachlor	U	1.80	
Heptachlor epoxide	U	1.80	
Methoxychlor	U	18.00	
Toxaphene	U	180.00	
alpha-BHC	U	1.80	
alpha-Chlordane	U	1.80	
beta-BHC	U	1.80	
delta-BHC	U	1.80	
gamma-BHC (Lindane)	U	1.80	
gamma-Chlordane	U	1.80	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB18 (0-2)DL *
****

Sample Collection Date: 11/02/93 Method: 3550,8080/2 Laboratory ID: 38259-002DL
Lab Receipt Date: 11/04/93
Sample Analysis Date: 12/08/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data
4,4'-DDD	PD	130.00	
4,4'-DDE	PD	67.00	
4,4'-DDT	U	18.00	
Aldrin	U	9.10	
Aroclor-1016	U	180.00	
Aroclor-1221	U	360.00	
Aroclor-1232	U	180.00	
Aroclor-1242	U	180.00	
Aroclor-1248	U	180.00	
Aroclor-1254	D	720.00	
Aroclor-1260	U	180.00	
Dieldrin	U	18.00	
Endosulfan I	U	9.10	
Endosulfan II	U	18.00	
Endosulfan sulfate	U	18.00	
Endrin	U	18.00	
Endrin aldehyde	U	18.00	
Endrin ketone	U	18.00	
Heptachlor	U	9.10	
Heptachlor epoxide	U	9.10	
Methoxychlor	U	91.00	
Toxaphene	U	910.00	
alpha-BHC	U	9.10	
alpha-Chlordane	U	9.10	
beta-BHC	U	9.10	
delta-BHC	U	9.10	
gamma-BHC (Lindane)	U	9.10	
gamma-Chlordane	U	9.10	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB22 (8-10) *
****

Sample Collection Date: 11/02/93 Method: 3550,8080/2 Laboratory ID: 38328-007
Lab Receipt Date: 11/09/93
Sample Analysis Date: 12/19/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data
4,4'-DDD	P	24.00	J
4,4'-DDE		16.00	
4,4'-DDT	P	13.00	J
Aldrin	U	2.00	
Aroclor-1016	U	40.00	
Aroclor-1221	U	81.00	
Aroclor-1232	U	40.00	
Aroclor-1242	U	40.00	
Aroclor-1248	U	40.00	
Aroclor-1254	P	99.00	J
Aroclor-1260	U	40.00	
Dieldrin	JP	1.20	J
Endosulfan I	U	2.00	
Endosulfan II	U	4.00	
Endosulfan sulfate	U	4.00	
Endrin	U	4.00	
Endrin aldehyde	U	4.00	
Endrin ketone	U	4.00	
Heptachlor	U	2.00	
Heptachlor epoxide	U	2.00	
Methoxychlor	U	20.00	
Toxaphene	U	200.00	
alpha-BHC	U	2.00	
alpha-Chlordane		2.40	
beta-BHC	U	2.00	
delta-BHC	U	2.00	
gamma-BHC (Lindane)	U	2.00	
gamma-Chlordane	P	3.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB19 (2-4) *
****

Sample Collection Date: 11/10/93 Method: 3550,8080/2 Laboratory ID: 38407-003
Lab Receipt Date: 11/13/93
Sample Analysis Date: 12/19/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data
4,4'-DDD	PE	180.00	J
4,4'-DDE	PE	140.00	J
4,4'-DDT	P	14.00	J
Aldrin	U	1.80	
Aroclor-1016	U	35.00	
Aroclor-1221	U	72.00	
Aroclor-1232	U	35.00	
Aroclor-1242	U	35.00	
Aroclor-1248	U	35.00	
Aroclor-1254	PE	920.00	J
Aroclor-1260	U	35.00	
Dieldrin	U	3.50	
Endosulfan I	U	1.80	
Endosulfan II	U	3.50	
Endosulfan sulfate	U	3.50	
Endrin	P	3.70	J
Endrin aldehyde	U	3.50	
Endrin ketone	U	3.50	
Heptachlor	JP	.51	J
Heptachlor epoxide	U	1.80	
Methoxychlor	U	18.00	
Toxaphene	U	180.00	
alpha-BHC	U	1.80	
alpha-Chlordane	U	1.80	
beta-BHC	U	1.80	
delta-BHC	U	1.80	
gamma-BHC (Lindane)	U	1.80	
gamma-Chlordane	U	1.80	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB19 (2-4)DL *
****

Sample Collection Date: 11/10/93 Method: 3550,8080/2 Laboratory ID: 38407-003DL
Lab Receipt Date: 11/13/93
Sample Analysis Date: 12/19/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data	
4,4'-DDD	DP	210.00		J
4,4'-DDE	D	270.00		
4,4'-DDT	DJP	9.50	18.00	UJ
Aldrin	U	9.10		
Aroclor-1016	U	180.00		
Aroclor-1221	U	360.00		
Aroclor-1232	U	180.00		
Aroclor-1242	U	180.00		
Aroclor-1248	U	180.00		
Aroclor-1254	DP	1200.00		J
Aroclor-1260	U	180.00		
Dieldrin	U	18.00		
Endosulfan I	U	9.10		
Endosulfan II	U	18.00		
Endosulfan sulfate	U	18.00		
Endrin	DJP	4.20		J
Endrin aldehyde	U	18.00		
Endrin ketone	U	18.00		
Heptachlor	U	9.10		
Heptachlor epoxide	U	9.10		
Methoxychlor	U	91.00		
Toxaphene	U	910.00		
alpha-BHC	U	9.10		
alpha-Chlordane	U	9.10		
beta-BHC	U	9.10		
delta-BHC	U	9.10		
gamma-BHC (Lindane)	U	9.10		
gamma-Chlordane	U	9.10		

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB9 (0-2) *
****

Sample Collection Date: 11/02/93 Method: 3550,8080/2 Laboratory ID: 38328-005
Lab Receipt Date: 11/09/93
Sample Analysis Date: 12/19/93 Concentration Units: UG/KG

Analyte		Lab Result or DL	Validation Data
4,4'-DDD	PE	230.00	J
4,4'-DDE		60.00	
4,4'-DDT		71.00	J
Aldrin	U	1.80	
Aroclor-1016	U	35.00	
Aroclor-1221	U	72.00	
Aroclor-1232	U	35.00	
Aroclor-1242	U	35.00	
Aroclor-1248	U	35.00	
Aroclor-1254	P	160.00	J
Aroclor-1260	U	35.00	
Dieldrin		7.50	
Endosulfan I	U	1.80	
Endosulfan II	U	3.50	
Endosulfan sulfate	U	3.50	
Endrin	JP	1.60	J
Endrin aldehyde	U	3.50	
Endrin ketone	U	3.50	
Heptachlor	U	1.80	
Heptachlor epoxide	U	1.80	
Methoxychlor	U	18.00	
Toxaphene	U	180.00	
alpha-BHC	U	1.80	
alpha-Chlordane	P	25.00	J
beta-BHC	U	1.80	
delta-BHC	U	1.80	
gamma-BHC (Lindane)	U	1.80	
gamma-Chlordane		31.00	

NAVAL SUBMARINE BASE - NEW LONDON
AREA A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB9 (0-2)DL *
****

Sample Collection Date: 11/05/93 Method: 3550,8080/2 Laboratory ID: 38328-005DL
Lab Receipt Date: 11/05/93
Sample Analysis Date: 12/22/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data	
4,4'-DDD	D	370.00		
4,4'-DDE	D	60.00		
4,4'-DDT	DP	51.00	51.00	UJ
Aldrin	U	16.00		
Aroclor-1016	U	320.00		
Aroclor-1221	U	650.00		
Aroclor-1232	U	320.00		
Aroclor-1242	U	320.00		
Aroclor-1248	U	320.00		
Aroclor-1254	JP	260.00		J
Aroclor-1260	U	320.00		
Dieldrin	DJ	7.90		
Endosulfan I	U	16.00		
Endosulfan II	U	32.00		
Endosulfan sulfate	U	32.00		
Endrin	U	32.00		
Endrin aldehyde	U	32.00		
Endrin ketone	U	32.00		
Heptachlor	U	16.00		
Heptachlor epoxide	U	16.00		
Methoxychlor	U	160.00		
Toxaphene	U	1600.00		
alpha-BHC	U	16.00		
alpha-Chlordane	D	29.00		
beta-BHC	U	16.00		
delta-BHC	U	16.00		
gamma-BHC (Lindane)	U	16.00		
gamma-Chlordane	DP	31.00		J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB13 (0-2) *
****

Sample Collection Date: 11/09/93 Method: 3550,8080/2 Laboratory ID: 38369-011
Lab Receipt Date: 11/11/93
Sample Analysis Date: 12/30/93 Concentration Units: UG/KG

Analyte		Lab Result or DL	Validation Data
4,4'-DDD	P	96.00	J
4,4'-DDE		45.00	J
4,4'-DDT		110.00	J
Aldrin	U	3.60	UJ
Aroclor-1016	U	69.00	UJ
Aroclor-1221	U	140.00	UJ
Aroclor-1232	U	69.00	UJ
Aroclor-1242	U	69.00	UJ
Aroclor-1248	U	69.00	UJ
Aroclor-1254		220.00	J
Aroclor-1260	U	69.00	UJ
Dieldrin	U	6.90	UJ
Endosulfan I	U	3.60	UJ
Endosulfan II	U	6.90	UJ
Endosulfan sulfate	U	6.90	UJ
Endrin	U	6.90	UJ
Endrin aldehyde	U	6.90	UJ
Endrin ketone	U	6.90	UJ
Heptachlor	U	3.60	UJ
Heptachlor epoxide	U	3.60	UJ
Methoxychlor	U	36.00	UJ
Toxaphene	U	360.00	UJ
alpha-BHC	U	3.60	UJ
alpha-Chlordane	P	12.00	J
beta-BHC	U	3.60	UJ
delta-BHC	U	3.60	UJ
gamma-BHC (Lindane)	U	3.60	UJ
gamma-Chlordane	P	12.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB20 (6-8) *
****

Sample Collection Date: 11/09/93 Method: 3550,8080/2 Laboratory ID: 38369-012
Lab Receipt Date: 11/09/93
Sample Analysis Date: 12/22/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data
4,4'-DDD	P	34.00	J
4,4'-DDE	U	4.10	
4,4'-DDT	PB	13.00	J
Aldrin	U	2.10	
Aroclor-1016	U	41.00	
Aroclor-1221	U	83.00	
Aroclor-1232	U	41.00	
Aroclor-1242	U	41.00	
Aroclor-1248	U	41.00	
Aroclor-1254	P	300.00	J
Aroclor-1260	U	41.00	
Dieldrin	U	4.10	
Endosulfan I	J	2.00	
Endosulfan II	U	4.10	
Endosulfan sulfate	U	4.10	
Endrin	JP	3.90	J
Endrin aldehyde		91.00	
Endrin ketone	P	5.90	J
Heptachlor	U	2.10	
Heptachlor epoxide	JP	.66	J
Methoxychlor	U	21.00	
Toxaphene	U	210.00	
alpha-BHC	U	2.10	
alpha-Chlordane	U	2.10	
beta-BHC	U	2.10	
delta-BHC	U	2.10	
gamma-BHC (Lindane)	U	2.10	
gamma-Chlordane	U	2.10	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB23 (4-8) *
****

Sample Collection Date: 11/08/93 Method: 3550,8080/2 Laboratory ID: 38369-009
Lab Receipt Date: 11/08/93
Sample Analysis Date: 12/22/93 Concentration Units: UG/KG

Analyte		Lab Result or DL	Validation Data
4,4'-DDD	U	360.00	
4,4'-DDE	U	360.00	
4,4'-DDT	U	360.00	
Aldrin	U	190.00	
Aroclor-1016	U	3600.00	
Aroclor-1221	U	7300.00	
Aroclor-1232	U	3600.00	
Aroclor-1242	U	3600.00	
Aroclor-1248	U	3600.00	
Aroclor-1254		51000.00	
Aroclor-1260	U	3600.00	
Dieldrin	U	360.00	
Endosulfan I	U	190.00	UJ
Endosulfan II	U	360.00	
Endosulfan sulfate	U	360.00	
Endrin		470.00	J
Endrin aldehyde	U	360.00	
Endrin ketone	U	360.00	
Heptachlor	JP	79.00	J
Heptachlor epoxide	U	190.00	
Methoxychlor	U	1900.00	
Toxaphene	U	19000.00	
alpha-BHC	U	190.00	
alpha-Chlordane	U	190.00	
beta-BHC	U	190.00	
delta-BHC	U	190.00	
gamma-BHC (Lindane)	U	190.00	
gamma-Chlordane	U	190.00	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB26 (4-6) *
****

Sample Collection Date: 11/12/93 Method: 3550,8080/2 Laboratory ID: 38416-005
Lab Receipt Date: 11/12/93
Sample Analysis Date: 12/22/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data	
4,4'-DDD	PB	9.60		J
4,4'-DDE		4.20		J
4,4'-DDT	JP	1.50	3.60	UJ
Aldrin	U	1.90		UJ
Aroclor-1016	U	36.00		UJ
Aroclor-1221	U	73.00		UJ
Aroclor-1232	U	36.00		UJ
Aroclor-1242	U	36.00		UJ
Aroclor-1248	U	36.00		UJ
Aroclor-1254	P	49.00		J
Aroclor-1260	U	36.00		UJ
Dieldrin	U	3.60		UJ
Endosulfan I	U	1.90		UJ
Endosulfan II	U	3.60		UJ
Endosulfan sulfate	U	3.60		UJ
Endrin	U	3.60		UJ
Endrin aldehyde	U	3.60		UJ
Endrin ketone	U	3.60		UJ
Heptachlor	U	1.90		UJ
Heptachlor epoxide	U	1.90		UJ
Methoxychlor	U	19.00		UJ
Toxaphene	U	190.00		UJ
alpha-BHC	U	1.90		UJ
alpha-Chlordane	P	2.00		J
beta-BHC	U	1.90		UJ
delta-BHC	U	1.90		UJ
gamma-BHC (Lindane)	U	1.90		UJ
gamma-Chlordane	U	1.90		UJ

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB28 (4-6) *
****

Sample Collection Date: 11/12/93 Method: 3550,8080/2 Laboratory ID: 38416-006
Lab Receipt Date: 11/12/93
Sample Analysis Date: 12/22/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data	
4,4'-DDD	PB	490.00		J
4,4'-DDE	U	35.00		
4,4'-DDT	P	58.00	58.00	UJ
Aldrin	U	18.00		
Aroclor-1016	U	350.00		
Aroclor-1221	U	720.00		
Aroclor-1232	U	350.00		
Aroclor-1242	U	350.00		
Aroclor-1248	U	350.00		
Aroclor-1254	E	6600.00		J
Aroclor-1260		2500.00		
Dieldrin	U	35.00		
Endosulfan I	P	31.00		J
Endosulfan II	U	35.00		
Endosulfan sulfate	U	35.00		
Endrin	JP	20.00		J
Endrin aldehyde	U	35.00		
Endrin ketone	U	35.00		
Heptachlor	JP	5.00		J
Heptachlor epoxide	U	18.00		
Methoxychlor	U	180.00		
Toxaphene	U	1800.00		
alpha-BHC	U	18.00		
alpha-Chlordane	U	18.00		
beta-BHC	U	18.00		
delta-BHC	U	18.00		
gamma-BHC (Lindane)	U	18.00		
gamma-Chlordane	U	18.00		

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB28 (4-6)DL *
****

Sample Collection Date: 11/12/93 Method: 3550,8080/2 Laboratory ID: 38416-006DL
Lab Receipt Date: 11/16/93
Sample Analysis Date: 12/30/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data
4,4'-DDD	DP	420.00	J
4,4'-DDE	DP	270.00	J
4,4'-DDT	U	180.00	
Aldrin	U	90.00	
Aroclor-1016	U	1800.00	
Aroclor-1221	U	3600.00	
Aroclor-1232	U	1800.00	
Aroclor-1242	U	1800.00	
Aroclor-1248	U	1800.00	
Aroclor-1254	D	8100.00	
Aroclor-1260	U	69.00	
Dieldrin	U	180.00	
Endosulfan I	U	90.00	
Endosulfan II	U	180.00	
Endosulfan sulfate	U	180.00	
Endrin	U	180.00	
Endrin aldehyde	U	180.00	
Endrin ketone	U	180.00	
Heptachlor	U	90.00	
Heptachlor epoxide	U	90.00	
Methoxychlor	U	900.00	
Toxaphene	U	9000.00	
alpha-BHC	U	90.00	
alpha-Chlordane	U	90.00	
beta-BHC	U	90.00	
delta-BHC	U	90.00	
gamma-BHC (Lindane)	U	90.00	
gamma-Chlordane	U	90.00	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB29 (10-12) *
****

Sample Collection Date: 11/14/93 Method: 3550,8080/2 Laboratory ID: 38442-007
Lab Receipt Date: 11/14/93
Sample Analysis Date: 12/22/93 Concentration Units: UG/KG

Analyte		Lab Result or DL	Validation Data
4,4'-DDD	EB	1800.00	J
4,4'-DDE	P	220.00	J
4,4'-DDT	E	770.00	J
Aldrin	U	18.00	
Aroclor-1016	U	360.00	
Aroclor-1221	U	720.00	
Aroclor-1232	U	360.00	
Aroclor-1242	U	360.00	
Aroclor-1248	U	360.00	
Aroclor-1254	P	490.00	J
Aroclor-1260	U	360.00	
Dieldrin	JP	27.00	J
Endosulfan I	U	18.00	
Endosulfan II	U	36.00	
Endosulfan sulfate	U	36.00	
Endrin	U	36.00	
Endrin aldehyde	U	36.00	UJ
Endrin ketone	U	36.00	
Heptachlor	U	18.00	
Heptachlor epoxide	JP	4.30	J
Methoxychlor	U	180.00	
Toxaphene	U	1800.00	
alpha-BHC	U	18.00	
alpha-Chlordane		86.00	
beta-BHC	U	18.00	
delta-BHC	U	18.00	
gamma-BHC (Lindane)	U	18.00	
gamma-Chlordane	P	84.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB29 (10-12)DL *
****

Sample Collection Date: 11/14/93 Method: 3550,8080/2 Laboratory ID: 38442-007DL
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/30/93 Concentration Units: UG/KG

Analyte		Lab Result or DL	Validation Data	
4,4'-DDD	D	1700.00		
4,4'-DDE	U	360.00		
4,4'-DDT	D	690.00	690.00	UJ
Aldrin	U	180.00		
Aroclor-1016	U	3600.00		
Aroclor-1221	U	7200.00		
Aroclor-1232	U	3600.00		
Aroclor-1242	U	3600.00		
Aroclor-1248	U	3600.00		
Aroclor-1254	U	3600.00		
Aroclor-1260	U	3600.00		
Dieldrin	U	360.00		
Endosulfan I	U	180.00		
Endosulfan II	U	360.00		
Endosulfan sulfate	U	360.00		
Endrin	U	360.00		
Endrin aldehyde	U	360.00		
Endrin ketone	U	360.00		
Heptachlor	U	180.00		
Heptachlor epoxide	U	180.00		
Methoxychlor	U	1800.00		
Toxaphene	U	18000.00		
alpha-BHC	U	180.00		
alpha-Chlordane	U	180.00		
beta-BHC	U	180.00		
delta-BHC	U	180.00		
gamma-BHC (Lindane)	U	180.00		
gamma-Chlordane	U	180.00		

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB31 (8-10) *
****

Sample Collection Date: 11/14/93 Method: 3550,8080/2 Laboratory ID: 38442-008
Lab Receipt Date: 11/14/93
Sample Analysis Date: 12/22/93 Concentration Units: UG/KG

Analyte		Lab Result or DL	Validation Data
4,4'-DDD	PB	410.00	J
4,4'-DDE		450.00	
4,4'-DDT	P	410.00	J
Aldrin	U	19.00	
Aroclor-1016	U	380.00	
Aroclor-1221	U	760.00	
Aroclor-1232	U	380.00	
Aroclor-1242		1700.00	
Aroclor-1248	U	380.00	
Aroclor-1254		2100.00	
Aroclor-1260	U	380.00	
Dieldrin	U	38.00	
Endosulfan I	U	19.00	
Endosulfan II	U	38.00	
Endosulfan sulfate	U	38.00	
Endrin	U	38.00	
Endrin aldehyde		63.00	
Endrin ketone	U	38.00	
Heptachlor	U	19.00	
Heptachlor epoxide	U	19.00	
Methoxychlor	U	190.00	
Toxaphene	U	1900.00	
alpha-BHC	U	19.00	
alpha-Chlordane	U	19.00	
beta-BHC	U	19.00	
delta-BHC	U	19.00	
gamma-BHC (Lindane)	U	19.00	
gamma-Chlordane	U	19.00	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB33 (4-8) *
****

Sample Collection Date: 11/08/93 Method: 3550,8080/2 Laboratory ID: 38369-010
Lab Receipt Date: 11/08/93
Sample Analysis Date: 12/22/93 Concentration Units: UG/KG

Analyte	Lab Result or DL		Validation Data
4,4'-DDD	U	370.00	
4,4'-DDE	U	370.00	
4,4'-DDT	U	370.00	
Aldrin	U	190.00	
Aroclor-1016	U	3700.00	
Aroclor-1221	U	7400.00	
Aroclor-1232	U	3700.00	
Aroclor-1242	U	3700.00	
Aroclor-1248	U	3700.00	
Aroclor-1254	E	71000.00	J
Aroclor-1260	U	3700.00	
Dieldrin	U	370.00	
Endosulfan I	P	340.00	J
Endosulfan II	U	370.00	
Endosulfan sulfate	U	370.00	
Endrin	JP	200.00	J
Endrin aldehyde	U	370.00	
Endrin ketone	U	370.00	
Heptachlor	U	190.00	
Heptachlor epoxide	U	190.00	
Methoxychlor	U	1900.00	
Toxaphene	U	19000.00	
alpha-BHC	U	190.00	
alpha-Chlordane	U	190.00	
beta-BHC	U	190.00	
delta-BHC	U	190.00	
gamma-BHC (Lindane)	U	190.00	
gamma-Chlordane	U	190.00	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB33 (4-8)DL *
****

Sample Collection Date: 11/08/93 Method: 3550,8080/2 Laboratory ID: 38369-010DL
Lab Receipt Date: 11/11/93
Sample Analysis Date: 12/31/93 Concentration Units: UG/KG

Analyte		Lab Result or DL	Validation Data
4,4'-DDD	U	3700.00	UJ
4,4'-DDE	U	3700.00	UJ
4,4'-DDT	U	3700.00	UJ
Aldrin	U	1900.00	UJ
Aroclor-1016	U	37000.00	UJ
Aroclor-1221	U	74000.00	UJ
Aroclor-1232	U	37000.00	UJ
Aroclor-1242	U	37000.00	UJ
Aroclor-1248	U	37000.00	UJ
Aroclor-1254		100000.00	J
Aroclor-1260	U	37000.00	UJ
Dieldrin	U	3700.00	UJ
Endosulfan I	DJP	390.00	J
Endosulfan II	U	3700.00	UJ
Endosulfan sulfate	U	3700.00	UJ
Endrin	U	3700.00	UJ
Endrin aldehyde	U	3700.00	UJ
Endrin ketone	U	3700.00	UJ
Heptachlor	U	1900.00	UJ
Heptachlor epoxide	U	1900.00	UJ
Methoxychlor	U	19000.00	UJ
Toxaphene	U	190000.00	UJ
alpha-BHC	U	1900.00	UJ
alpha-Chlordane	U	1900.00	UJ
beta-BHC	U	1900.00	UJ
delta-BHC	U	1900.00	UJ
gamma-BHC (Lindane)	U	1900.00	UJ
gamma-Chlordane	U	1900.00	UJ

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB39 (10-12) *
****

Sample Collection Date: 11/14/93 Method: 3550,8080/2 Laboratory ID: 38442-009
Lab Receipt Date: 11/14/93
Sample Analysis Date: 12/22/93 Concentration Units: UG/KG

Analyte		Lab Result or DL	Validation Data
4,4'-DDD	PEB	2200.00	J
4,4'-DDE	P	280.00	J
4,4'-DDT	E	1300.00	J
Aldrin	U	20.00	
Aroclor-1016	U	380.00	
Aroclor-1221	U	770.00	
Aroclor-1232	U	380.00	
Aroclor-1242	U	380.00	
Aroclor-1248	U	380.00	
Aroclor-1254	U	380.00	UJ
Aroclor-1260	U	380.00	
Dieldrin	JP	35.00	J
Endosulfan I	U	20.00	
Endosulfan II	U	38.00	
Endosulfan sulfate	U	38.00	
Endrin	U	38.00	
Endrin aldehyde	P	40.00	J
Endrin ketone	U	38.00	
Heptachlor	U	20.00	
Heptachlor epoxide	J	5.30	
Methoxychlor	U	200.00	
Toxaphene	U	2000.00	
alpha-BHC	U	20.00	
alpha-Chlordane		100.00	
beta-BHC	U	20.00	
delta-BHC	U	20.00	
gamma-BHC (Lindane)	U	20.00	
gamma-Chlordane	P	95.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR PESTICIDES AND PCB'S

****
* SAMPLE ID: 2LTB39 (10-12)DL *
****

Sample Collection Date: 11/14/93 Method: 3550,8080/2 Laboratory ID: 38442-009DL
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/30/93 Concentration Units: UG/KG

Analyte		Lab Result or DL	Validation Data
4,4'-DDD	D	2600.00	
4,4'-DDE	U	380.00	
4,4'-DDT	D	1200.00	J
Aldrin	U	200.00	
Aroclor-1016	U	3800.00	
Aroclor-1221	U	7700.00	
Aroclor-1232	U	3800.00	
Aroclor-1242	U	3800.00	
Aroclor-1248	U	3800.00	
Aroclor-1254	U	3800.00	
Aroclor-1260	U	3800.00	
Dieldrin	U	380.00	
Endosulfan I	U	200.00	
Endosulfan II	U	380.00	
Endosulfan sulfate	U	380.00	
Endrin	U	380.00	
Endrin aldehyde	U	380.00	
Endrin ketone	U	380.00	
Heptachlor	U	200.00	
Heptachlor epoxide	U	200.00	
Methoxychlor	U	2000.00	
Toxaphene	U	20000.00	
alpha-BHC	U	200.00	
alpha-Chlordane	U	200.00	
beta-BHC	U	200.00	
delta-BHC	U	200.00	
gamma-BHC (Lindane)	U	200.00	
gamma-Chlordane	U	200.00	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR DIOXIN COMPOUNDS

****
* SAMPLE ID: 2LTB13 (0-2) *
****

Sample Collection Date: Method: SW 8280 Laboratory ID: 16369.10
Lab Receipt Date: 11/13/93
Sample Analysis Date: 11/20/93 Concentration Units: ug/kg

Analyte		Lab Result or DL	Validation Data
1234678-HPCDD	U	.464	
1234678-HPCDF	U	.301	
123478-HXCDD	U	.127	
123478-HXCDF	U	.334	
1234789-HPCDF	U	.219	
123678-HXCDD	U	.157	
123678-HXCDF	U	.055	
12378-PECDD	U	.290	
12378-PECDF	U	.222	
123789-HXCDD	U	.314	
123789-HXCDF	U	.062	
234678-HXCDF	U	.120	
23478-PECDF	U	.080	
2378-TCDD	U	.183	
2378-TCDF	U	.068	
OCDD		1.592	
OCDF	U	.379	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR DIOXIN COMPOUNDS

****
* SAMPLE ID: 2LTB23 (4-8) *
****

Sample Collection Date:
Lab Receipt Date: 11/13/93
Sample Analysis Date: 11/24/93

Method: SW 8280

Laboratory ID: 16369.05

Concentration Units: ug/kg

Analyte	Lab Result or DL		Validation Data
1234678-HPCDD	U	.653	
1234678-HPCDF	U	.254	
123478-HXCDD	U	1.153	
123478-HXCDF	U	.256	
1234789-HPCDF	U	.918	
123678-HXCDD	U	1.169	
123678-HXCDF	U	.742	
12378-PECDD	U	.458	
12378-PECDF	U	.178	
123789-HXCDD	U	1.698	
123789-HXCDF	U	.374	
234678-HXCDF	U	1.086	
23478-PECDF	U	.079	
2378-TCDD	U	.210	
2378-TCDF	U	.422	
OCDD	U	1.982	
OCDF	U	.992	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR DIOXIN COMPOUNDS

****
* SAMPLE ID: 2LTB33 (4-8) *
****

Sample Collection Date: Method: SW 8280 Laboratory ID: 16369.08
Lab Receipt Date: 11/13/93
Sample Analysis Date: 11/20/93 Concentration Units: ug/kg

Analyte		Lab Result or DL	Validation Data
1234678-HPCDD	U	.447	
1234678-HPCDF		.246	
123478-HXCDD	U	.115	
123478-HXCDF		.306	
1234789-HPCDF	U	.137	
123678-HXCDD	U	.214	
123678-HXCDF		.153	
12378-PECDD	U	.113	
12378-PECDF	U	.148	
123789-HXCDD	U	.298	
123789-HXCDF	U	.411	
234678-HXCDF	U	.085	
23478-PECDF	U	.095	
2378-TCDD	U	.039	
2378-TCDF	U	189.000	
OCDD		1.626	
OCDF	U	1.029	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB16 (0-2) *
****

Sample Collection Date: 11/04/93 Method: 3050,6010/2 Laboratory ID: 38304-009
Lab Receipt Date: 11/06/93
Sample Analysis Date: 12/09/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		8710.00	
Antimony, total	UN	3.20	UJ
Arsenic, total	BN	2.00	J
Barium, total	*	49.00	J
Beryllium, total	B	.44	
Boron, total	B	2.70	U
Cadmium, total	N	1.50	J
Calcium, total		4680.00	
Chromium, total	N	14.00	J
Cobalt, total	B	6.40	
Copper, total	*	47.90	J
Iron, total		12400.00	
Lead, total		38.20	
Magnesium, total		2960.00	
Manganese, total	N*	176.00	J
Mercury, total		.09	U
Nickel, total	N	10.00	J
Potassium, total		1560.00	
Selenium, total	BN*	.23	UJ
Silver, total	B*	.38	U
Sodium, total	B	441.00	
Thallium, total	U	.28	
Total Cyanide	B	.08	
Vanadium, total		23.50	
Zinc, total	E	81.20	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB17 (0-2) *
****

Sample Collection Date: 11/03/93 Method: 3050,6010/2 Laboratory ID: 38304-010
Lab Receipt Date: 11/06/93
Sample Analysis Date: 12/09/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		5990.00	
Antimony, total	N	17.70	UJ
Arsenic, total	BN	1.50	UJ
Barium, total	*	199.00	J
Beryllium, total		1.90	
Boron, total	B	10.30	U
Cadmium, total	N	4.70	J
Calcium, total		5580.00	
Chromium, total	N	26.50	J
Cobalt, total		14.70	
Copper, total	*	345.00	J
Iron, total		15600.00	
Lead, total		449.00	
Magnesium, total		3570.00	
Manganese, total	N*	277.00	J
Mercury, total		.24	U
Nickel, total	N	47.80	J
Potassium, total		1310.00	
Selenium, total	UN*	.34	UJ
Silver, total	B*	2.30	U
Sodium, total		2030.00	
Thallium, total	U	.40	
Total Cyanide	B	.22	
Vanadium, total		31.70	
Zinc, total	E	1020.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB18 (0-2) *
****

Sample Collection Date: 11/02/93 Method: 3050,6010/2 Laboratory ID: 38259-003
Lab Receipt Date: 11/04/93
Sample Analysis Date: 12/03/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		5150.00	
Antimony, total	N	14.30	UJ
Arsenic, total		2.70	
Barium, total		87.40	
Beryllium, total		2.20	
Boron, total	B	11.60	U
Cadmium, total		3.50	
Calcium, total	*	3560.00	J
Chromium, total		18.10	
Cobalt, total		10.40	
Copper, total	N*	871.00	J
Iron, total	*	12200.00	J
Lead, total	EN*	244.00	J
Magnesium, total		2120.00	
Manganese, total	N	285.00	J
Mercury, total		.61	
Nickel, total		31.80	
Potassium, total		1120.00	
Selenium, total	U	.46	
Silver, total	BN	1.30	UJ
Sodium, total	B	354.00	
Thallium, total	U	.44	
Total Cyanide	BN	.10	J
Vanadium, total	N*	16.40	J
Zinc, total		5340.00	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB19 (2-4) *
****

Sample Collection Date: 11/10/93 Method: 3050,6010/2 Laboratory ID: 38407-001
Lab Receipt Date: 11/13/93
Sample Analysis Date: 12/09/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		7000.00	
Antimony, total	N	44.60	J
Arsenic, total	BN	2.10	J
Barium, total	*	115.00	J
Beryllium, total	B	.63	
Boron, total	B	14.90	U
Cadmium, total	N	2.20	J
Calcium, total		8140.00	
Chromium, total	N	31.40	J
Cobalt, total	B	7.70	
Copper, total	*	815.00	J
Iron, total		26400.00	
Lead, total		307.00	
Magnesium, total		1910.00	
Manganese, total	N*	465.00	J
Mercury, total		.24	
Nickel, total	N	81.40	J
Potassium, total	B	1080.00	
Selenium, total	BNW*	.46	UJ
Silver, total	*	38.90	
Sodium, total		4120.00	
Thallium, total	U	.29	
Total Cyanide	U	.09	
Vanadium, total		16.80	J
Zinc, total	E	975.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB9 (0-2) *
****

Sample Collection Date: 11/05/93 Method: 3050,6010/2 Laboratory ID: 38328-001
Lab Receipt Date: 11/09/93
Sample Analysis Date: 12/09/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		5600.00	
Antimony, total	UN	1.30	UJ
Arsenic, total	BNW	.87	UJ
Barium, total	*	29.50	J
Beryllium, total	B	.29	
Boron, total	U	.95	
Cadmium, total	N	.48	J
Calcium, total		876.00	
Chromium, total	N	8.30	J
Cobalt, total	B	3.80	
Copper, total	*	23.00	J
Iron, total		8860.00	
Lead, total		13.70	
Magnesium, total		1680.00	
Manganese, total	N*	93.90	J
Mercury, total		.05	U
Nickel, total	N	13.60	J
Potassium, total		1070.00	
Selenium, total	UW*	.13	J
Silver, total	U*	.15	
Sodium, total	B	140.00	U
Thallium, total	UW	.16	
Total Cyanide	B	.12	U
Vanadium, total		13.80	
Zinc, total	E	36.40	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB13 (0-2) *
****

Sample Collection Date: 11/09/93 Method: 3050,6010/2 Laboratory ID: 38369-003
Lab Receipt Date: 11/11/93
Sample Analysis Date: 12/09/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		5450.00	
Antimony, total	UN	3.60	UJ
Arsenic, total	BN	.95	UJ
Barium, total	B*	43.10	J
Beryllium, total	B	.83	
Boron, total	U	2.60	
Cadmium, total	BN	.91	J
Calcium, total		1490.00	
Chromium, total	N	12.10	J
Cobalt, total	B	8.00	
Copper, total	*	101.00	J
Iron, total		10300.00	
Lead, total		119.00	
Magnesium, total		2400.00	
Manganese, total	N*	134.00	J
Mercury, total		.22	
Nickel, total	N	26.00	J
Potassium, total		1330.00	
Selenium, total	UNW*	.22	UJ
Silver, total	U*	.41	
Sodium, total	B	421.00	
Thallium, total	UW	.26	
Total Cyanide	B	.09	U
Vanadium, total		17.30	
Zinc, total	E	270.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LT820 (6-8) *
****

Sample Collection Date: 11/09/93 Method: 3050,6010/2 Laboratory ID: 38369-004
Lab Receipt Date: 11/11/93
Sample Analysis Date: 12/09/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		7140.00	
Antimony, total	N	58.80	J
Arsenic, total	NS	5.00	J
Barium, total	*	103.00	J
Beryllium, total		1.50	
Boron, total	B	9.40	U
Cadmium, total	BN	.56	J
Calcium, total		7520.00	
Chromium, total	N	30.00	J
Cobalt, total	B	6.60	
Copper, total	*	174.00	J
Iron, total		29500.00	
Lead, total		663.00	
Magnesium, total		1570.00	
Manganese, total	N*	216.00	J
Mercury, total	U	.02	
Nickel, total	N	58.90	J
Potassium, total		994.00	
Selenium, total	UNW*	.21	UJ
Silver, total	U*	.26	
Sodium, total	B	367.00	J
Thallium, total	UW	.24	UJ
Total Cyanide	U	.11	U
Vanadium, total		138.00	
Zinc, total	E	499.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB22 (6-8) *
****

Sample Collection Date: 11/05/93 Method: 3050,6010/2 Laboratory ID: 38328-002
Lab Receipt Date: 11/09/93
Sample Analysis Date: 12/09/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		9000.00	
Antimony, total	N	134.00	J
Arsenic, total	NS	10.60	J
Barium, total	*	420.00	J
Beryllium, total		1.70	
Boron, total	B	79.80	
Cadmium, total	N	5.20	J
Calcium, total		17200.00	
Chromium, total	N	289.00	J
Cobalt, total		122.00	
Copper, total	*	21600.00	J
Iron, total		157000.00	
Lead, total		1780.00	
Magnesium, total		4780.00	
Manganese, total	N*	1150.00	J
Mercury, total		.47	
Nickel, total	N	1440.00	J
Potassium, total	B	1490.00	
Selenium, total	UNW*	.36	UJ
Silver, total	*	12.60	
Sodium, total	B	1610.00	J
Thallium, total	U	2.10	
Total Cyanide	B	.25	U
Vanadium, total		73.20	J
Zinc, total	E	9850.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB23 (4-8) *
****

Sample Collection Date: 11/08/93 Method: 3050,6010/2 Laboratory ID: 38369-001
Lab Receipt Date: 11/11/93
Sample Analysis Date: 12/09/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		7840.00	
Antimony, total	N	26.90	UJ
Arsenic, total	NS	3.00	J
Barium, total	*	667.00	J
Beryllium, total	B	.84	
Boron, total	B	19.00	U
Cadmium, total	N	10.00	J
Calcium, total		9960.00	
Chromium, total	N	36.60	J
Cobalt, total		14.60	
Copper, total	*	3900.00	J
Iron, total		21500.00	
Lead, total		705.00	
Magnesium, total		6290.00	
Manganese, total	N*	376.00	J
Mercury, total		1.10	
Nickel, total	N	63.40	J
Potassium, total		1260.00	
Selenium, total	BN*	.93	UJ
Silver, total	*	12.20	
Sodium, total		3770.00	
Thallium, total	UW	.31	UJ
Total Cyanide	B	.27	U
Vanadium, total		32.60	
Zinc, total	E	1550.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB26 (4-6) *
****

Sample Collection Date: 11/12/93 Method: 3050,6010/2 Laboratory ID: 38416-001
Lab Receipt Date: /16/93
Sample Analysis Date: 12/09/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		6590.00	
Antimony, total	BN	7.30	UJ
Arsenic, total	BN	1.50	J
Barium, total	*	55.30	J
Beryllium, total	B	.35	
Boron, total	U	2.10	
Cadmium, total	BN	.68	J
Calcium, total		2510.00	
Chromium, total	N	14.30	J
Cobalt, total	B	6.10	
Copper, total	*	107.00	J
Iron, total		11300.00	
Lead, total		69.80	
Magnesium, total		2650.00	
Manganese, total	N*	178.00	J
Mercury, total		.16	
Nickel, total	N	12.90	J
Potassium, total		1780.00	
Selenium, total	BN*	.33	UJ
Silver, total	B*	1.00	U
Sodium, total	B	267.00	U
Thallium, total	UW	.25	
Total Cyanide	U	.10	
Vanadium, total		22.00	
Zinc, total	E	190.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB28 (4-6) *
****

Sample Collection Date: 11/12/93 Method: 3050,6010/2 Laboratory ID: 38416-002
Lab Receipt Date: 11/16/93
Sample Analysis Date: 12/09/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		6840.00	
Antimony, total	N	17.60	UJ
Arsenic, total	NS	2.50	
Barium, total	*	65.80	J
Beryllium, total	B	.29	
Boron, total	B	30.00	
Cadmium, total	N	1.40	J
Calcium, total		2680.00	
Chromium, total	N	26.20	J
Cobalt, total	B	6.80	
Copper, total	*	300.00	J
Iron, total		64400.00	
Lead, total		463.00	
Magnesium, total		1880.00	
Manganese, total	N*	318.00	J
Mercury, total		.14	
Nickel, total	N	28.00	J
Potassium, total		1060.00	
Selenium, total	UNW*	.20	UJ
Silver, total	*	2.80	
Sodium, total	B	406.00	J
Thallium, total	UW	.24	UJ
Total Cyanide	U	.10	
Vanadium, total		20.50	J
Zinc, total	E	378.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB29 (10-12) *
****

Sample Collection Date: 11/14/93 Method: 3050,6010/2 Laboratory ID: 38442-001
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/09/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		8250.00	
Antimony, total	N	56.70	J
Arsenic, total	NS	4.50	J
Barium, total	*	233.00	J
Beryllium, total		1.80	
Boron, total	B	38.50	
Cadmium, total	N	3.10	J
Calcium, total		5590.00	
Chromium, total	N	44.70	J
Cobalt, total		23.50	
Copper, total	*	2830.00	J
Iron, total		67300.00	
Lead, total		720.00	
Magnesium, total		2120.00	
Manganese, total	N*	503.00	J
Mercury, total		.91	
Nickel, total	N	118.00	J
Potassium, total		1110.00	
Selenium, total	UNW*	.13	UJ
Silver, total	*	9.20	
Sodium, total		2770.00	
Thallium, total	U	.76	
Total Cyanide		.74	
Vanadium, total		27.90	J
Zinc, total	E	4030.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB31 (8-10) *
****

Sample Collection Date: 11/14/93 Method: 3050,6010/2 Laboratory ID: 38442-002
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/09/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		9280.00	
Antimony, total	N	25.60	J
Arsenic, total	NS	8.60	J
Barium, total	*	193.00	J
Beryllium, total	B	.48	
Boron, total	B	22.70	
Cadmium, total	N	5.30	J
Calcium, total		6930.00	
Chromium, total	N	127.00	J
Cobalt, total		54.40	
Copper, total	*	819.00	J
Iron, total		146000.00	
Lead, total		1290.00	
Magnesium, total		3320.00	
Manganese, total	N*	1040.00	J
Mercury, total		.65	
Nickel, total	N	245.00	J
Potassium, total		1750.00	
Selenium, total	UNW*	.16	UJ
Silver, total	*	4.80	
Sodium, total	B	500.00	J
Thallium, total	UW	.92	UJ
Total Cyanide		.53	
Vanadium, total		22.60	J
Zinc, total	E	7570.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB33 (4-8) *
****

Sample Collection Date: 11/08/93 Method: 3050,6010/2 Laboratory ID: 38369-002
Lab Receipt Date: 11/11/93
Sample Analysis Date: 12/09/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		8970.00	
Antimony, total	N	31.70	J
Arsenic, total	BN	2.10	J
Barium, total	*	272.00	J
Beryllium, total		1.70	
Boron, total	B	35.70	
Cadmium, total	N	12.10	J
Calcium, total		9760.00	
Chromium, total	N	86.50	J
Cobalt, total		18.30	
Copper, total	*	1710.00	J
Iron, total		32000.00	
Lead, total		612.00	
Magnesium, total		9330.00	
Manganese, total	N*	465.00	J
Mercury, total		1.20	
Nickel, total	N	89.60	J
Potassium, total		1310.00	
Selenium, total	BN*	.72	UJ
Silver, total	*	9.60	
Sodium, total		3950.00	
Thallium, total	U	.28	
Total Cyanide	B	.35	
Vanadium, total		41.40	
Zinc, total	E	1650.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR INORGANIC COMPOUNDS

****
* SAMPLE ID: 2LTB39 (10-12) *
****

Sample Collection Date: 11/14/93 Method: 3050,6010/2 Laboratory ID: 38442-003
Lab Receipt Date: 11/17/93
Sample Analysis Date: 12/09/93 Concentration Units: MG/KG

Analyte		Lab Result or DL	Validation Data
Aluminum, total		7410.00	
Antimony, total	N	59.00	J
Arsenic, total	NS	4.10	J
Barium, total	*	223.00	J
Beryllium, total		2.20	
Boron, total	B	25.10	
Cadmium, total	N	2.80	J
Calcium, total		3570.00	
Chromium, total	N	43.80	J
Cobalt, total		19.80	
Copper, total	*	2300.00	J
Iron, total		83300.00	
Lead, total		645.00	
Magnesium, total		1990.00	
Manganese, total	N*	458.00	J
Mercury, total		.82	
Nickel, total	N	115.00	J
Potassium, total		1000.00	
Selenium, total	BNW*	.19	UJ
Silver, total	*	9.20	
Sodium, total		2250.00	
Thallium, total	U	.77	
Total Cyanide	B	.42	
Vanadium, total		31.40	J
Zinc, total	E	1980.00	J

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR TCLP PARAMETERS

****
* SAMPLE ID: 2LTB18 (0-2) *
****

Laboratory ID: 38260-001

***** Analytical Section: Volatile Organics

Sample Receipt Date: 11/04/93 Method Reference: 8240/2
Sample Extraction Date: 11/10/93
Sample Analysis Date: 11/17/93 Concentration Units: mg/L

Analyte	Lab Result or DL		Validation Data
1,1-Dichloroethene	U	.0050	
1,2-Dichloroethane	U	.0050	
2-Butanone	U	.0250	
Benzene	U	.0050	
Carbon Tetrachloride	U	.0050	
Chlorobenzene	U	.0050	
Chloroform	U	.0050	
Methyl ethyl ketone	U	.0250	
Tetrachloroethene	U	.0050	
Trichloroethene	U	.0050	
Vinyl Chloride	U	.0100	

***** Analytical Section: Semi Volatile Organics

Sample Receipt Date: 11/04/93 Method Reference: 8270/2
Sample Extraction Date: 11/10/93
Sample Analysis Date: 12/01/93 Concentration Units: mg/L

Analyte	Lab Result or DL		Validation Data
1,4-Dichlorobenzene	U	.0560	
2,4,5-Trichlorophenol	U	.0560	
2,4,6-Trichlorophenol	U	.0560	
2,4-Dinitrotoluene	U	.0560	
2-Methylphenol	U	.0560	
4-Methylphenol	U	.0560	
Hexachlorobenzene	U	.0560	
Hexachlorobutadiene	U	.0560	
Hexachloroethane	U	.0560	
Nitrobenzene	U	.0560	
Pentachlorophenol	U	.0560	
Pyridine	U	.0560	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR TCLP PARAMETERS

****
* SAMPLE ID: 2LTB18 (0-2) *
****

Laboratory ID: 38260-001

***** Analytical Section: Pesticides

Sample Receipt Date: 11/04/93 Method Reference: 8080/2
Sample Extraction Date: 11/10/93
Sample Analysis Date: 11/21/93 Concentration Units: mg/L

Analyte	Lab Result or DL		Validation Data
Chlordane	U	.0020	
Endrin	U	.0003	
Gamma-BHC	U	.0003	
Heptachlor	U	.0030	
Heptachlor Epoxide	U	.0030	
Methoxychlor	U	.0020	
Toxaphene	U	.0100	

***** Analytical Section: Herbicides

Sample Receipt Date: 11/04/93 Method Reference: 8150/2
Sample Extraction Date: 11/10/93
Sample Analysis Date: 11/17/93 Concentration Units: mg/L

Analyte	Lab Result or DL		Validation Data
2,4-D	U	.0050	
Silvex	U	.0050	

***** Analytical Section: Inorganics

Sample Receipt Date: 11/04/93 Method Reference: 3050,6010/2
Sample Extraction Date: 11/17/93
Sample Analysis Date: 11/19/93 Concentration Units: UG/L

Analyte	Lab Result or DL		Validation Data
Arsenic, total	U	34.5000	UJ
Barium, total		1060.0000	J
Cadmium, total		58.0000	J
Chromium, total		32.1000	J
Lead, total		2190.0000	J
Mercury, total	U	.1000	UJ
Selenium, total	U	21.8000	UJ
Silver, total	U	1.9000	UJ

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR TCLP PARAMETERS

****
* SAMPLE ID: 2LTB26 (4-6) *
****

Laboratory ID: 38419-003

***** Analytical Section: Volatile Organics

Sample Receipt Date: 11/16/93 Method Reference: 8240/2
Sample Extraction Date:
Sample Analysis Date: 11/30/93 Concentration Units: mg/L

Analyte	Lab Result or DL		Validation Data
1,1-Dichloroethene	U	.0050	
1,2-Dichloroethane	U	.0050	
2-Butanone	U	.0250	
Benzene	U	.0050	
Carbon Tetrachloride	U	.0050	
Chlorobenzene	U	.0050	
Chloroform	U	.0050	
Methyl ethyl ketone	U	.0250	
Tetrachloroethene	U	.0050	
Trichloroethene	U	.0050	
Vinyl Chloride	U	.0100	

***** Analytical Section: Semi Volatile Organics

Sample Receipt Date: 11/16/93 Method Reference: 8270/2
Sample Extraction Date: 12/01/93
Sample Analysis Date: 12/09/93 Concentration Units: mg/L

Analyte	Lab Result or DL		Validation Data
1,4-Dichlorobenzene	U	7.5000	
2,4,5-Trichlorophenol	U	400.0000	
2,4,6-Trichlorophenol	U	2.0000	
2,4-Dinitrotoluene	U	.1300	
2-Methylphenol	U	200.0000	
4-Methylphenol	U	200.0000	
Hexachlorobenzene	U	.1300	
Hexachlorobutadiene	U	.5000	
Hexachloroethane	U	3.0000	
Nitrobenzene	U	2.0000	
Pentachlorophenol	U	100.0000	
Pyridine	U	5.0000	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR TCLP PARAMETERS

****
* SAMPLE ID: 2LTB26 (4-6) *
****

Laboratory ID: 38419-003

***** Analytical Section: Pesticides

Sample Receipt Date: 11/16/93 Method Reference: 8080/2
Sample Extraction Date: 12/01/93
Sample Analysis Date: 12/03/93 Concentration Units: mg/L

Analyte	Lab Result or DL		Validation Data
Chlordane	U	.0020	
Endrin	U	.0003	
Gamma-BHC	U	.0003	
Heptachlor	U	.0003	
Heptachlor Epoxide	U	.0003	
Methoxychlor	U	.0020	
Toxaphene	U	.0100	

***** Analytical Section: Herbicides

Sample Receipt Date: 11/16/93 Method Reference: 8150/2
Sample Extraction Date: 11/30/93
Sample Analysis Date: 12/02/93 Concentration Units: mg/L

Analyte	Lab Result or DL		Validation Data
2,4-D	U	.0050	
Silvex	U	.0050	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
CHEMICAL ANALYSIS SUMMARY FOR TCLP PARAMETERS

****
* SAMPLE ID: 2LTB26 (4-6) *
****

Laboratory ID: 38419-003

***** Analytical Section: Inorganics

Sample Receipt Date: 11/16/93 Method Reference: 3050,6010/2
Sample Extraction Date: 11/30/93
Sample Analysis Date: 12/09/93 Concentration Units: UG/L

Analyte	Lab Result or DL		Validation Data
Arsenic, total	U	34.5000	
Barium, total		532.0000	
Cadmium, total		9.7000	
Chromium, total	B	5.9000	
Lead, total		301.0000	
Mercury, total	U	.1000	
Selenium, total	U	21.8000	
Silver, total	U	1.9000	

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
SUMMARY OF ENGINEERING PARAMETERS

****
* SAMPLE ID: 2LTB17 (0-2) *
****

Sample Collection Date: 11/14/93
Lab Receipt Date: 11/17/93
Sample Analysis Date: 11/22/93

Laboratory ID: 38443-001

Parameter	Lab Result or DL	Units	Validation Data	Method Reference
Ash	92.00	%		D482-80/4
Cation Exchange Capacity	4.90	meq/10		9081/2
Moisture	5.60	%		209F/3
Organic Carbon	.45	%		Walkley Black
Specific Gravity	2.40			213E/3
pH	8.08	units	J	9045/2

NAVAL SUBMARINE BASE - NEW LONDON
AREA-A LANDFILL
SUMMARY OF ENGINEERING PARAMETERS

****
* SAMPLE ID: 2LTB19 (4-6) *
****

Sample Collection Date: 11/14/93
Lab Receipt Date: 11/17/93
Sample Analysis Date: 11/22/93

Laboratory ID: 38443-002

Parameter	Lab Result or DL	Units	Validation Data	Method Reference
Ash	93.50	%		D482-80/4
Cation Exchange Capacity	3.90	meq/10		9081/2
Moisture	4.50	%		209F/3
Organic Carbon	.29	%		Walkley Black
Specific Gravity	2.30			213E/3
pH	8.56	units	J	9045/2

APPENDIX C

WETLAND INTERFACE SAMPLING RESULTS AREA A LANDFILL

Halliburton NUS
CORPORATION

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C-49-05-5-228

May 24, 1995

Halliburton NUS Project Number 9594

Mr. Mark Evans, Remedial Project Manager
U.S. Department of the Navy
Naval Facilities Engineering Command
Northern Division
10 Industrial Highway
Code 1823, Mail Stop 82
Lester, Pennsylvania 19113-2090

Reference: CLEAN Contract No. N62472-90-D-1298
Contract Task Order No. 0129

Subject: Naval Submarine Base, New London, Groton, Connecticut
Area A Landfill/Wetland Interface Sampling Results

Dear Mr. Evans:

Attached to this letter is the final letter report which provides a summary of the analytical results of the subject sampling event. This data was sent to you in draft form on February 27, 1995. The letter report was incorporated into Appendix C of the Focused Feasibility Study for the Area A Landfill which was prepared by Atlantic Environmental, Inc. Subsequently, it was reviewed and commented on by the EPA. Revisions to the document were made in light of the EPA comments that were received. The final letter report is organized in the same manner as the draft report with a short summary of the results which includes a generic data evaluation, followed by a tabular presentation of the data, a map showing the sample locations, summary tables of all validated analytical data, copies of all associated sample logsheets and chain of custody forms.

If you would have any questions regarding this document, please contact me at (412) 921-8418.

Very truly yours,

Corey A. Rich for

Matthew G. Cochran, P.G.
Project Manager

CAR/sic

c: Jean-Luc Glorieux (Halliburton NUS)
Barry Giroux (Atlantic)
Corey Rich (Halliburton NUS)
CTO 0129 File

ATTACHMENT A.1
LANDFILL/WETLAND INTERFACE ANALYTICAL DATA SUMMARY

A.1 LANDFILL/WETLAND INTERFACE ANALYTICAL DATA SUMMARY

A.1.1 INTRODUCTION

This letter report presents a summary of analytical data which were generated by the Area A Landfill/Wetland Interface sampling. The sampling was performed by Halliburton NUS personnel during the period November 28-30, 1994 in accordance with the Letter Work Plan for Area A Landfill/Wetland Interface (HNUS, November 1994).

Specific to the Wetland/Landfill interface, a total of 20 locations were sampled (2 locations at each of 10 transects). One sample was collected in the landfill and one sample was collected in the wetland at each transect. Locations of the transects are presented in the figure contained in Attachment A.2. All samples were collected using a decontaminated hand auger from a depth interval of 0 to 12 inches. Samples collected in areas with standing water were considered sediment samples, while samples collected in areas without standing water were considered soil samples. Although attempts were made to collect discreet samples without considerable amounts of water within the sample matrix, one sample (T7-B) contained approximately 85% water (by weight) which resulted in rejection of all associated nondetected results for this sample.

All sample analyses were performed with reference to the USEPA Contract Laboratory Program (CLP) analytical Statement of Work OLM01.8 (for Target Compound List (TCL) organics) and CLP ICP, cold vapor, and colorimetric techniques (for Target Analyte List inorganics). All samples were also analyzed for total organic carbon (via the Walkley-Black method) and grain size distribution (ASTM Method D422).

All organic and inorganic analytical data were subjected to data validation using USEPA Region I-specific protocols and qualification actions. Physical data (TOC and grain size) were not validated. Analytical results for all Landfill/Wetland Interface samples are presented in Attachment A.3. A summary of frequency and range of detections and locations of maximum detected concentrations for all positively detected organic and inorganic chemicals is presented in Table A.1-1. These data are segregated according to the side (landfill or wetland) of the transect which permits comparison of discharge potential in the landfill to impact in the wetland.

The sample chain-of-custody forms are contained in Attachment A.4 and sample logsheets are contained in Attachment A.5.

A.1.2 DATA SUMMARY

Discussion of the detected chemicals in the landfill/wetland includes the general classes of detected chemicals, ranges of detected chemicals, and the locations of maximum detections for the landfill and wetland sides of the transects. Discussion of general chemical classes is appropriate for most chemicals because the variety of material in the former landfill does not permit accurate identification of single source points for all chemicals. Information about the frequency of detection and range of detections can be used qualitatively to identify background chemicals and discharges of potentially hazardous chemicals. The location of maximum detections also qualitatively identifies locations of discharge from the landfill.

Several volatile organics were detected in the landfill/wetland interface samples. Carbon disulfide, 2-butanone, toluene, chlorobenzene, and xylenes were detected in the wetland samples. Only 2-butanone, toluene, and chlorobenzene were detected in the landfill samples. All of the detected volatiles, except carbon disulfide, are considered anthropogenic, with origins in the landfill.

A wide variety of semivolatile organic compounds were detected in the interface samples, including dichlorobenzene, methyl-substituted phenolics, polynuclear aromatic hydrocarbons (PAHs), and phthalate esters. Only the PAHs and phthalate esters are noted to be consistently detected in both landfill-side and wetland-side transect samples. For the chemical classes where detections are noted in both landfill and wetland samples, wetland concentrations are generally lower than respective landfill sample results in the same transect. This indicates the landfill to be sourcing some discharge to the wetland. Although the detected chemical species are notoriously anthropogenic, the primary source may not be the landfill, as the parking areas on the former landfill are reported to be paved (a significant source of PAHs and possibly phthalate esters).

As with the semivolatile organic fraction, a wide variety of pesticides were detected in the interface samples, with all individually detected pesticides found in at least one landfill sample and just over half of these species detected in the wetland. Generally, maximum concentrations of detected pesticides detected in the wetland are comparable in magnitude to those detected in the landfill samples, although the locations of the maximum detections do not always correspond to the same transect.

Only one PCB mixture (Aroclor-1260) was detected in the landfill/wetland interface sample analysis. The maximum concentration detected in the landfill (1,500 μg/kg at location T6-A) does not correspond to the maximum detected on the wetland-side (550 μg/kg at location T7-B). However, the proximity of these two sampling locations to each other (approximately 50 feet apart) may provide an indication that maximum discharge from the landfill is occurring in this general vicinity of the interface. Positive results for

Aroclor-1260 are also noted at sampling locations T1-A, T1-B, T6-B, and T7-A, suggesting PCB discharges at or near transects T1, T6, and T7.

For inorganic analytes, the high frequency of detection and narrow distribution of reported concentrations (typically one order of magnitude between minimum and maximum concentrations of reported positive results) is indicative of detections of background levels. Notable exceptions in the landfill-side samples include antimony (detected in 3 of 10 samples), boron (detected in 2 of 10 samples), mercury (detected in 4 of 6 samples), selenium (detected in 3 of 10 samples), silver (detected in 5 of 10 samples), and cyanide (detected in 3 of 7 samples). This pattern of frequency of detection is mirrored by the wetland-side samples for the sample analytes: antimony (detected in 1 of 9 samples), boron (detected in 3 of 9 samples), mercury (detected in 4 of 7 samples), selenium (detected in 4 of 10 samples), silver (detected in 5 of 10 samples), and cyanide (detected in 3 of 7 samples). Although the lower end of these positively detected chemicals are comparable to the respective analytical detection limits, a majority of the maximum detected concentrations are associated with samples collected at transects 6 and 7. Coincidentally, these transects correspond to the maximum detected amounts of PCBs at the landfill/wetland interface.

Physical data for the soils provide organic carbon data which range from approximately 0.85 to 8.4% organic carbon. Maximum organic carbon content is noted at transect 8 in samples T8-A and T8-B. The median (50th percentile) particle sizes for the interface samples are comparable, regardless of whether the samples were collected on the landfill or wetland side of the interface. Median particle sizes ranged from 0.0179 mm to 0.5921 mm (for the landfill-side samples) and from 0.0173 mm to 1.0835 mm (for the wetland-side samples).

TABLE A.1-1

SUMMARY OF POSITIVELY DETECTED CHEMICALS
AREA A LANDFILL/WETLAND INTERFACE
NSB - NEW LONDON, GROTON, CONNECTICUT

Chemical	Landfill Side Samples (-A Suffix)			Wetland Side Sample (-B Suffix)		
	Frequency of Detection	Range of Positive Results	Location of Maximum Detection	Frequency of Detection	Range of Positive Results	Location of Maximum Detection
Volatile Organic Compounds (µg/kg)						
Carbon disulfide	ND	NA	NA	2/10	3 - 12	T10-B
2-Butanone	1/10	520	T2-A	2/10	59 - 1,400	T8-B
Toluene	4/10	2 - 5	T2-A, T7-A	2/10	3 - 6	T8-B
Chlorobenzene	1/10	2	T2-A	2/10	3 - 14	T7-B
Xylenes	ND	NA	NA	1/10	3	T6-B
Semivolatile Organic Compounds (µg/kg)						
1,4-Dichlorobenzene	ND	NA	NA	1/9	42	T6-B
4-Methylphenol	1/10	43	T9-A	ND	NA	NA
2,4-Dimethylphenol	ND	NA	NA	1/9	210	T8-B
Naphthalene	5/10	56 - 77	T9-A	ND	NA	NA
2-Methylnaphthalene	4/10	40 - 55	T3-A	ND	NA	NA
Acenaphthylene	3/10	34 - 390	T3-A	1/9	70	T3-B
Pentachlorophenol	ND	NA	NA	1/9	240	T1-B
Dibenzofuran	7/10	35 - 72	T5-A	2/10	68 - 280	T7-B
Fluorene	8/10	21 - 160	T3-A	3/10	38 - 340	T7-B
Acenaphthene	7/10	30 - 220	T5-A	2/10	110 - 380	T7-B
Phenanthrene	10/10	43 - 1,800	T3-A	10/10	22 - 320	T3-B
Anthracene	9/10	34 - 450	T3-A	5/9	38 - 90	T3-B
Carbazole	5/10	25 - 130	T5-A	1/9	32	T3-B
Di-n-butylphthalate	5/10	26 - 56	T6-A	3/9	23 - 63	T3-B
Fluoranthene	10/10	160 - 4,200	T3-A	10/10	56 - 890	T3-B
Pyrene	10/10	96 - 4,600	T3-A	10/10	46 - 910	T3-B
Butylbenzylphthalate	2/10	21 - 50	T6-A	2/10	61 - 690	T7-B
Benzo(a)anthracene	10/10	45 - 3,000	T3-A	10/10	25 - 480	T3-B
Chrysene	10/10	65 - 3,700	T3-A	10/10	38 - 590	T3-B
Bis(2-ethylhexyl)phthalate	ND	NA	NA	1/9	3,500	T10-B
Benzo(b)fluoranthene	9/10	54 - 660	T2-A	9/10	44 - 420	T3-B
Benzo(k)fluoranthene	10/10	62 - 3,700	T3-A	9/10	75 - 510	T3-B

TABLE A.1-1 (Continued)
SUMMARY OF POSITIVELY DETECTED CHEMICALS
AREA A LANDFILL/WETLAND INTERFACE
NSB - NEW LONDON, GROTON, CONNECTICUT

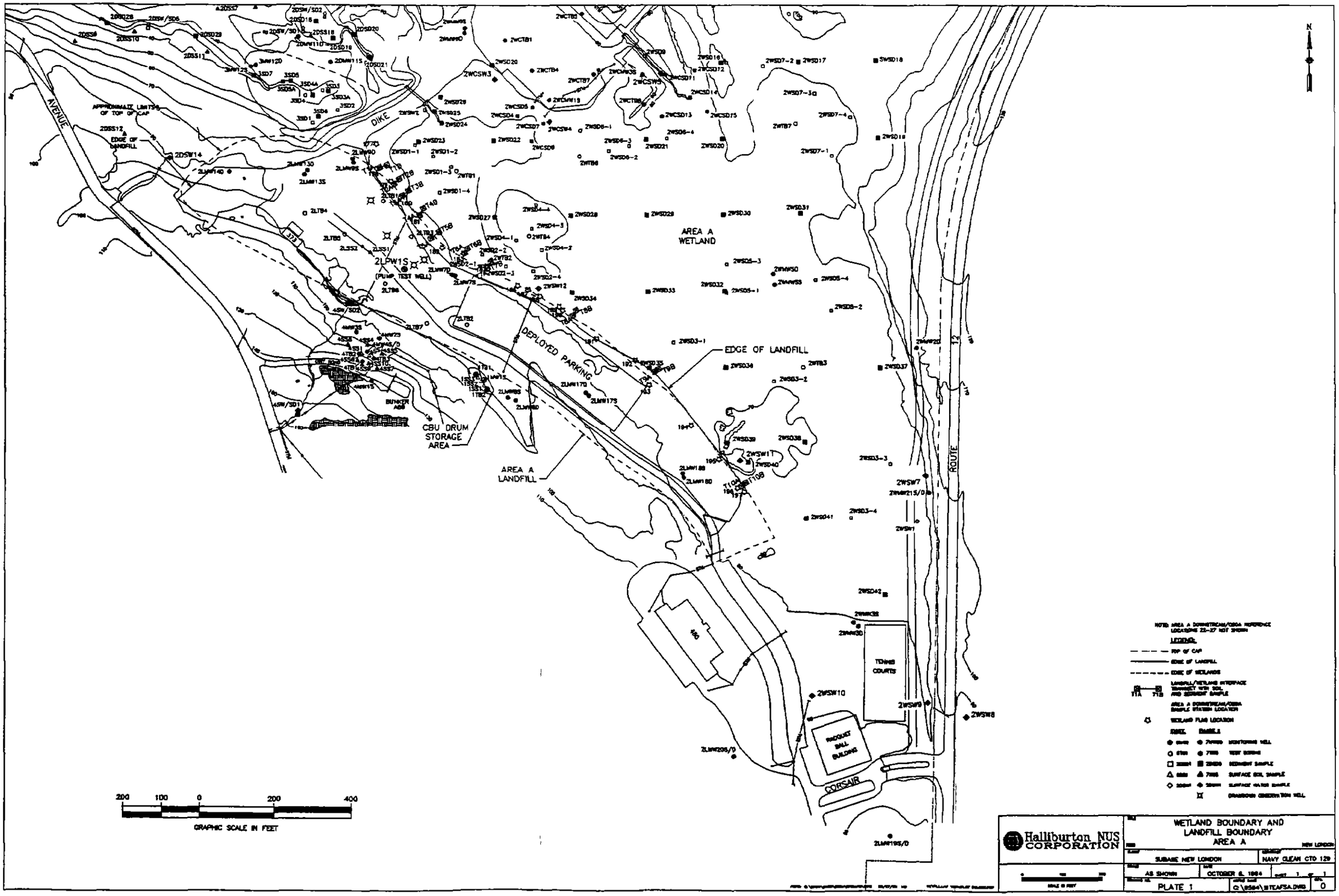
Chemical	Landfill Side Samples (-A Suffix)			Wetland Side Sample (-B Suffix)		
	Frequency of Detection	Range of Positive Results	Location of Maximum Detection	Frequency of Detection	Range of Positive Results	Location of Maximum Detection
Benzo(a)pyrene	10/10	55 - 2,600	T3-A	10/10	30 - 480	T3-B
Indeno(1,2,3-cd)pyrene	10/10	41 - 1,000	T3-A	10/10	22 - 350	T7-B
Dibenz(a,h)anthracene	4/10	72 - 310	T2-A	2/9	87 - 170	T3-B
Benzo(g,h,i)perylene	10/10	50 - 1,110	T3-A	9/10	27 - 340	T7-B
Pesticide/PCB Compounds (µg/kg)						
beta-BHC	1/10	2.7	T5-A	ND	NA	NA
delta-BHC	1/10	4.2	T5-A	ND	NA	NA
gamma-BHC	1/10	3.5	T5-A	ND	NA	NA
Heptachlor	2/10	2.8 - 4.5	T5-A	ND	NA	NA
Aldrin	1/10	3.2	T5-A	ND	NA	NA
Heptachlor epoxide	2/10	2.2 - 2.8	T1-A	2/9	3.7 - 4.5	T1-B
Endosulfan I	3/10	2.4 - 11	T3-A	1/9	2.1	T1-B
Dieldrin	2/10	8.4 - 26	T6-A	ND	NA	NA
4,4'-DDE	7/10	10 - 260	T3-A	5/10	7.4 - 330	T3-B
Endrin	2/10	7.8 - 16	T5-A	ND	NA	NA
Endosulfan II	1/9	31	T2-A	1/9	6.9	T2-B
4,4'-DDD	7/9	9 - 1,300	T5-A	5/8	4.5 - 1,400	T3-B
Endosulfan sulfate	2/9	6.9 - 14	T3-A	ND	NA	NA
4,4'-DDT	4/6	44 - 890	T5-A	4/8	4.4 - 2,900	T3-B
Methoxychlor	1/9	38	T5-A	ND	NA	NA
Endrin ketone	1/9	20	T5-A	ND	NA	NA
Endrin aldehyde	2/9	10 - 16	T2-A	2/9	5.6 - 16	T3-B
alpha-Chlordane	6/10	4.4 - 29	T6-A	5/10	2.9 - 22	T7-B
gamma-Chlordane	5/10	4.5 - 23	T6-A	4/9	3.7 - 13	T3-B
Aroclor-1260	3/10	82 - 1,500	T6-A	3/10	180 - 550	T7-B
Inorganic Analyses and Physical Data (mg/kg)						
Aluminum	10/10	3,530 - 15,800	T6-A	10/10	2,690 - 27,100	T7-B
Antimony	3/10	0.48 - 1.2	T7-A	1/9	1.1	T6-B
Arsenic	10/10	1.4 - 11.0	T8-A	10/10	1.0 - 14.1	T8-B
Barium	10/10	27.9 - 124	T7-A	10/10	11.9 - 318	T7-B

TABLE A.1-1 (Continued)
SUMMARY OF POSITIVELY DETECTED CHEMICALS
AREA A LANDFILL/WETLAND INTERFACE
NSB - NEW LONDON, GROTON, CONNECTICUT

Chemical	Landfill Side Samples (-A Suffix)			Wetland Side Sample (-B Suffix)		
	Frequency of Detection	Range of Positive Results	Location of Maximum Detection	Frequency of Detection	Range of Positive Results	Location of Maximum Detection
Beryllium	10/10	0.16 - 1.3	T6-A	10/10	0.14 - 4.1	T7-B
Boron	2/10	14.7 - 28.7	T8-A	3/9	29.5 - 39.6	T9-B
Cadmium	8/10	0.23 - 0.72	T6-A	9/10	0.12 - 1.6	T7-B
Calcium	10/10	900 - 3,350	T7-A	10/10	868 - 5,330	T7-B
Chromium	10/10	8.1 - 80.3	T8-A	10/10	7.0 - 96.8	T8-B
Cobalt	10/10	3.0 - 10.0	T6-A	10/10	3.2 - 13.6	T7-B
Copper	10/10	14.7 - 133	T6-A	10/10	19.5 - 173	T7-B
Iron	10/10	5,800 - 53,100	T6-A	10/10	5,630 - 19,800	T7-B
Lead	10/10	17.4 - 141	T6-A	10/10	16.1 - 110	T7-B
Magnesium	10/10	1,650 - 7,230	T8-A	10/10	1,570 - 9,150	T8-B
Manganese	10/10	78.8 - 313	T9-A	10/10	55.3 - 335	T9-B
Mercury	4/6	0.15 - 0.44	T7-A	4/7	0.19 - 1.2	T6-B
Nickel	10/10	6.6 - 61.5	T2-A	10/10	8.5 - 47.7	T7-B
Potassium	10/10	813 - 3,880	T8-A	10/10	659 - 5,170	T8-B
Selenium	3/10	1.8 - 2.2	T6-A, T8-A	4/10	1.5 - 6.8	T7-B
Silver	5/10	0.17 - 0.96	T6-A	5/10	0.15 - 0.86	T7-B
Sodium	10/10	114 - 2,980	T8-A	10/10	215 - 4,980	T9-B
Vanadium	10/10	12.8 - 183	T2-A	10/10	8.9 - 203	T7-B
Zinc	10/10	39.2 - 378	T2-A	10/10	45.1 - 702	T7-B
Cyanide	3/7	0.90 - 2.1	T6-A	3/7	0.90 - 6.1	T7-B
Total Organic Carbon	10/10	9,960 - 84,100	T8-A	10/10	8,420 - 79,600	T8-B
D_{50} Particle Size (mm)	NA	0.0179 - 0.5921	T3-A	NA	0.0173 - 1.0835	T7-A

NA Evaluation not applicable.
ND Compound or analyte not detected in samples associated with this side of landfill/wetland interface.

ATTACHMENT A.2
LANDFILL/WETLAND INTERFACE SAMPLE LOCATIONS


N
AVENUE
DIKE
APPROXIMATE LIMITS OF TOP OF CAP
EDGE OF LANDFILL
2DSW14
2LPW1S
(PUMP TEST WELL)
AREA A
WETLAND
DEPLOYED PARKING
EDGE OF LANDFILL
CBU DRUM
STORAGE
AREA
AREA A
LANDFILL
BUNKER
A68
ROUTE
12
TENNIS
COURTS
PADDLE
BALL
BUILDING
CORSAIR
2WSW10
2WSW9
2WSW8
2WSW7
2WSW1
2LMW195/D
2LMW206/D
200
100
0
200
400
GRAPHIC SCALE IN FEET
LEGEND:
TOP OF CAP
EDGE OF LANDFILL
EDGE OF WETLANDS
LANDFILL/WETLAND INTERFACE TRANSECT WITH SOIL AND SEDIMENT SAMPLE
AREA A DOWNSTREAM/CBDA SAMPLE STATION LOCATION
WETLAND FLAG LOCATION
MONITORING WELL
TEST BORING
SEDIMENT SAMPLE
SURFACE SOIL SAMPLE
SURFACE WATER SAMPLE
DRAINAGE OBSERVATION WELL
Halliburton NUS CORPORATION
WETLAND BOUNDARY AND
LANDFILL BOUNDARY
AREA A
NEW LONDON
SUBASE NEW LONDON
NAVY CLEAN CTO 129
AS SHOWN
OCTOBER 6, 1994
PLATE 1
C:\8584\STEAFSA.DWG
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ATTACHMENT A.3
LANDFILL/WETLAND INTERFACE ANALYTICAL RESULTS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			T1-A		T1-B		T2-A		DUP-03		T2-B	
LABORATORY ID:			20715.04		20715.05		20715.06		20715.07		20715.08	
TCL VOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
CHLOROMETHANE	10	1.9	12	U	11	U	16	U	15	U	17	U
BROMOMETHANE	10	2.8	12	U	11	U	16	U	15	U	17	U
VINYL CHLORIDE	10	1.9	12	U	11	U	16	U	15	U	17	U
CHLOROETHANE	10	2.9	12	U	11	U	16	U	15	U	17	U
METHYLENE CHLORIDE	10	2.1	12	U	12	U	16	U	19	U	17	U
ACETONE	10	3.7	12	U	11	U	49	U	85	U	53	U
CARBON DISULFIDE	10	1.4	12	U	11	U	16	U	15	U	17	U
1,1-DICHLOROETHENE	10	1.1	12	U	11	U	16	U	15	U	17	U
1,1-DICHLOROETHANE	10	1.6	12	U	11	U	16	U	15	U	17	U
1,2-DICHLOROETHENE(TOTAL)	10	1.2	12	U	11	U	16	U	15	U	17	U
CHLOROFORM	10	1.3	12	U	11	U	16	U	15	U	17	U
1,2-DICHLOROETHANE	10	2.8	12	U	11	U	16	U	15	U	17	U
2-BUTANONE	10	3.9	12	U	11	U	*520		*420		32	U
1,1,1-TRICHLOROETHANE	10	0.6	12	U	11	U	16	U	15	U	17	U
CARBON TETRACHLORIDE	10	1.2	12	U	11	U	16	U	15	U	17	U
BROMODICHLOROMETHANE	10	0.7	12	U	11	U	16	U	15	U	17	U
1,2-DICHLOROPROPANE	10	1.0	12	U	11	U	16	U	15	U	17	U
CIS-1,3-DICHLOROPROPENE	10	1.0	12	U	11	U	16	U	15	U	17	U
TRICHLOROETHENE	10	1.1	12	U	11	U	16	U	15	U	17	U
DIBROMOCHLOROMETHANE	10	1.4	12	U	11	U	16	U	15	U	17	U
1,1,2-TRICHLOROETHANE	10	1.1	12	U	11	U	16	U	15	U	17	U
BENZENE	10	1.2	12	U	11	U	16	U	15	U	17	U
TRANS-1,3-DICHLOROPROPENE	10	0.9	12	U	11	U	16	U	15	U	17	U
BROMOFORM	10	2.5	12	U	11	U	16	U	15	U	17	U
4-METHYL-2-PENTANONE	10	4.0	12	U	11	U	16	U	15	UJ	17	U
2-HEXANONE	10	4.8	12	U	11	U	16	U	15	UJ	17	U
TETRACHLOROETHENE	10	1.3	12	U	11	U	16	U	15	UJ	17	U
1,1,2,2-TETRACHLOROETHANE	10	1.7	12	U	11	U	16	U	15	UJ	17	U
TOLUENE	10	0.9	12	U	11	U	5	J	2	J	17	U
CHLOROBENZENE	10	0.8	12	U	11	U	16	U	2	J	17	U
ETHYLBENZENE	10	2.6	12	U	11	U	16	U	15	UJ	17	U
STYRENE	10	0.9	12	U	11	U	16	U	15	UJ	17	U
XYLENE (TOTAL)	10	1.7	12	U	11	U	16	U	15	UJ	17	U
VINYL ACETATE	10	4.9	12	U	11	U	16	U	15	U	17	U
% SOLIDS:			80.0		87.0		64.0		68.0		60.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

TCL VOLATILE SOILS (UG/KG)

CLIENT ID:			T3-A		T3-B		T4-A		T4-B		T5-A	
LABORATORY ID:			20715.09		20715.10		20730.03		20730.04		20730.05	
ANALYTE	CRQL	MDL										
CHLOROMETHANE	10	1.9	12	U	15	U	12	U	12	U	14	U
BROMOMETHANE	10	2.8	12	U	15	U	12	U	12	U	14	U
VINYL CHLORIDE	10	1.9	12	U	15	U	12	U	12	U	14	U
CHLOROETHANE	10	2.9	12	U	15	U	12	U	12	U	14	U
METHYLENE CHLORIDE	10	2.1	12	U	19	U	24	U	35	U	39	U
ACETONE	10	3.7	12	U	18	U	12	U	12	U	30	U
CARBON DISULFIDE	10	1.4	12	U	15	U	12	U	12	U	14	U
1,1-DICHLOROETHENE	10	1.1	12	U	15	U	12	U	12	U	14	U
1,1-DICHLOROETHANE	10	1.6	12	U	15	U	12	U	12	U	14	U
1,2-DICHLOROETHENE(TOTAL)	10	1.2	12	U	15	U	12	U	12	U	14	U
CHLOROFORM	10	1.3	12	U	15	U	12	U	12	U	14	U
1,2-DICHLOROETHANE	10	2.8	12	U	15	U	12	U	12	U	14	U
2-BUTANONE	10	3.9	12	U	15	U	12	U	12	U	17	U
1,1,1-TRICHLOROETHANE	10	0.6	12	U	15	U	12	U	12	U	14	U
CARBON TETRACHLORIDE	10	1.2	12	U	15	U	12	U	12	U	14	U
BROMODICHLOROMETHANE	10	0.7	12	U	15	U	12	U	12	U	14	U
1,2-DICHLOROPROPANE	10	1.0	12	U	15	U	12	U	12	U	14	U
CIS-1,3-DICHLOROPROPENE	10	1.0	12	U	15	U	12	U	12	U	14	U
TRICHLOROETHENE	10	1.1	12	U	15	U	12	U	12	U	14	U
DIBROMOCHLOROMETHANE	10	1.4	12	U	15	U	12	U	12	U	14	U
1,1,2-TRICHLOROETHANE	10	1.1	12	U	15	U	12	U	12	U	14	U
BENZENE	10	1.2	12	U	15	U	12	U	12	U	14	U
TRANS-1,3-DICHLOROPROPENE	10	0.9	12	U	15	U	12	U	12	U	14	U
BROMOFORM	10	2.5	12	U	15	U	12	U	12	U	14	U
4-METHYL-2-PENTANONE	10	4.0	12	U	15	U	12	U	12	U	14	U
2-HEXANONE	10	4.8	12	U	15	U	12	U	12	U	14	U
TETRACHLOROETHENE	10	1.3	12	U	15	U	12	U	12	U	14	U
1,1,2,2-TETRACHLOROETHANE	10	1.7	12	U	15	U	12	U	12	U	14	U
TOLUENE	10	0.9	12	U	3	J	12	U	12	U	14	U
CHLOROBENZENE	10	0.8	12	U	15	U	12	U	12	U	14	U
ETHYLBENZENE	10	2.6	12	U	15	U	12	U	12	U	14	U
STYRENE	10	0.9	12	U	15	U	12	U	12	U	14	U
XYLENE (TOTAL)	10	1.7	12	U	15	U	12	U	12	U	14	U
VINYL ACETATE	10	4.9	12	U	15	U	12	U	12	U	14	U
% SOLIDS:			84.0		66.0		96.0		83.0		69.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			T5-B		T6-A		DUP-05		T6-B		T7-A	
LABORATORY ID:			20730.06		20730.07		20730.08		20730.09		20730.13	
TCL VOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
CHLOROMETHANE	10	1.9	12	U	19	UJ	19	U	24	U	19	U
BROMOMETHANE	10	2.8	12	U	19	UJ	19	U	24	U	19	U
VINYL CHLORIDE	10	1.9	12	U	19	UJ	19	U	24	U	19	U
CHLOROETHANE	10	2.9	12	U	19	UJ	19	U	24	U	19	U
METHYLENE CHLORIDE	10	2.1	29	U	62	U	61	U	74	U	38	U
ACETONE	10	3.7	12	U	19	U	19	U	40	U	76	U
CARBON DISULFIDE	10	1.4	12	U	19	UJ	19	U	24	U	19	U
1,1-DICHLOROETHENE	10	1.1	12	U	19	UJ	19	U	24	U	19	U
1,1-DICHLOROETHANE	10	1.6	12	U	19	UJ	19	U	24	U	19	U
1,2-DICHLOROETHENE(TOTAL)	10	1.2	12	U	19	UJ	19	U	24	U	19	U
CHLOROFORM	10	1.3	12	U	19	UJ	19	U	24	U	19	U
1,2-DICHLOROETHANE	10	2.8	12	U	19	UJ	19	U	24	U	19	U
2-BUTANONE	10	3.9	12	U	19	UJ	19	U	21	U	37	U
1,1,1-TRICHLOROETHANE	10	0.6	12	U	19	UJ	19	U	24	U	19	U
CARBON TETRACHLORIDE	10	1.2	12	U	19	UJ	19	U	24	U	19	U
BROMODICHLOROMETHANE	10	0.7	12	U	19	UJ	19	U	24	U	19	U
1,2-DICHLOROPROPANE	10	1.0	12	U	19	UJ	19	U	24	U	19	U
CIS-1,3-DICHLOROPROPENE	10	1.0	12	U	19	UJ	19	U	24	U	19	U
TRICHLOROETHENE	10	1.1	12	U	19	UJ	19	U	24	U	19	U
DIBROMOCHLOROMETHANE	10	1.4	12	U	19	UJ	19	U	24	U	19	U
1,1,2-TRICHLOROETHANE	10	1.1	12	U	19	UJ	19	U	24	U	19	U
BENZENE	10	1.2	12	U	19	UJ	19	U	24	U	19	U
TRANS-1,3-DICHLOROPROPENE	10	0.9	12	U	19	UJ	19	U	24	U	19	U
BROMOFORM	10	2.5	12	U	19	UJ	19	U	24	U	19	U
4-METHYL-2-PENTANONE	10	4.0	12	U	19	UJ	19	UJ	24	UJ	19	U
2-HEXANONE	10	4.8	12	U	19	UJ	19	UJ	24	UJ	19	U
TETRACHLOROETHENE	10	1.3	12	U	19	UJ	19	UJ	24	UJ	19	U
1,1,2,2-TETRACHLOROETHANE	10	1.7	12	U	19	UJ	19	UJ	24	UJ	19	U
TOLUENE	10	0.9	12	U	3	J	3	J	24	UJ	5	J
CHLOROBENZENE	10	0.8	12	U	19	UJ	19	UJ	3	J	19	U
ETHYLBENZENE	10	2.6	12	U	19	UJ	19	UJ	24	UJ	19	U
STYRENE	10	0.9	12	U	19	UJ	19	UJ	24	UJ	19	U
XYLENE (TOTAL)	10	1.7	12	U	19	UJ	19	UJ	3	J	19	U
VINYL ACETATE	10	4.9	12	U	19	UJ	19	U	24	U	19	U
% SOLIDS:			86.0		53.0		52.0		41.0		53.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:	T7-B
LABORATORY ID:	20730.14

TCL VOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL		
CHLOROMETHANE	10	1.9	67	UR
BROMOMETHANE	10	2.8	67	UR
VINYL CHLORIDE	10	1.9	67	UR
CHLOROETHANE	10	2.9	67	UR
METHYLENE CHLORIDE	10	2.1	210	UR
ACETONE	10	3.7	260	UR
CARBON DISULFIDE	10	1.4	67	UR
1,1-DICHLOROETHENE	10	1.1	67	UR
1,1-DICHLOROETHANE	10	1.6	67	UR
1,2-DICHLOROETHENE(TOTAL)	10	1.2	67	UR
CHLOROFORM	10	1.3	67	UR
1,2-DICHLOROETHANE	10	2.8	67	UR
2-BUTANONE	10	3.9	120	UR
1,1,1-TRICHLOROETHANE	10	0.6	67	UR
CARBON TETRACHLORIDE	10	1.2	67	UR
BROMODICHLOROMETHANE	10	0.7	67	UR
1,2-DICHLOROPROPANE	10	1.0	67	UR
CIS-1,3-DICHLOROPROPENE	10	1.0	67	UR
TRICHLOROETHENE	10	1.1	67	UR
DIBROMOCHLOROMETHANE	10	1.4	67	UR
1,1,2-TRICHLOROETHANE	10	1.1	67	UR
BENZENE	10	1.2	67	UR
TRANS-1,3-DICHLOROPROPENE	10	0.9	67	UR
BROMOFORM	10	2.5	67	UR
4-METHYL-2-PENTANONE	10	4.0	67	UR
2-HEXANONE	10	4.8	67	UR
TETRACHLOROETHENE	10	1.3	67	UR
1,1,2,2-TETRACHLOROETHANE	10	1.7	67	UR
TOLUENE	10	0.9	67	UR
CHLOROBENZENE	10	0.8	14	J
ETHYLBENZENE	10	2.6	67	UR
STYRENE	10	0.9	67	UR
XYLENE (TOTAL)	10	1.7	67	UR
VINYL ACETATE	10	4.9	67	UR
% SOLIDS:			15.0	
DILUTION FACTOR:			1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

TCL VOLATILE SOILS (UG/KG)

CLIENT ID:			T8-A		T8-B		T9-A		T9-B		T10-A	
LABORATORY ID:			20748.13		20748.14		20748.15 RE		20748.16		20748.17	
ANALYTE	CRQL	MDL										
CHLOROMETHANE	10	1.9	21	U	22	U	17	U	21	U	14	U
BROMOMETHANE	10	2.8	21	U	22	U	17	U	21	U	14	U
VINYL CHLORIDE	10	1.9	21	U	22	U	17	U	21	U	14	U
CHLOROETHANE	10	2.9	21	U	22	U	17	U	21	U	14	U
METHYLENE CHLORIDE	10	2.1	21	U	42	U	17	U	21	U	14	U
ACETONE	10	3.7	67	U	110	U	90	U	21	U	25	U
CARBON DISULFIDE	10	1.4	21	U	22	U	17	U	3	J	14	U
1,1-DICHLOROETHENE	10	1.1	21	U	22	U	17	U	21	U	14	U
1,1-DICHLOROETHANE	10	1.6	21	U	22	U	17	U	21	U	14	U
1,2-DICHLOROETHENE (TOTAL)	10	1.2	21	U	22	U	17	U	21	U	14	U
CHLOROFORM	10	1.3	21	U	22	U	17	U	21	U	14	U
1,2-DICHLOROETHANE	10	2.8	21	U	22	U	17	U	21	U	14	U
2-BUTANONE	10	3.9	27	U	*1400		34	U	59		14	U
1,1,1-TRICHLOROETHANE	10	0.6	21	U	22	U	17	U	21	U	14	U
CARBON TETRACHLORIDE	10	1.2	21	U	22	U	17	U	21	U	14	U
BROMODICHLOROMETHANE	10	0.7	21	U	22	U	17	U	21	U	14	U
1,2-DICHLOROPROPANE	10	1.0	21	U	22	U	17	U	21	U	14	U
CIS-1,3-DICHLOROPROPENE	10	1.0	21	U	22	U	17	U	21	U	14	U
TRICHLOROETHENE	10	1.1	21	U	22	U	17	U	21	U	14	U
DIBROMOCHLOROMETHANE	10	1.4	21	U	22	U	17	U	21	U	14	U
1,1,2-TRICHLOROETHANE	10	1.1	21	U	22	U	17	U	21	U	14	U
BENZENE	10	1.2	21	U	22	U	17	U	21	U	14	U
TRANS-1,3-DICHLOROPROPENE	10	0.9	21	U	22	U	17	U	21	U	14	U
BROMOFORM	10	2.5	21	U	22	U	17	U	21	U	14	U
4-METHYL-2-PENTANONE	10	4.0	21	U	22	U	17	UJ	21	U	14	U
2-HEXANONE	10	4.8	21	U	22	U	17	UJ	21	U	14	U
TETRACHLOROETHENE	10	1.3	21	U	22	U	17	UJ	21	U	14	U
1,1,2,2-TETRACHLOROETHANE	10	1.7	21	U	22	U	17	UJ	21	U	14	U
TOLUENE	10	0.9	21	U	6	J	17	UJ	21	U	3	J
CHLOROBENZENE	10	0.8	21	U	22	U	17	UJ	21	U	14	U
ETHYLBENZENE	10	2.6	21	U	22	U	17	UJ	21	U	14	U
STYRENE	10	0.9	21	U	22	UJ	17	UJ	21	U	14	U
XYLENE (TOTAL)	10	1.7	21	U	22	UJ	17	UJ	21	U	14	U
VINYL ACETATE	10	4.9	21	U	22	U	17	U	21	U	14	U
% SOLIDS:			48.0		45.0		58.0		47.0		70.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID: T10-B
LABORATORY ID: 20748.18

TCL VOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL		
CHLOROMETHANE	10	1.9	22	U
BROMOMETHANE	10	2.8	22	U
VINYL CHLORIDE	10	1.9	22	U
CHLOROETHANE	10	2.9	22	U
METHYLENE CHLORIDE	10	2.1	32	U
ACETONE	10	3.7	67	U
CARBON DISULFIDE	10	1.4	12	J
1,1-DICHLOROETHENE	10	1.1	22	U
1,1-DICHLOROETHANE	10	1.6	22	U
1,2-DICHLOROETHENE (TOTAL)	10	1.2	22	U
CHLOROFORM	10	1.3	22	U
1,2-DICHLOROETHANE	10	2.8	22	U
2-BUTANONE	10	3.9	21	U
1,1,1-TRICHLOROETHANE	10	0.6	22	U
CARBON TETRACHLORIDE	10	1.2	22	U
BROMODICHLOROMETHANE	10	0.7	22	U
1,2-DICHLOROPROPANE	10	1.0	22	U
CIS-1,3-DICHLOROPROPENE	10	1.0	22	U
TRICHLOROETHENE	10	1.1	22	U
DIBROMOCHLOROMETHANE	10	1.4	22	U
1,1,2-TRICHLOROETHANE	10	1.1	22	U
BENZENE	10	1.2	22	U
TRANS-1,3-DICHLOROPROPENE	10	0.9	22	U
BROMOFORM	10	2.5	22	U
4-METHYL-2-PENTANONE	10	4.0	22	U
2-HEXANONE	10	4.8	22	U
TETRACHLOROETHENE	10	1.3	22	U
1,1,2,2-TETRACHLOROETHANE	10	1.7	22	U
TOLUENE	10	0.9	22	U
CHLOROBENZENE	10	0.8	22	U
ETHYLBENZENE	10	2.6	22	U
STYRENE	10	0.9	22	UJ
XYLENE (TOTAL)	10	1.7	22	UJ
VINYL ACETATE	10	4.9	22	U
% SOLIDS:			45.0	
DILUTION FACTOR:			1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

TCL SEMIVOLATILE SOILS (UG/KG)

CLIENT ID:			T1-A		T1-B		T2-A		DUP-03		T2-B	
LABORATORY ID:			20715.04		20715.05 RE		20715.06		20715.07 RE		20715.08	
ANALYTE	CRQL	MDL										
PHENOL	330	75	410	U	380	U	520	U	480	U	550	U
BIS(2-CHLOROETHYL)ETHER	330	63	410	U	380	U	520	U	480	U	550	U
2-CHLOROPHENOL	330	65	410	U	380	U	520	U	480	U	550	U
1,3-DICHLOROBENZENE	330	57	410	U	380	U	520	U	480	U	550	U
1,4-DICHLOROBENZENE	330	55	410	U	380	U	520	U	480	U	550	U
1,2-DICHLOROBENZENE	330	65	410	U	380	U	520	U	480	U	550	U
2-METHYLPHENOL	330	23	410	U	380	U	520	U	480	U	550	U
BIS(2-CHLOROISOPROPYL)ETHER	330	195	410	U	380	U	520	U	480	U	550	U
4-METHYLPHENOL	330	60	410	U	380	U	520	U	480	U	550	U
N-NITROSO-DI-N-PROPYLAMINE	330	100	410	U	380	U	520	U	480	U	550	U
HEXACHLOROETHANE	330	52	410	U	380	U	520	U	480	U	550	U
NITROBENZENE	330	21	410	U	380	UJ	520	U	480	UJ	550	U
ISOPHORONE	330	46	410	U	380	UJ	520	U	480	UJ	550	U
2-NITROPHENOL	330	29	410	U	380	UJ	520	U	480	UJ	550	U
2,4-DIMETHYLPHENOL	330	78	410	U	380	UJ	520	U	480	UJ	550	U
2,4-DICHLOROPHENOL	330	42	410	U	380	UJ	520	U	480	UJ	550	U
1,2,4-TRICHLOROBENZENE	330	52	410	U	380	UJ	520	U	480	UJ	550	U
NAPHTHALENE	330	45	410	U	380	UJ	520	U	480	UJ	550	U
4-CHLOROANILINE	330	89	410	U	380	UJ	520	U	480	UJ	550	U
BIS(2-CHLOROETHOXY)METHANE	330	35	410	U	380	UJ	520	U	480	UJ	550	U
HEXACHLOROBUTADIENE	330	78	410	U	380	UJ	520	U	480	UJ	550	U
4-CHLORO-3-METHYLPHENOL	330	41	410	U	380	UJ	520	U	480	UJ	550	U
2-METHYLNAPHTHALENE	330	29	410	U	380	UJ	520	U	480	UJ	550	U
HEXACHLOROCYCLOPENTADIENE	330	259	410	U	380	UJ	520	U	480	UJ	550	U
2,4,6-TRICHLOROPHENOL	330	54	410	U	380	UJ	520	U	480	UJ	550	U
2,4,5-TRICHLOROPHENOL	800	83	1000	U	920	UJ	1200	U	1200	UJ	1300	U
2-CHLORONAPHTHALENE	330	33	410	U	380	UJ	520	U	480	UJ	550	U
2-NITROANILINE	800	60	1000	U	920	UJ	1200	U	1200	UJ	1300	U
DIMETHYL PHTHALATE	330	25	410	U	380	UJ	520	U	480	UJ	550	U
ACENAPHTHYLENE	330	29	410	U	380	UJ	520	U	480	UJ	550	U
2,6-DINITROTOLUENE	330	39	410	U	380	UJ	520	U	480	UJ	550	U
3-NITROANILINE	800	164	1000	U	920	UJ	1200	U	1200	UJ	1300	U
ACENAPHTHENE	330	37	410	U	380	UJ	30	J	91	J	550	U

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

TCL SEMIVOLATILE SOILS (UG/KG)

CLIENT ID:			T1-A		T1-B		T2-A		DUP-03		T2-B	
LABORATORY ID:			20715.04		20715.05 RE		20715.06		20715.07 RE		20715.08	
ANALYTE	CRQL	MDL										
2,4-DINITROPHENOL	800	87	1000	UJ	920	UJ	1200	U	1200	UJ	1300	U
4-NITROPHENOL	800	68	1000	U	920	UJ	1200	U	1200	UJ	1300	U
DIBENZOFURAN	330	28	410	U	380	UJ	520	U	44	J	550	U
2,4-DINITROTOLUENE	330	46	410	U	380	UJ	520	U	480	UJ	550	U
DIETHYLPHTHALATE	330	37	410	U	380	UJ	520	U	480	UJ	550	U
4-CHLOROPHENYL-PHENYL ETHER	330	61	410	U	380	UJ	520	U	480	UJ	550	U
FLUORENE	330	30	410	U	380	UJ	37	J	95	J	550	U
4-NITROANILINE	800	89	1000	U	920	UJ	1200	U	1200	UJ	1300	U
4,6-DINITRO-2-METHYLPHENOL	800	68	1000	U	920	U	1200	U	1200	U	1300	U
N-NITROSODIPHENYLAMINE	330	31	410	U	380	U	520	U	480	U	550	U
4-BROMOPHENYL-PHENYL ETHER	330	96	410	U	380	U	520	U	480	U	550	U
HEXACHLOROBENZENE	330	95	410	U	380	U	520	U	480	U	550	U
PENTACHLOROPHENOL	800	287	1000	U	240	J	1200	U	1200	U	1300	U
PHENANTHRENE	330	45	43	J	190	J	260	J	920	J	230	J
ANTHRACENE	330	56	410	U	40	J	71	J	200	J	58	J
CARBAZOLE	330	73	410	U	380	U	32	J	480	U	550	U
DI-N-BUTYL PHTHALATE	330	43	410	U	380	U	520	U	31	J	550	U
FLUORANTHENE	330	41	110	J	240	J	490	J	1000	J	450	J
PYRENE	330	92	96	J	470		560	J	2000	J	620	
3,3'-DICHLOROBENZIDINE	330	80	410	U	380	U	520	U	480	U	550	U
BUTYLBENZYL PHTHALATE	330	86	410	U	380	U	520	U	480	U	550	U
BENZO(A)ANTHRACENE	330	29	45	J	180	J	260	J	680	J	260	J
CHRYSENE	330	27	65	J	220	J	340	J	780	J	350	J
BIS(2-ETHYLHEXYL)PHTHALATE	330	91	410	U	380	U	520	U	480	U	550	U
DI-N-OCTYL PHTHALATE	330	43	410	U	380	U	520	U	480	U	550	U
BENZO(B)FLUORANTHENE	330	142	54	J	220	J	310	J	660	J	550	U
BENZO(K)FLUORANTHENE	330	166	62	J	150	J	220	J	520	J	440	J
BENZO(A)PYRENE	330	31	55	J	190	J	290	J	690	J	300	J
INDENO(1,2,3-CD)PYRENE	330	67	41	J	140	J	200	J	550	J	200	J
DIBENZ(A,H)ANTHRACENE	330	81	410	U	380	U	100	J	310	J	87	J
BENZO(G,H,I)PERYLENE	330	66	50	J	160	J	230	J	630	J	240	J
BENZYL ALCOHOL	330	81	410	U	380	U	520	U	480	U	550	U
BENZOIC ACID	1700	69	2100	U	2000	U	2600	U	2500	U	2800	U
% SOLIDS:			80.0		87.0		64.0		68.0		60.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			T3-A		T3-B		T4-A		T4-B		T5-A	
LABORATORY ID:			20715.09		20715.10		20730.03		20730.04		20730.05	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
PHENOL	330	75	390	U	500	U	380	U	400	U	480	U
BIS(2-CHLOROETHYL)ETHER	330	63	390	U	500	U	380	U	400	U	480	U
2-CHLOROPHENOL	330	65	390	U	500	U	380	U	400	U	480	U
1,3-DICHLOROBENZENE	330	57	390	U	500	U	380	U	400	U	480	U
1,4-DICHLOROBENZENE	330	55	390	U	500	U	380	U	400	U	480	U
1,2-DICHLOROBENZENE	330	65	390	U	500	U	380	U	400	U	480	U
2-METHYLPHENOL	330	23	390	U	500	U	380	U	400	U	480	U
BIS(2-CHLOROISOPROPYL)ETHER	330	195	390	U	500	U	380	U	400	U	480	U
4-METHYLPHENOL	330	60	390	U	500	U	380	U	400	U	480	U
N-NITROSO-DI-N-PROPYLAMINE	330	100	390	U	500	U	380	U	400	U	480	U
HEXACHLOROETHANE	330	52	390	U	500	U	380	U	400	U	480	U
NITROBENZENE	330	21	390	U	500	U	380	U	400	U	480	U
ISOPHORONE	330	46	390	U	500	U	380	U	400	U	480	U
2-NITROPHENOL	330	29	390	U	500	U	380	U	400	U	480	U
2,4-DIMETHYLPHENOL	330	78	390	U	500	U	380	U	400	U	480	U
2,4-DICHLOROPHENOL	330	42	390	U	500	U	380	U	400	U	480	U
1,2,4-TRICHLOROBENZENE	330	52	390	U	500	U	380	U	400	U	480	U
NAPHTHALENE	330	45	56	J	500	U	380	U	400	U	76	J
4-CHLOROANILINE	330	89	390	U	500	U	380	U	400	U	480	U
BIS(2-CHLOROETHOXY)METHANE	330	35	390	U	500	U	380	U	400	U	480	U
HEXACHLOROBUTADIENE	330	78	390	U	500	U	380	U	400	U	480	U
4-CHLORO-3-METHYLPHENOL	330	41	390	U	500	U	380	U	400	U	480	U
2-METHYLNAPHTHALENE	330	29	55	J	500	U	380	U	400	U	480	U
HEXACHLOROCYCLOPENTADIENE	330	259	390	U	500	U	380	U	400	U	480	U
2,4,6-TRICHLOROPHENOL	330	54	390	U	500	U	380	U	400	U	480	U
2,4,5-TRICHLOROPHENOL	800	83	950	U	1200	U	930	U	960	U	1200	U
2-CHLORONAPHTHALENE	330	33	390	U	500	U	380	U	400	U	480	U
2-NITROANILINE	800	60	950	U	1200	U	930	U	960	U	1200	U
DIMETHYL PHTHALATE	330	25	390	U	500	U	380	U	400	U	480	U
ACENAPHTHYLENE	330	29	390		70	J	380	U	400	U	34	J
2,6-DINITROTOLUENE	330	39	390	U	500	U	380	U	400	U	480	U
3-NITROANILINE	800	164	950	U	1200	U	930	U	960	U	1200	U
ACENAPHTHENE	330	37	58	J	500	U	380	U	400	U	220	J

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			T3-A		T3-B		T4-A		T4-B		T5-A	
LABORATORY ID:			20715.09		20715.10		20730.03		20730.04		20730.05	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
2,4-DINITROPHENOL	800	87	950	U	1200	UJ	930	UJ	960	UJ	1200	UJ
4-NITROPHENOL	800	68	950	U	1200	U	930	U	960	U	1200	U
DIBENZOFURAN	330	28	35	J	500	U	380	U	400	U	72	J
2,4-DINITROTOLUENE	330	46	390	U	500	U	380	U	400	U	480	U
DIETHYLPHTHALATE	330	37	390	U	500	U	380	U	400	U	480	U
4-CHLOROPHENYL-PHENYL ETHER	330	61	390	U	500	U	380	U	400	U	480	U
FLUORENE	330	30	160	J	38	J	21	J	400	U	29	J
4-NITROANILINE	800	89	950	U	1200	U	930	U	960	U	1200	U
4,6-DINITRO-2-METHYLPHENOL	800	68	950	U	1200	U	930	U	960	U	1200	U
N-NITROSODIPHENYLAMINE	330	31	390	U	500	U	380	U	400	U	480	U
4-BROMOPHENYL-PHENYL ETHER	330	96	390	U	500	U	380	U	400	U	480	U
HEXACHLOROBENZENE	330	95	390	U	500	U	380	U	400	U	480	U
PENTACHLOROPHENOL	800	287	950	U	1200	U	930	U	960	U	1200	U
PHENANTHRENE	330	45	1800		320	J	180	J	93	J	240	J
ANTHRACENE	330	56	450		90	J	45	J	400	U	43	J
CARBAZOLE	330	73	57	J	32	J	25	J	400	U	130	J
DI-N-BUTYL PHTHALATE	330	43	390	U	63	J	26	J	23	J	44	J
FLUORANTHENE	330	41	*4200		890		260	J	180	J	520	
PYRENE	330	92	*4600		910		220	J	150	J	440	J
3,3'-DICHLOROBENZIDINE	330	80	390	U	500	U	380	U	400	U	480	U
BUTYLBENZYL PHTHALATE	330	86	390	U	61	J	21	J	400	U	480	U
BENZO(A)ANTHRACENE	330	29	*3000		480	J	120	J	77	J	180	J
CHRYSENE	330	27	*3700		590		150	J	90	J	280	J
BIS(2-ETHYLHEXYL)PHTHALATE	330	91	400	U	500	U	380	U	400	U	480	U
DI-N-OCTYL PHTHALATE	330	43	390	U	500	U	380	U	400	U	480	U
BENZO(B)FLUORANTHENE	330	142	390	U	420	J	130	J	85	J	210	J
BENZO(K)FLUORANTHENE	330	166	*3700		510		130	J	75	J	270	J
BENZO(A)PYRENE	330	31	2600		480	J	130	J	74	J	220	J
INDENO(1,2,3-CD)PYRENE	330	67	1000		300	J	92	J	57	J	180	J
DIBENZ(A,H)ANTHRACENE	330	81	390	U	170	J	380	U	400	U	480	U
BENZO(G,H,I)PERYLENE	330	66	1100		320	J	100	J	66	J	230	J
BENZYL ALCOHOL	330	81	390	U	500	U	380	U	400	U	480	U
BENZOIC ACID	1700	69	2000	U	2600	U	1800	U	2000	U	2400	U
% SOLIDS:			84.0		66.0		96.0		83.0		69.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

TCL SEMIVOLATILE SOILS (UG/KG)

CLIENT ID:			T5-B		T6-A		DUP-05		T6-B		T7-A	
LABORATORY ID:			20730.06		20730.07		20730.08 RE		20730.09 RE		20730.13	
ANALYTE	CRQL	MDL										
PHENOL	330	75	380	U	620	U	630	UJ	800	UJ	620	U
BIS(2-CHLOROETHYL)ETHER	330	63	380	U	620	U	630	UJ	800	UJ	620	U
2-CHLOROPHENOL	330	65	380	U	620	U	630	UJ	800	UJ	620	U
1,3-DICHLOROBENZENE	330	57	380	U	620	U	630	UJ	800	UJ	620	U
1,4-DICHLOROBENZENE	330	55	380	U	620	U	630	UJ	42	J	620	U
1,2-DICHLOROBENZENE	330	65	380	U	620	U	630	UJ	800	UJ	620	U
2-METHYLPHENOL	330	23	380	U	620	U	630	UJ	800	UJ	620	U
BIS(2-CHLOROISOPROPYL)ETHER	330	195	380	U	620	U	630	UJ	800	UJ	620	U
4-METHYLPHENOL	330	60	380	U	620	U	630	UJ	800	UJ	620	U
N-NITROSO-DI-N-PROPYLAMINE	330	100	380	U	620	U	630	UJ	800	UJ	620	U
HEXACHLOROETHANE	330	52	380	U	620	U	630	UJ	800	UJ	620	U
NITROBENZENE	330	21	380	U	620	U	630	UJ	800	UJ	620	U
ISOPHORONE	330	46	380	U	620	U	630	UJ	800	UJ	620	U
2-NITROPHENOL	330	29	380	U	620	U	630	UJ	800	UJ	620	U
2,4-DIMETHYLPHENOL	330	78	380	U	620	U	630	UJ	800	UJ	620	U
2,4-DICHLOROPHENOL	330	42	380	U	620	U	630	UJ	800	UJ	620	U
1,2,4-TRICHLOROBENZENE	330	52	380	U	620	U	630	UJ	800	UJ	620	U
NAPHTHALENE	330	45	380	U	620	U	630	UJ	800	UJ	620	U
4-CHLOROANILINE	330	89	380	U	620	U	630	UJ	800	UJ	620	U
BIS(2-CHLOROETHOXY)METHANE	330	35	380	U	620	U	630	UJ	800	UJ	620	U
HEXACHLOROBUTADIENE	330	78	380	U	620	U	630	UJ	800	UJ	620	U
4-CHLORO-3-METHYLPHENOL	330	41	380	U	620	U	630	UJ	800	UJ	620	U
2-METHYLNAPHTHALENE	330	29	380	U	620	U	630	UJ	800	UJ	620	U
HEXACHLOROCYCLOPENTADIENE	330	259	380	U	620	U	630	UJ	800	UJ	620	U
2,4,6-TRICHLOROPHENOL	330	54	380	U	620	U	630	UJ	800	UJ	620	U
2,4,5-TRICHLOROPHENOL	800	83	930	U	1500	U	1500	UJ	2000	UJ	1500	U
2-CHLORONAPHTHALENE	330	33	380	U	620	U	630	UJ	800	UJ	620	U
2-NITROANILINE	800	60	930	U	1500	U	1500	UJ	2000	UJ	1500	U
DIMETHYL PHTHALATE	330	25	380	U	620	U	630	UJ	800	UJ	620	U
ACENAPHTHYLENE	330	29	380	U	52	J	630	UJ	800	UJ	620	U
2,6-DINITROTOLUENE	330	39	380	U	620	U	630	UJ	800	UJ	620	U
3-NITROANILINE	800	164	930	U	1500	U	1500	UJ	2000	UJ	1500	U
ACENAPHTHENE	330	37	380	U	620	U	630	UJ	110	J	77	J

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			T5-B		T6-A		DUP-05		T6-B		T7-A	
LABORATORY ID:			20730.06		20730.07		20730.08 RE		20730.09 RE		20730.13	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
2,4-DINITROPHENOL	800	87	930	UJ	1500	UJ	1500	UJ	2000	UJ	1500	U
4-NITROPHENOL	800	68	930	U	1500	U	1500	UJ	2000	UJ	1500	U
DIBENZOFURAN	330	28	380	U	620	U	630	UJ	68	J	55	J
2,4-DINITROTOLUENE	330	46	380	U	620	U	630	UJ	800	UJ	620	U
DIETHYLPHTHALATE	330	37	380	U	620	U	630	UJ	800	UJ	620	U
4-CHLOROPHENYL-PHENYL ETHER	330	61	380	U	620	U	630	UJ	800	UJ	620	U
FLUORENE	330	30	380	U	620	U	630	UJ	69	J	90	J
4-NITROANILINE	800	89	930	U	1500	U	1500	UJ	2000	UJ	1500	U
4,6-DINITRO-2-METHYLPHENOL	800	68	930	U	1500	U	1500	UJ	2000	U	1500	U
N-NITROSODIPHENYLAMINE	330	31	380	U	620	U	630	UJ	800	U	620	U
4-BROMOPHENYL-PHENYL ETHER	330	96	380	U	620	U	630	UJ	800	U	620	U
HEXACHLOROBENZENE	330	95	380	U	620	U	630	UJ	800	U	620	U
PENTACHLOROPHENOL	800	287	930	U	1500	U	1500	UJ	2000	U	1500	U
PHENANTHRENE	330	45	22	J	200	J	220	J	140	J	350	J
ANTHRACENE	330	56	380	U	56	J	34	J	800	U	79	J
CARBAZOLE	330	73	380	U	43	J	630	UJ	800	U	620	U
DI-N-BUTYL PHTHALATE	330	43	26	J	56	J	34	J	800	U	33	J
FLUORANTHENE	330	41	56	J	500	J	330	J	200	J	650	
PYRENE	330	92	46	J	470	J	900	J	370	J	530	J
3,3'-DICHLOROBENZIDINE	330	80	380	U	620	U	630	U	800	U	620	U
BUTYLBENZYL PHTHALATE	330	86	380	U	50	J	630	U	800	U	620	U
BENZO(A)ANTHRACENE	330	29	25	J	190	J	280	J	140	J	390	J
CHRYSENE	330	27	38	J	300	J	430	J	230	J	410	J
BIS(2-ETHYLHEXYL)PHTHALATE	330	91	380	U	620	U	630	U	800	U	620	U
DI-N-OCTYL PHTHALATE	330	43	380	U	620	U	630	U	800	U	620	U
BENZO(B)FLUORANTHENE	330	142	44	J	220	J	390	J	240	J	430	J
BENZO(K)FLUORANTHENE	330	166	380	U	330	J	240	J	140	J	320	J
BENZO(A)PYRENE	330	31	30	J	230	J	310	J	160	J	430	J
INDENO(1,2,3-CD)PYRENE	330	67	22	J	210	J	330	J	220	J	360	J
DIBENZ(A,H)ANTHRACENE	330	81	380	U	86	J	630	U	800	U	130	J
BENZO(G,H,I)PERYLENE	330	66	27	J	250	J	420	J	290	J	350	J
BENZYL ALCOHOL	330	81	380	U	620	U	630	U	800	U	620	U
BENZOIC ACID	1700	69	2000	U	3200	U	3200	U	4100	U	3200	U
% SOLIDS:			86.0		53.0		52.0		41.0		53.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID: T7-B
LABORATORY ID: 20730.14

TCL SEMIVOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL		
PHENOL	330	75	2200	UR
BIS(2-CHLOROETHYL)ETHER	330	63	2200	UR
2-CHLOROPHENOL	330	65	2200	UR
1,3-DICHLOROBENZENE	330	57	2200	UR
1,4-DICHLOROBENZENE	330	55	2200	UR
1,2-DICHLOROBENZENE	330	65	2200	UR
2-METHYLPHENOL	330	23	2200	UR
BIS(2-CHLOROISOPROPYL)ETHER	330	195	2200	UR
4-METHYLPHENOL	330	60	2200	UR
N-NITROSO-DI-N-PROPYLAMINE	330	100	2200	UR
HEXACHLOROETHANE	330	52	2200	UR
NITROBENZENE	330	21	2200	UR
ISOPHORONE	330	46	2200	UR
2-NITROPHENOL	330	29	2200	UR
2,4-DIMETHYLPHENOL	330	78	2200	UR
2,4-DICHLOROPHENOL	330	42	2200	UR
1,2,4-TRICHLOROBENZENE	330	52	2200	UR
NAPHTHALENE	330	45	2200	UR
4-CHLOROANILINE	330	89	2200	UR
BIS(2-CHLOROETHOXY)METHANE	330	35	2200	UR
HEXACHLOROBUTADIENE	330	78	2200	UR
4-CHLORO-3-METHYLPHENOL	330	41	2200	UR
2-METHYLNAPHTHALENE	330	29	2200	UR
HEXACHLOROCYCLOPENTADIENE	330	259	2200	UR
2,4,6-TRICHLOROPHENOL	330	54	2200	UR
2,4,5-TRICHLOROPHENOL	800	83	5300	UR
2-CHLORONAPHTHALENE	330	33	2200	UR
2-NITROANILINE	800	60	5300	UR
DIMETHYL PHTHALATE	330	25	2200	UR
ACENAPHTHYLENE	330	29	2200	UR
2,6-DINITROTOLUENE	330	39	2200	UR
3-NITROANILINE	800	164	5300	UR
ACENAPHTHENE	330	37	380	J

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID: T7-B
LABORATORY ID: 20730.14

TCL SEMIVOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL		
2,4-DINITROPHENOL	800	87	5300	UR
4-NITROPHENOL	800	68	5300	UR
DIBENZOFURAN	330	28	280	J
2,4-DINITROTOLUENE	330	46	2200	UR
DIETHYLPHTHALATE	330	37	2200	UR
4-CHLOROPHENYL-PHENYL ETHER	330	61	2200	UR
FLUORENE	330	30	340	J
4-NITROANILINE	800	89	5300	UR
4,6-DINITRO-2-METHYLPHENOL	800	68	5300	UR
N-NITROSODIPHENYLAMINE	330	31	2200	UR
4-BROMOPHENYL-PHENYL ETHER	330	96	2200	UR
HEXACHLOROBENZENE	330	95	2200	UR
PENTACHLOROPHENOL	800	287	5300	UR
PHENANTHRENE	330	45	300	J
ANTHRACENE	330	56	2200	UR
CARBAZOLE	330	73	2200	UR
DI-N-BUTYL PHTHALATE	330	43	2200	UR
FLUORANTHENE	330	41	560	J
PYRENE	330	92	450	J
3,3'-DICHLOROBENZIDINE	330	80	2200	UR
BUTYLBENZYL PHTHALATE	330	86	390	J
BENZO(A)ANTHRACENE	330	29	240	J
CHRYSENE	330	27	340	J
BIS(2-ETHYLHEXYL)PHTHALATE	330	91	4900	UR
DI-N-OCTYL PHTHALATE	330	43	2200	UR
BENZO(B)FLUORANTHENE	330	142	370	J
BENZO(K)FLUORANTHENE	330	166	270	J
BENZO(A)PYRENE	330	31	340	J
INDENO(1,2,3-CD)PYRENE	330	67	350	J
DIBENZ(A,H)ANTHRACENE	330	81	2200	UR
BENZO(G,H,I)PERYLENE	330	66	340	J
BENZYL ALCOHOL	330	81	2200	UR
BENZOIC ACID	1700	69	11000	UR

% SOLIDS: 15.0
DILUTION FACTOR: 1.0

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			T8-A		T8-B		T9-A		T9-B		T10-A	
LABORATORY ID:			20748.13		20748.14		20748.15		20748.16		20748.17	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
PHENOL	330	75	690	U	730	U	570	U	700	U	470	U
BIS(2-CHLOROETHYL)ETHER	330	63	690	U	730	U	570	U	700	U	470	U
2-CHLOROPHENOL	330	65	690	U	730	U	570	U	700	U	470	U
1,3-DICHLOROBENZENE	330	57	690	U	730	U	570	U	700	U	470	U
1,4-DICHLOROBENZENE	330	55	690	U	730	U	570	U	700	U	470	U
1,2-DICHLOROBENZENE	330	65	690	U	730	U	570	U	700	U	470	U
2-METHYLPHENOL	330	23	690	U	730	U	570	U	700	U	470	U
2,2'-OXYBIS(1-CHLOROPROPANE)	330	195	690	U	730	U	570	U	700	U	470	U
4-METHYLPHENOL	330	60	690	U	730	U	43	J	700	U	470	U
N-NITROSO-DI-N-PROPYLAMINE	330	100	690	U	730	U	570	U	700	U	470	U
HEXACHLOROETHANE	330	52	690	U	730	U	570	U	700	U	470	U
NITROBENZENE	330	21	690	U	730	U	570	U	700	U	470	U
ISOPHORONE	330	46	690	U	730	U	570	U	700	U	470	U
2-NITROPHENOL	330	29	690	U	730	U	570	U	700	U	470	U
2,4-DIMETHYLPHENOL	330	78	690	U	210	J	570	U	700	U	470	U
2,4-DICHLOROPHENOL	330	42	690	U	730	U	570	U	700	U	470	U
1,2,4-TRICHLOROBENZENE	330	52	690	U	730	U	570	U	700	U	470	U
NAPHTHALENE	330	45	57	J	730	U	77	J	700	U	73	J
4-CHLOROANILINE	330	89	690	U	730	U	570	U	700	U	470	U
BIS(2-CHLOROETHOXY)METHANE	330	35	690	U	730	U	570	U	700	U	470	U
HEXACHLOROBUTADIENE	330	78	690	U	730	U	570	U	700	U	470	U
4-CHLORO-3-METHYLPHENOL	330	41	690	U	730	U	570	U	700	U	470	U
2-METHYLNAPHTHALENE	330	29	49	J	730	U	51	J	700	U	40	J
HEXACHLOROCYCLOPENTADIENE	330	259	690	U	730	U	570	U	700	U	470	U
2,4,6-TRICHLOROPHENOL	330	54	690	U	730	U	570	U	700	U	470	U
2,4,5-TRICHLOROPHENOL	800	83	1700	U	1800	U	1400	U	1700	U	1100	U
2-CHLORONAPHTHALENE	330	33	690	U	730	U	570	U	700	U	470	U
2-NITROANILINE	800	60	1700	U	1800	U	1400	U	1700	U	1100	U
DIMETHYL PHTHALATE	330	25	690	U	730	U	570	U	700	U	470	U
ACENAPHTHYLENE	330	29	690	U	730	U	570	U	700	U	470	U
2,6-DINITROTOLUENE	330	39	690	U	730	U	570	U	700	U	470	U
3-NITROANILINE	800	164	1700	U	1800	U	1400	U	1700	U	1100	U
ACENAPHTHENE	330	37	35	J	730	U	48	J	700	U	110	J

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			T8-A		T8-B		T9-A		T9-B		T10-A	
LABORATORY ID:			20748.13		20748.14		20748.15		20748.16		20748.17	
TCL SEMIVOLATILE SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
2,4-DINITROPHENOL	800	87	1700	U	1800	U	1400	U	1700	U	1100	U
4-NITROPHENOL	800	68	1700	U	1800	U	1400	U	1700	U	1100	U
DIBENZOFURAN	330	28	40	J	730	U	35	J	700	U	62	J
2,4-DINITROTOLUENE	330	46	690	U	730	U	570	U	700	U	470	U
DIETHYL PHTHALATE	330	37	690	U	730	U	570	U	700	U	470	U
4-CHLOROPHENYL-PHENYLETHER	330	61	690	U	730	U	570	U	700	U	470	U
FLUORENE	330	30	79	J	730	U	47	J	700	U	83	J
4-NITROANILINE	800	89	1700	U	1800	U	1400	U	1700	U	1100	U
4,6-DINITRO-2-METHYLPHENOL	800	68	1700	U	1800	U	1400	U	1700	U	1100	U
N-NITROSODIPHENYLAMINE	330	31	690	U	730	U	570	U	700	U	470	U
4-BROMOPHENYL-PHENYLETHER	330	96	690	U	730	U	570	U	700	U	470	U
HEXACHLOROBENZENE	330	95	690	U	730	U	570	U	700	U	470	U
PENTACHLOROPHENOL	800	287	1700	U	1800	U	1400	U	1700	U	1100	U
PHENANTHRENE	330	45	260	J	180	J	160	J	140	J	280	J
ANTHRACENE	330	56	71	J	38	J	34	J	52	J	48	J
CARBAZOLE	330	56	690	U	730	U	570	U	700	U	470	U
DI-N-BUTYL PHTHALATE	330	43	690	U	730	U	570	U	700	U	470	U
FLUORANTHENE	330	41	520	J	310	J	160	J	220	J	490	
PYRENE	330	92	1300		630	J	430	J	690	J	720	
BUTYLBENZYL PHTHALATE	330	86	690	U	730	U	570	UJ	700	U	36	J
3,3'-DICHLOROBENZIDINE	330	80	690	U	730	U	570	UJ	700	U	470	U
BENZO(A)ANTHRACENE	330	29	370	J	210	J	140	J	230	J	290	J
CHRYSENE	330	27	490	J	280	J	230	J	260	J	360	J
BIS(2-ETHYLHEXYL)PHTHALATE	330	91	690	U	730	U	570	U	700	U	470	U
DI-N-OCTYL PHTHALATE	330	43	690	UJ	730	U	570	UJ	700	U	470	U
BENZO(B)FLUORANTHENE	330	142	370	J	210	J	130	J	240	J	270	J
BENZO(K)FLUORANTHENE	330	166	350	J	210	J	140	J	200	J	300	J
BENZO(A)PYRENE	330	31	340	J	210	J	160	J	260	J	320	J
INDENO(1,2,3-CD)PYRENE	330	67	260	J	150	J	140	J	170	J	260	J
DIBENZ(A,H)ANTHRACENE	330	81	690	UJ	730	U	72	J	700	U	470	U
BENZO(G,H,I)PERYLENE	330	66	300	J	180	J	220	J	190	J	290	J
BENZYL ALCOHOL	330	81	690	UJ	730	U	570	UJ	700	U	470	U
BENZOIC ACID	1700	69	3500	U	3800	U	3000	U	3600	U	2500	U
% SOLIDS:			48.0		45.0		58.0		47.0		70.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID: T10-B
LABORATORY ID: 20748.18

TCL SEMIVOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL		
PHENOL	330	75	730	U
BIS(2-CHLOROETHYL)ETHER	330	63	730	U
2-CHLOROPHENOL	330	65	730	U
1,3-DICHLOROBENZENE	330	57	730	U
1,4-DICHLOROBENZENE	330	55	730	U
1,2-DICHLOROBENZENE	330	65	730	U
2-METHYLPHENOL	330	23	730	U
2,2'-OXYBIS(1-CHLOROPROPANE)	330	195	730	U
4-METHYLPHENOL	330	60	730	U
N-NITROSO-DI-N-PROPYLAMINE	330	100	730	U
HEXACHLOROETHANE	330	52	730	U
NITROBENZENE	330	21	730	U
ISOPHORONE	330	46	730	U
2-NITROPHENOL	330	29	730	U
2,4-DIMETHYLPHENOL	330	78	730	U
2,4-DICHLOROPHENOL	330	42	730	U
1,2,4-TRICHLOROBENZENE	330	52	730	U
NAPHTHALENE	330	45	730	U
4-CHLOROANILINE	330	89	730	U
BIS(2-CHLOROETHOXY)METHANE	330	35	730	U
HEXACHLOROBUTADIENE	330	78	730	U
4-CHLORO-3-METHYLPHENOL	330	41	730	U
2-METHYLNAPHTHALENE	330	29	730	U
HEXACHLOROCYCLOPENTADIENE	330	259	730	U
2,4,6-TRICHLOROPHENOL	330	54	730	U
2,4,5-TRICHLOROPHENOL	800	83	1800	U
2-CHLORONAPHTHALENE	330	33	730	U
2-NITROANILINE	800	60	1800	U
DIMETHYL PHTHALATE	330	25	730	U
ACENAPHTHYLENE	330	29	730	U
2,6-DINITROTOLUENE	330	39	730	U
3-NITROANILINE	800	164	1800	U
ACENAPHTHENE	330	37	730	U

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID: T10-B
LABORATORY ID: 20748.18

TCL SEMIVOLATILE SOILS (UG/KG)

ANALYTE	CRQL	MDL		
2,4-DINITROPHENOL	800	87	1800	U
4-NITROPHENOL	800	68	1800	U
DIBENZOFURAN	330	28	730	U
2,4-DINITROTOLUENE	330	46	730	U
DIETHYL PHTHALATE	330	37	730	U
4-CHLOROPHENYL-PHENYLETHER	330	61	730	U
FLUORENE	330	30	730	U
4-NITROANILINE	800	89	1800	U
4,6-DINITRO-2-METHYLPHENOL	800	68	1800	U
N-NITROSODIPHENYLAMINE	330	31	730	U
4-BROMOPHENYL-PHENYLETHER	330	96	730	U
HEXACHLOROBENZENE	330	95	730	U
PENTACHLOROPHENOL	800	287	1800	U
PHENANTHRENE	330	45	79	J
ANTHRACENE	330	56	730	U
CARBAZOLE	330	56	730	U
DI-N-BUTYL PHTHALATE	330	43	730	U
FLUORANTHENE	330	41	100	J
PYRENE	330	92	320	J
BUTYLBENZYL PHTHALATE	330	86	730	U
3,3'-DICHLOROBENZIDINE	330	80	730	U
BENZO(A)ANTHRACENE	330	29	90	J
CHRYSENE	330	27	110	J
BIS(2-ETHYLHEXYL)PHTHALATE	330	91	3500	J
DI-N-OCTYL PHTHALATE	330	43	730	U
BENZO(B)FLUORANTHENE	330	142	110	J
BENZO(K)FLUORANTHENE	330	166	120	J
BENZO(A)PYRENE	330	31	110	J
INDENO(1,2,3-CD)PYRENE	330	67	86	J
DIBENZ(A,H)ANTHRACENE	330	81	730	U
BENZO(G,H,I)PERYLENE	330	66	730	U
BENZYL ALCOHOL	330	81	730	U
BENZOIC ACID	1700	69	3800	U

% SOLIDS: 45.0
DILUTION FACTOR: 1.0

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

TCL PESTICIDE/PCB SOILS (UG/KG)

CLIENT ID:			T1-A		T1-B		T2-A		DUP-03		T2-B	
LABORATORY ID:			20715.04		20715.05		20715.06		20715.07		20715.08	
ANALYTE	CRQL	MDL										
ALPHA-BHC	1.7	0.07	2.1	U	2.0	U	2.7	U	2.5	U	2.8	U
BETA-BHC	1.7	0.15	2.1	U	2.0	U	2.7	U	2.5	U	2.8	U
DELTA-BHC	1.7	0.07	2.1	U	2.0	U	2.7	U	2.5	U	2.8	U
GAMMA-BHC (LINDANE)	1.7	0.07	2.1	U	2.0	U	2.7	U	2.5	U	2.8	U
HEPTACHLOR	1.7	0.16	2.8	J	2.0	U	2.7	U	2.5	U	2.8	U
ALDRIN	1.7	0.07	2.1	U	2.0	U	2.7	U	2.5	U	2.8	U
HEPTACHLOR EPOXIDE	1.7	0.05	3.7	J	4.5		2.7	U	2.5	U	3.7	J
ENDOSULFAN I	1.7	0.08	2.4	J	2.1	J	2.7	U	2.5	U	2.8	U
DIELDRIN	3.3	0.24	4.1	U	3.8	U	5.2	U	4.9	U	5.5	U
4,4'-DDE	3.3	0.10	4.1	U	3.8	U	30	J	13	J	19	J
ENDRIN	3.3	0.15	4.1	U	3.8	U	5.2	U	4.9	U	5.5	U
ENDOSULFAN II	3.3	0.13	4.1	U	3.8	U	31	J	4.9	UJ	6.9	J
4,4'-DDD	3.3	0.09	9.0	J	12	R	*650	J	*250	J	*210	J
ENDOSULFAN SULFATE	3.3	2.9	4.1	U	3.8	U	5.2	U	4.9	U	5.5	U
4,4'-DDT	3.3	0.14	15	R	45		44		60	J	*88	J
METHOXYCHLOR	17	0.66	21	U	20	U	27	U	25	U	28	U
ENDRIN KETONE	3.3	0.12	4.1	U	3.8	U	5.2	U	4.9	U	5.5	U
ENDRIN ALDEHYDE	3.3	0.10	4.1	U	5.6	J	16	J	4.9	UJ	5.5	U
ALPHA-CHLORDANE	1.7	0.12	4.8	J	2.9	J	2.7	U	2.5	U	7.6	
GAMMA-CHLORDANE	1.7	0.09	5.7	J	3.7	J	4.8	J	2.5	UJ	5.1	
TOXAPHENE	170	1.0	210	U	200	U	270	U	250	U	280	U
AROCLOR-1016	33	1.0	41	U	38	U	52	U	49	U	55	U
AROCLOR-1221	67	1.3	84	U	77	U	100	U	99	U	110	U
AROCLOR-1232	33	0.33	41	U	38	U	52	U	49	U	55	U
AROCLOR-1242	33	0.33	41	U	38	U	52	U	49	U	55	U
AROCLOR-1248	33	1.3	41	U	38	U	52	U	49	U	55	U
AROCLOR-1254	33	1.7	41	U	38	U	52	U	49	U	55	U
AROCLOR-1260	33	1.3	150	J	180		52	U	49	U	55	U
% SOLIDS:			80.0		87.0		64.0		68.0		60.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			T3-A		T3-B		T4-A		T4-B		T5-A	
LABORATORY ID:			20715.09		20715.10		20730.03		20730.04		20730.05	
TCL PESTICIDE/PCB SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
ALPHA-BHC	1.7	0.07	20	U	26	U	2.0	U	2.0	U	12	U
BETA-BHC	1.7	0.15	20	U	26	U	2.0	UJ	2.0	UJ	2.7	J
DELTA-BHC	1.7	0.07	20	U	26	U	2.0	U	2.0	U	4.2	J
GAMMA-BHC (LINDANE)	1.7	0.07	20	U	26	U	2.0	U	2.0	U	3.5	J
HEPTACHLOR	1.7	0.16	20	U	26	U	2.0	U	2.0	U	4.5	J
ALDRIN	1.7	0.07	20	U	26	U	2.0	U	2.0	U	3.2	J
HEPTACHLOR EPOXIDE	1.7	0.05	20	U	26	U	2.0	U	2.0	U	2.2	J
ENDOSULFAN I	1.7	0.08	11	J	26	U	2.0	U	2.0	U	12	U
DIELDRIN	3.3	0.24	39	U	50	U	3.8	U	4.0	U	8.4	J
4,4'-DDE	3.3	0.10	260		330		3.8	U	4.0	U	57	J
ENDRIN	3.3	0.15	39	U	50	U	3.8	U	4.0	U	16	J
ENDOSULFAN II	3.3	0.13	39	U	50	U	3.8	U	4.0	U	24	U
4,4'-DDD	3.3	0.09	390		*1400		3.8	U	4.5	J	*1300	
ENDOSULFAN SULFATE	3.3	2.9	14	J	50	U	3.8	U	4.0	U	6.9	J
4,4'-DDT	3.3	0.14	*890		*2900		3.8	U	4.0	U	380	
METHOXYCHLOR	17	0.66	200	U	260	U	20	U	20	U	38	J
ENDRIN KETONE	3.3	0.12	39	U	50	U	3.8	U	4.0	U	20	J
ENDRIN ALDEHYDE	3.3	0.10	39	U	16	J	3.8	UJ	4.0	UJ	10	J
ALPHA-CHLORDANE	1.7	0.12	4.4	J	12	J	2.0	U	2.0	U	13	
GAMMA-CHLORDANE	1.7	0.09	20	U	13	J	2.0	U	2.0	U	8.7	J
TOXAPHENE	170	1.0	2000	U	2600	U	200	U	200	U	1200	U
AROCLOR-1016	33	1.0	390	U	500	U	38	U	40	U	240	U
AROCLOR-1221	67	1.3	800	U	1000	U	78	U	81	U	490	U
AROCLOR-1232	33	0.33	390	U	500	U	38	U	40	U	240	U
AROCLOR-1242	33	0.33	390	U	500	U	38	U	40	U	240	U
AROCLOR-1248	33	1.3	390	U	500	U	38	U	40	U	240	U
AROCLOR-1254	33	1.7	390	U	500	U	38	U	40	U	240	U
AROCLOR-1260	33	1.3	390	U	500	U	38	U	40	U	240	U
% SOLIDS:			84.0		66.0		96.0		83.0		69.0	
DILUTION FACTOR:			10.0		10.0		1.0		1.0		5.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			T5-B		T6-A		DUP-05		T6-B		T7-A	
LABORATORY ID:			20730.06		20730.07		20730.08		20730.09		20730.13	
TCL PESTICIDE/PCB SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
ALPHA-BHC	1.7	0.07	2.0	U	3.2	U	3.3	U	4.1	U	3.2	U
BETA-BHC	1.7	0.15	2.0	UJ	3.2	U	3.3	U	4.1	U	3.2	U
DELTA-BHC	1.7	0.07	2.0	U	3.2	U	3.3	U	4.1	U	3.2	U
GAMMA-BHC (LINDANE)	1.7	0.07	2.0	U	3.2	U	3.3	U	4.1	U	3.2	U
HEPTACHLOR	1.7	0.16	2.0	U	3.2	U	3.3	U	4.1	U	3.2	U
ALDRIN	1.7	0.07	2.0	U	3.2	U	3.3	U	4.1	U	3.2	U
HEPTACHLOR EPOXIDE	1.7	0.05	2.0	U	3.2	U	3.3	U	4.1	U	3.2	U
ENDOSULFAN I	1.7	0.08	2.0	U	3.2	U	3.3	U	4.1	U	3.2	U
DIELDRIN	3.3	0.24	3.8	U	26		23		8.0	U	6.2	U
4,4'-DDE	3.3	0.10	3.8	U	10	J	15	J	38		6.2	U
ENDRIN	3.3	0.15	3.8	U	8.2	J	7.8	J	8.0	U	6.2	U
ENDOSULFAN II	3.3	0.13	3.8	U	48	R	50	R	17	R	6.2	U
4,4'-DDD	3.3	0.09	3.8	U	46	R	49	R	*410		6.2	U
ENDOSULFAN SULFATE	3.3	2.9	3.8	U	9.7	R	10	R	8.0	U	6.2	U
4,4'-DDT	3.3	0.14	4.4	J	55	R	39	R	8.0	U	6.2	U
METHOXYCHLOR	17	0.66	20	U	31	R	39	R	41	U	32	U
ENDRIN KETONE	3.3	0.12	3.8	U	5.4	R	12	R	8.0	U	6.2	U
ENDRIN ALDEHYDE	3.3	0.10	3.8	UJ	22	R	23	R	8.0	U	6.2	U
ALPHA-CHLORDANE	1.7	0.12	2.0	U	29		29		15	P	3.2	U
GAMMA-CHLORDANE	1.7	0.09	2.0	U	21	J	23	J	11	J	3.2	U
TOXAPHENE	170	1.0	200	U	320	U	330	U	410	U	320	U
AROCLOR-1016	33	1.0	38	U	62	U	63	U	80	U	62	U
AROCLOR-1221	67	1.3	78	U	130	U	130	U	160	U	130	U
AROCLOR-1232	33	0.33	38	U	62	U	63	U	80	U	62	U
AROCLOR-1242	33	0.33	38	U	62	U	63	U	80	U	62	U
AROCLOR-1248	33	1.3	38	U	62	U	63	U	80	U	62	U
AROCLOR-1254	33	1.7	38	U	62	U	63	U	80	U	62	U
AROCLOR-1260	33	1.3	38	U	1400		1500		530		82	J
% SOLIDS:			86.0		53.0		52.0		41.0		53.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID: T7-B
LABORATORY ID: 20730.14

TCL PESTICIDE/PCB SOILS (UG/KG)

ANALYTE	CRQL	MDL		
ALPHA-BHC	1.7	0.07	11	UR
BETA-BHC	1.7	0.15	11	UR
DELTA-BHC	1.7	0.07	11	UR
GAMMA-BHC (LINDANE)	1.7	0.07	11	UR
HEPTACHLOR	1.7	0.16	11	UR
ALDRIN	1.7	0.07	11	UR
HEPTACHLOR EPOXIDE	1.7	0.05	11	UR
ENDOSULFAN I	1.7	0.08	11	UR
DIELDRIN	3.3	0.24	22	UR
4,4'-DDE	3.3	0.10	140	J
ENDRIN	3.3	0.15	22	UR
ENDOSULFAN II	3.3	0.13	22	UR
4,4'-DDD	3.3	0.09	22	UR
ENDOSULFAN SULFATE	3.3	2.9	22	UR
4,4'-DDT	3.3	0.14	23	R
METHOXYCHLOR	17	0.66	110	UR
ENDRIN KETONE	3.3	0.12	22	UR
ENDRIN ALDEHYDE	3.3	0.10	22	UR
ALPHA-CHLORDANE	1.7	0.12	22	J
GAMMA-CHLORDANE	1.7	0.09	11	UR
TOXAPHENE	170	1.0	1100	UR
AROCLOR-1016	33	1.0	220	UR
AROCLOR-1221	67	1.3	450	UR
AROCLOR-1232	33	0.33	220	UR
AROCLOR-1242	33	0.33	220	UR
AROCLOR-1248	33	1.3	220	UR
AROCLOR-1254	33	1.7	220	UR
AROCLOR-1260	33	1.3	550	J
% SOLIDS:			15.0	
DILUTION FACTOR:			1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			T8-A		T8-B		T9-A		T9-B		T10-A	
LABORATORY ID:			20748.13		20748.14		20748.15		20748.16		20748.17	
TCL PESTICIDE/PCB SOILS (UG/KG)												
ANALYTE	CRQL	MDL										
ALPHA-BHC	1.7	0.07	3.5	U	3.8	U	2.9	U	3.6	U	2.4	U
BETA-BHC	1.7	0.15	3.5	UJ	3.8	UJ	2.9	UJ	3.6	UJ	2.4	UJ
DELTA-BHC	1.7	0.07	3.5	U	3.8	U	2.9	U	3.6	U	2.4	U
GAMMA-BHC (LINDANE)	1.7	0.07	3.5	UJ	3.8	UJ	2.9	UJ	3.6	UJ	2.4	UJ
HEPTACHLOR	1.7	0.16	3.5	U	3.8	U	2.9	U	3.6	U	2.4	U
ALDRIN	1.7	0.07	3.5	UJ	3.8	UJ	2.9	UJ	3.6	UJ	2.4	UJ
HEPTACHLOR EPOXIDE	1.7	0.05	3.5	U	3.8	U	2.9	U	3.6	U	2.4	U
ENDOSULFAN I	1.7	0.08	3.5	U	3.8	U	2.9	U	3.6	U	4.8	J
DIELDRIN	3.3	0.24	6.9	U	7.3	U	5.7	U	7.0	U	4.7	U
4,4'-DDE	3.3	0.10	19	J	7.3	UJ	49	J	7.0	UJ	23	J
ENDRIN	3.3	0.15	6.9	U	7.3	U	5.7	U	7.0	U	4.7	U
ENDOSULFAN II	3.3	0.13	6.9	U	7.3	U	5.7	U	7.0	U	4.7	U
4,4'-DDD	3.3	0.09	86	J	7.3	UJ	*630	J	7.0	UJ	190	J
ENDOSULFAN SULFATE	3.3	2.9	6.9	U	7.3	U	5.7	U	7.0	U	4.7	U
4,4'-DDT	3.3	0.14	6.9	UR	7.3	UJ	5.7	UR	7.0	UJ	85	J
METHOXYCHLOR	17	0.66	35	UJ	38	UJ	29	UJ	36	UJ	24	UJ
ENDRIN KETONE	3.3	0.12	6.9	U	7.3	U	5.7	U	7.0	U	4.7	U
ENDRIN ALDEHYDE	3.3	0.1	6.9	U	7.3	U	5.7	U	7.0	U	4.7	U
ALPHA-CHLORDANE	1.7	0.12	3.5	U	3.8	U	6.0	J	3.6	U	5.5	J
GAMMA-CHLORDANE	1.7	0.09	3.5	U	3.8	U	2.9	U	3.6	U	4.5	J
TOXAPHENE	170	1.0	350	U	380	U	290	U	360	U	240	U
AROCLOR-1016	33	1.0	69	U	73	U	57	U	70	U	47	U
AROCLOR-1221	67	1.3	140	U	150	U	120	U	140	U	96	U
AROCLOR-1232	33	0.33	69	U	73	U	57	U	70	U	47	U
AROCLOR-1242	33	0.33	69	U	73	U	57	U	70	U	47	U
AROCLOR-1248	33	1.3	69	U	73	U	57	U	70	U	47	U
AROCLOR-1254	33	1.7	69	U	73	U	57	U	70	U	47	U
AROCLOR-1260	33	1.3	69	U	73	U	57	U	70	U	47	U
% SOLIDS:			48.0		45.0		58.0		47.0		70.0	
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:
LABORATORY ID: T10-B
20748.18

TCL PESTICIDE/PCB SOILS (UG/KG)

ANALYTE	CRQL	MDL		
ALPHA-BHC	1.7	0.07	3.8	U
BETA-BHC	1.7	0.15	3.8	UJ
DELTA-BHC	1.7	0.07	3.8	U
GAMMA-BHC (LINDANE)	1.7	0.07	3.8	UJ
HEPTACHLOR	1.7	0.16	3.8	U
ALDRIN	1.7	0.07	3.8	UJ
HEPTACHLOR EPOXIDE	1.7	0.05	3.8	U
ENDOSULFAN I	1.7	0.08	3.8	U
DIELDRIN	3.3	0.24	7.3	U
4,4'-DDE	3.3	0.10	7.4	J
ENDRIN	3.3	0.15	7.3	U
ENDOSULFAN II	3.3	0.13	7.3	U
4,4'-DDD	3.3	0.09	35	J
ENDOSULFAN SULFATE	3.3	2.9	7.3	U
4,4'-DDT	3.3	0.14	7.3	UR
METHOXYCHLOR	17	0.66	38	UJ
ENDRIN KETONE	3.3	0.12	7.3	U
ENDRIN ALDEHYDE	3.3	0.1	7.3	U
ALPHA-CHLORDANE	1.7	0.12	3.8	U
GAMMA-CHLORDANE	1.7	0.09	3.8	U
TOXAPHENE	170	1.0	380	U
AROCLOR-1016	33	1.0	73	U
AROCLOR-1221	67	1.3	150	U
AROCLOR-1232	33	0.33	73	U
AROCLOR-1242	33	0.33	73	U
AROCLOR-1248	33	1.3	73	U
AROCLOR-1254	33	1.7	73	U
AROCLOR-1260	33	1.3	73	U
% SOLIDS:			45.0	
DILUTION FACTOR:			1.0	

* RESULT FROM DILUTION ANALYSIS

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			T1-A		T1-B		T2-A		DUP-03		T2-B	
LABORATORY ID:			20715.04		20715.05		20715.06		20715.07		20715.08	
TAL METAL SOILS (MG/KG)												
ANALYTE	CRQL	IDL										
ALUMINUM	20	0.9	3530		4240		4470		4700		6020	
ANTIMONY	6	0.4	0.48	J	0.48	UJ	0.72	J	0.62	UJ	0.62	UJ
ARSENIC	1	0.6	1.9		1.6		2.5		2.5		2.2	
BARIUM	20	0.1	27.9		33.9		46.7		56.5		73.8	
BERYLLIUM	0.5	0.1	0.23		0.24		0.48		0.70		0.32	
BORON	5	0.3	0.35	U	0.36	U	2.2	U	7.6	U	0.46	UJ
CADMIUM	0.5	0.1	0.29		0.12	J	0.29		0.46		0.30	
CALCIUM	500	1.1	1130		1240		1510		1510		1300	
CHROMIUM	1	0.1	8.1		9.6		15.2		16.9		19.5	
COBALT	5	0.1	3.6		4.3		6.8		8.4		5.0	
COPPER	2.5	0.2	79.6		45.5		104		101		44.9	
IRON	10	0.7	5980		7740		10300		15600		12500	
LEAD	0.3	0.2	23.9		28.7		123		142		42.0	
MAGNESIUM	500	1.2	1750		2120		1940		2000		2860	
MANGANESE	1.5	0.1	132		125		78.8		99.7		132	
MERCURY	0.1	0.1	0.12	UR	0.36	J	0.17	J	0.24	J	0.32	J
NICKEL	4	0.1	6.6	J	9.1	J	61.5	J	53.0	J	17.0	J
POTASSIUM	500	1.3	890		1080		1120		1070		1890	
SELENIUM	0.5	0.5	0.58	UJ	0.60	UJ	0.68	UJ	0.77	UJ	0.77	UJ
SILVER	1	0.1	0.37		0.73		0.17	J	0.22		0.15	U
SODIUM	500	0.9	114		215		512		556		516	
THALLIUM	1	0.6	0.70	U	0.72	U	0.82	U	0.92	U	0.92	U
VANADIUM	5	0.1	17.2	J	13.2	J	161	J	183	J	66.4	J
ZINC	2	0.1	63.6	J	100	J	225	J	378	J	95.4	J
CYANIDE	0.5	0.5										
% SOLIDS:			85.7		83.7		73.0		65.0		65.0	

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			T3-A		T3-B		T4-A		T4-B		T5-A	
LABORATORY ID:			20715.09		20715.10		20730.03		20730.04		20730.05	
TAL METAL SOILS (MG/KG)												
ANALYTE	CRQL	IDL										
ALUMINUM	20	0.9	3820		5040		3670		2980		5080	
ANTIMONY	6	0.4	0.53	UJ	0.58	UJ	0.47	UJ	0.47	UJ	0.60	UJ
ARSENIC	1	0.6	3.0		2.6		1.4		1.4		2.1	
BARIUM	20	0.1	28.8		38.4		29.2		41.1		59.4	
BERYLLIUM	0.5	0.1	0.21	J	0.33		0.16	J	0.14	J	0.26	J
BORON	5	0.3	0.40	U	0.51	U	0.35	U	0.36	U	1.3	U
CADMIUM	0.5	0.1	0.26		0.43		0.12	U	0.21	J	0.15	U
CALCIUM	500	1.1	900		868		1060		934		1630	
CHROMIUM	1	0.1	8.6		11.1		8.0		7.0		15.0	
COBALT	5	0.1	4.4		7.9		3.0		3.2		4.2	
COPPER	2.5	0.2	34.5		52.6		14.7		36.7		28.4	
IRON	10	0.7	9390		8020		5800		5630		10600	
LEAD	0.3	0.2	32.1		61.5		26.5		32.4		40.6	
MAGNESIUM	500	1.2	1650		2200		1770		1570		2280	
MANGANESE	1.5	0.1	310		99.8		90.1		55.3		101	
MERCURY	0.1	0.1	0.15	J	0.19	J	0.12	UR	0.12	UR	0.15	UR
NICKEL	4	0.1	8.6	J	18.9	J	6.7	J	10.3	J	13.8	J
POTASSIUM	500	1.3	813		1100		1120		926		1290	
SELENIUM	0.5	0.5	0.67	UJ	0.73	UJ	0.59	UJ	0.59	UJ	0.75	UJ
SILVER	1	0.1	0.13	U	0.15	U	0.12	U	0.12	U	0.15	U
SODIUM	500	0.9	285		1050		250		462		2480	
THALLIUM	1	0.6	0.80	U	0.87	U	0.71	U	0.71	U	0.90	U
VANADIUM	5	0.1	17.0	J	18.5	J	12.8	J	11.2	J	37.4	J
ZINC	2	0.1	87.4	J	284	J	39.2	J	45.1	J	68.2	J
CYANIDE	0.5	0.5					1.5		0.59	U	0.90	J
% SOLIDS:			74.8		68.6		84.6		84.5		66.7	

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

TAL METAL SOILS (MG/KG)

CLIENT ID:			T5-B		T6-A		DUP-05		T6-B		T7-A	
LABORATORY ID:			20730.06		20730.07		20730.08		20730.09		20730.13	
ANALYTE	CRQL	IDL										
ALUMINUM	20	0.9	2690		15800		14800		9820		7150	
ANTIMONY	6	0.4	0.47	UJ	0.85	UJ	0.77	UJ	1.1	J	1.2	J
ARSENIC	1	0.6	1.0	J	7.2		8.1		4.8		2.5	
BARIUM	20	0.1	11.9		113		120		94.1		124	
BERYLLIUM	0.5	0.1	0.14	J	1.3		1.2		1.3		0.28	J
BORON	5	0.3	0.35	U	0.64	UJ	0.58	UJ	0.77	UJ	0.90	U
CADMIUM	0.5	0.1	0.12	U	0.72		0.63		0.68		0.23	J
CALCIUM	500	1.1	1220		3290		2960		2230		3350	
CHROMIUM	1	0.1	7.7		44.5		49.8		40.2		13.7	
COBALT	5	0.1	3.3		10.0		9.2		4.7		8.1	
COPPER	2.5	0.2	19.5		133		114		82.0		33.8	
IRON	10	0.7	5660		47500		53100		35700		19200	
LEAD	0.3	0.2	16.2		141		109		78.4		17.4	
MAGNESIUM	500	1.2	1820		5550		4800		2660		4170	
MANGANESE	1.5	0.1	89.3		285		271		134		154	
MERCURY	0.1	0.1	0.12	UR	0.21	UR	0.43	J	1.2	J	0.44	J
NICKEL	4	0.1	8.5	J	29.0	J	26.2	J	15.8	J	12.2	J
POTASSIUM	500	1.3	659		2980		2650		1490		3000	
SELENIUM	0.5	0.5	0.58	UJ	1.1	UJ	2.2	J	1.3	UJ	1.1	UJ
SILVER	1	0.1	0.12	U	0.96		0.81		0.85		0.22	U
SODIUM	500	0.9	388		1130		966		725		926	
THALLIUM	1	0.6	0.70	U	1.3	U	1.2	U	1.5	U	1.3	U
VANADIUM	5	0.1	8.9	J	176	J	152	J	120	J	38.2	J
ZINC	2	0.1	35.0	J	213	J	195	J	172	J	76.3	J
CYANIDE	0.5	0.5	0.90	J	2.0	J	2.1		1.8	J	1.1	U
% SOLIDS:			85.7		46.8		51.8		39.0		46.3	

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID: T7-B
LABORATORY ID: 20730.14

TAL METAL SOILS (MG/KG)

ANALYTE	CRQL	IDL		
ALUMINUM	20	0.9	27100	J
ANTIMONY	6	0.4	3.1	UR
ARSENIC	1	0.6	8.1	J
BARIUM	20	0.1	318	J
BERYLLIUM	0.5	0.1	4.1	J
BORON	5	0.3	2.3	UR
CADMIUM	0.5	0.1	1.6	J
CALCIUM	500	1.1	5330	J
CHROMIUM	1	0.1	44.3	J
COBALT	5	0.1	13.6	J
COPPER	2.5	0.2	173	J
IRON	10	0.7	198000	J
LEAD	0.3	0.2	110	J
MAGNESIUM	500	1.2	3900	J
MANGANESE	1.5	0.1	269	J
MERCURY	0.1	0.1	0.76	UR
NICKEL	4	0.1	47.7	J
POTASSIUM	500	1.3	2030	J
SELENIUM	0.5	0.5	6.8	J
SILVER	1	0.1	0.86	J
SODIUM	500	0.9	1410	J
THALLIUM	1	0.6	4.6	UR
VANADIUM	5	0.1	203	J
ZINC	2	0.1	702	J
CYANIDE	0.5	0.5	6.1	J
% SOLIDS:			13.1	

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			T8-A		T8-B		T9-A		T9-B		T10-A	
LABORATORY ID:			20748.13		20748.14		20748.15		20748.16		20748.17	
TAL METAL SOILS (MG/KG)												
ANALYTE	CRDL	IDL										
ALUMINUM	20	0.9	14200		19900		18100		15100		6700	
ANTIMONY	6	0.4	0.84	U	0.95	U	0.72	U	0.85	U	0.56	U
ARSENIC	1	0.6	11.0		14.1		7.2		10.8		3.4	
BARIUM	20	0.1	53.4		77.9		86.8		47.7		57.0	
BERYLLIUM	0.5	0.1	0.66		0.98		0.81		0.73		0.24	J
BORON	5	0.3	28.7		39.3		14.7		39.6		2.1	U
CADMIUM	0.5	0.1	0.41	J	0.47	J	0.57		0.43	J	0.37	
CALCIUM	500	1.1	2790		3610		2640		4110		1650	
CHROMIUM	1	0.1	80.3		96.8		48.5		59.9		15.4	
COBALT	5	0.1	8.1		9.6		8.1		9.0		3.9	
COPPER	2.5	0.2	48.4		64.2		48.1		37.2		31.4	
IRON	10	0.7	24500		37100		25500		30300		12400	
LEAD	0.3	0.2	61.2		66.6		40.6		39.3		71.3	
MAGNESIUM	500	1.2	7230		9150		6100		8450		2770	
MANGANESE	1.5	0.1	240		338		313		355		121	
MERCURY	0.1	0.1	0.40	U	0.51	U	0.27	U	0.21	UJ	0.28	U
NICKEL	4	0.1	21.7		27.8		20.7		23.8		12.7	
POTASSIUM	500	68.9	3880	J	5170	J	3300	J	4410	J	1630	J
SELENIUM	0.5	0.5	2.2	J	3.0	J	1.8	J	1.9	J	0.70	U
SILVER	1	0.1	0.33	J	0.47	J	0.18	J	0.21	U	0.14	U
SODIUM	500	14.3	2980		3320		1930		4980		253	
THALLIUM	1	0.6	1.3	U	1.4	U	1.1	U	1.3	U	0.84	U
VANADIUM	5	0.1	45.3		59.5		49.0		43.8		38.7	
ZINC	2	0.1	73.0	J	95.5	J	132	J	82.8	J	133	J
CYANIDE	0.5	0.5	1.1	UJ	1.2	UJ	0.90	UJ	1.1	UJ	0.70	UJ
% SOLIDS:			48.0		42.0		55.0		47.0		71.0	

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID: T10-B
LABORATORY ID: 20748.18

TAL METAL SOILS (MG/KG)

ANALYTE	CRDL	IDL		
ALUMINUM	20	0.9	12800	
ANTIMONY	6	0.4	0.81	U
ARSENIC	1	0.6	9.1	
BARIUM	20	0.1	42.9	
BERYLLIUM	0.5	0.1	0.62	
BORON	5	0.3	29.5	
CADMIUM	0.5	0.1	0.34	J
CALCIUM	500	1.1	3330	
CHROMIUM	1	0.1	39.9	
COBALT	5	0.1	7.7	
COPPER	2.5	0.2	18.8	
IRON	10	0.7	27500	
LEAD	0.3	0.2	16.1	
MAGNESIUM	500	1.2	7340	
MANGANESE	1.5	0.1	323	
MERCURY	0.1	0.1	0.28	U
NICKEL	4	0.1	20.8	
POTASSIUM	500	68.9	3770	J
SELENIUM	0.5	0.5	1.5	J
SILVER	1	0.1	0.20	U
SODIUM	500	14.3	3870	
THALLIUM	1	0.6	1.2	U
VANADIUM	5	0.1	39.1	
ZINC	2	0.1	66.5	J
CYANIDE	0.5	0.5	1.0	UJ
% SOLIDS:			50.0	

NEW LONDON NSB

CASE NUS, SDG 20715

TABLE II. Tentatively Identified Compound Summary

TIC	EB-2	EB-3	FB-2	TB-6	TB-7	T1-A	T1-B
Unknown organic acid			X				X
Unknown alkane						X	X
Unknown amide							X
Benzaldehyde, 4-hydroxy-3-methoxy	X		X				
Benzo[e]pyrene						X	X
28-Nor-17.alpha.(H)-hopane						X	
4H-cyclopenta[def]phenanthrene							X

NEW LONDON NSB

CASE NUS, SDG 20715

TABLE II. Tentatively Identified Compound Summary

TIC	T2-A	DUP-03	T2-B	T3-A	T3-B	T4-A	T4-B
Unknown organic acid	X	X	X		X	X	
Unknown alkane	X	X	X		X	X	X
Unknown cycloalkane					X	X	
Unknown amide	X	X	X				
Unknown aldehyde						X	
Unknown hydrocarbon						X	
Unknown PAH					X		X
Anthracene, 2-methyl-	X			X	X		
Benzo[e]pyrene	X	X	X				
6H-cyclobuta[JK]-Phenanthrene	X	X					
DDMU	X						
.gamma. -Sitosterol	X		X		X	X	
Mitotane	X	X	X		X		
Naphthalene,1,2,3,4,4a,5,6,8a-octhydro-4a,8-dimethyl-2-(1-methylethenyl)-	X						
Stigmasterol	X						
3-Penten-2-one, 4-methyl-		X					
Phenanthrene, 4-methyl-		X					
9,10-Anthracenedione		X					
11H-Benzo[b]fluorene		X		X	X		
o,p'-DDT			X		X		
Anthracene, 1-methyl-				X			
Phenanthrene, 3,6-dimethyl-				X			
Phenanthrene, 2,3-dimethyl-				X			
Phenanthrene, 2,5-dimethyl-				X			
Cyclopenta(def)phenanthrene				X			
p,p'-DDE				X			
Pyrene, 2-methyl-				X			
Pyrene, 1,3-dimethyl-				X			
7H-Benz[de]anthracen-7-one				X			

NEW LONDON NSB

CASE NUS, SDG 20715

TABLE II. Tentatively Identified Compound Summary

TIC	T2-A	DUP-03	T2-B	T3-A	T3-B	T4-A	T4-B
Chrysene, 5-methyl-				X			
Phenanthrene, 4,5-dimethylanthracene					X		
2,2-Bis(p-chlorophenyl)ethanol					X		
Benzo[b]naphtho[1,2-d]thiophene					X		

NEW LONDON NSB

CASE NUS, SDG 20715

TABLE II. Tentatively Identified Compound Summary

TIC	T5-A	T5-B	T6-A	DUP-05	T6-B	T7-A	T7-B
Unknown organic acid	X	X	X		X	X	X
Unknown alkane	X	X	X	X	X	X	X
Unknown hydrocarbon			X			X	
Unknown PAH	X						
11H-Benzo[b]fluorene	X						
1,1-Dichloro-2,2-bis-(p-chlorophenyl)ethane	X						
Dibenzo[c,h] [2,6]-naphthyridine	X						
.gamma. -Sitosterol	X						
Mitotane	X						
2-Pentene, 2,3-dimethyl-		X					
Anthracene, 2-methyl-				X			
Benzo[e]pyrene				X			
28-Nor-17.alpha.(H)-hopane				X			
1,2-Benzenediol						X	
Salicyl alcohol						X	
Oleic acid						X	
Cholesterol						X	X
Cholestan-3-ol, 4-methyl-, (3.beta., 4.alpha., 5.alpha.)-						X	
Stigmasterol						X	
Cyclohexane, pentyl-							X
Stigmast-4-en-3-one							X
Androst-4-en-3-one, 17-hydroxy-(10.alpha., 17.beta.)-							X

NEW LONDON NSB

CASE NUS, SDG 20748

TABLE II. Tentatively Identified Compound Summary

TIC	EB-4	T8-A	T8-B	T9-A	T9-B	T10-A
VOA						
Unknown Hydrocarbon		X				
2-Butanol			X			
SVOA						
Unknown Alkane	X	X	X	X	X	X
Unknown Organic Acid	X		X	X	X	X
Unknown Amide		X		X		
Unknown Hydrocarbon		X		X	X	
Unknown PAH		X				X
Unknown Alcohol					X	
Phenol, 2-methoxy-	X					
Vanillin	X					
6,10,14-Hexadecatrien-1-ol,3,7,11,15-tetramethyl-						
Butanoic Acid		X				X
Octanoic Acid		X				
Cyclohexane, Octyl-		X				
.gamma. -Sitosterol		X	X	X	X	X
Decahydro-4,4,8,9,10-pentamethylnaphthalene			X	X		X
Phenol, 3-octyl-			X			
Hexadecanoic acid			X			
Perylene			X		X	
1,1'-Biphenyl, 3,3',4,4',5,5'-hexamethyl				X		
Urs-20-en-16-ol, (16 .beta., 18 .alpha., 19 .alpha.)-				X		X
Stigmast-4-en-3-one				X		X
4H-Cyclopenta[def]phenanthrene						X
Squalene						X
Benzo[e]pyrene						X
Baccharane				X		X

NEW LONDON NSB

CASE NUS, SDG 20748

TABLE II. Tentatively Identified Compound Summary

TIC	EB-4	T8-A	T8-B	T9-A	T9-B	T10-A
28-Nor-17 .beta. (H)-hopane						X
Stigmasterol						X
Ergostanol						X

NEW LONDON NSB

CASE NUS, SDG 20748

TABLE II. Tentatively Identified Compound Summary

TIC	T10-B
Unknown Alkane	X
Unknown Alkene	X
Unkown Cycloalkane	X
Unknown Hydrocarbon	
Unknown Organic Acid	X
Benzenepropanoic acid	X
.gamma. -Sitosterol	X
Stigmast-4-en-3-one	X
.alpha. -Pinene	
Pulegone	
Naphthalene, decahydro-2-methyl-	
1H-Indene, octahydro-	
2,2,4,4,7,7-hexamethyl-, trans-	

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

TCL VOLATILE WATERS (UG/L)

CLIENT ID:			TB-6		FB-2		EB-2		TB-7		EB-3	
LABORATORY ID:			20715.01		20715.02		20715.03		20730.01		20730.02	
ANALYTE	CRQL	MDL										
CHLOROMETHANE	10	0.4	10	U	10	U	10	U	10	U	10	U
BROMOMETHANE	10	1.0	10	U	10	U	10	U	10	U	10	U
VINYL CHLORIDE	10	0.8	10	U	10	U	10	U	10	U	10	U
CHLOROETHANE	10	1.2	10	U	10	U	10	U	10	U	10	U
METHYLENE CHLORIDE	10	1.0	10	U	10	U	10	U	10	U	10	U
ACETONE	10	1.9	10	U	10	U	10	U	10	U	10	U
CARBON DISULFIDE	10	0.7	10	U	10	U	10	U	10	U	10	U
1,1-DICHLOROETHENE	10	1.1	10	U	10	U	10	U	10	U	10	U
1,1-DICHLOROETHANE	10	0.5	10	U	10	U	10	U	10	U	10	U
1,2-DICHLOROETHENE(TOTAL)	10	1.0	10	U	10	U	10	U	10	U	10	U
CHLOROFORM	10	0.8	10	U	10	U	10	U	10	U	10	U
1,2-DICHLOROETHANE	10	1.4	10	U	10	U	10	U	10	U	10	U
2-BUTANONE	10	8.8	10	U	10	U	10	U	10	U	10	U
1,1,1-TRICHLOROETHANE	10	0.6	10	U	10	U	10	U	10	U	10	U
CARBON TETRACHLORIDE	10	0.5	10	U	10	U	10	U	10	U	10	U
BROMODICHLOROMETHANE	10	2.5	10	U	10	U	10	U	10	U	10	U
1,2-DICHLOROPROPANE	10	1.3	10	U	10	U	10	U	10	U	10	U
CIS-1,3-DICHLOROPROPENE	10	0.7	10	U	10	U	10	U	10	U	10	U
TRICHLOROETHENE	10	0.4	10	U	10	U	10	U	10	U	10	U
DIBROMOCHLOROMETHANE	10	2.5	10	U	10	U	10	U	10	U	10	U
1,1,2-TRICHLOROETHANE	10	2.2	10	U	10	U	10	U	10	U	10	U
BENZENE	10	0.8	10	U	10	U	10	U	10	U	10	U
TRANS-1,3-DICHLOROPROPENE	10	1.0	10	U	10	U	10	U	10	U	10	U
BROMOFORM	10	3.7	10	U	10	U	10	U	10	U	10	U
4-METHYL-2-PENTANONE	10	2.1	10	U	10	U	10	U	10	U	10	U
2-HEXANONE	10	1.5	10	U	10	U	10	U	10	U	10	U
TETRACHLOROETHENE	10	0.8	10	U	10	U	10	U	10	U	10	U
1,1,2,2-TETRACHLOROETHANE	10	3.7	10	U	10	U	10	U	10	U	10	U
TOLUENE	10	0.4	10	U	10	U	10	U	10	U	10	U
CHLOROBENZENE	10	0.5	10	U	10	U	10	U	10	U	10	U
ETHYLBENZENE	10	0.6	10	U	10	U	10	U	10	U	10	U
STYRENE	10	0.8	10	U	10	U	10	U	10	U	10	U
XYLENE (TOTAL)	10	0.6	10	U	10	U	10	U	10	U	10	U
VINYL ACETATE	10	2.6	10	U	10	U	10	U	10	U	10	U
DILUTION FACTOR:			1.0		1.0		1.0		1.0		1.0	

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID: EB-4
LABORATORY ID: 20748.12

TCL VOLATILE WATERS (UG/L)

ANALYTE				
CHLOROMETHANE	10	0.4	10	U
BROMOMETHANE	10	1.0	10	U
VINYL CHLORIDE	10	0.8	10	U
CHLOROETHANE	10	1.2	10	U
METHYLENE CHLORIDE	10	1.0	10	U
ACETONE	10	1.9	10	U
CARBON DISULFIDE	10	0.7	10	U
1,1-DICHLOROETHENE	10	1.1	10	U
1,1-DICHLOROETHANE	10	0.5	10	U
1,2-DICHLOROETHENE(TOTAL)	10	1.0	10	U
CHLOROFORM	10	0.8	10	U
1,2-DICHLOROETHANE	10	1.4	10	U
2-BUTANONE	10	8.8	10	U
1,1,1-TRICHLOROETHANE	10	0.6	10	U
CARBON TETRACHLORIDE	10	0.5	10	U
BROMODICHLOROMETHANE	10	2.5	10	U
1,2-DICHLOROPROPANE	10	1.3	10	U
CIS-1,3-DICHLOROPROPENE	10	0.7	10	U
TRICHLOROETHENE	10	0.4	10	U
DIBROMOCHLOROMETHANE	10	2.5	10	U
1,1,2-TRICHLOROETHANE	10	2.2	10	U
BENZENE	10	0.8	10	U
TRANS-1,3-DICHLOROPROPENE	10	1.0	10	U
BROMOFORM	10	3.7	10	U
4-METHYL-2-PENTANONE	10	2.1	10	U
2-HEXANONE	10	1.5	10	U
TETRACHLOROETHENE	10	0.8	10	U
1,1,2,2-TETRACHLOROETHANE	10	3.7	10	U
TOLUENE	10	0.4	10	U
CHLOROBENZENE	10	0.5	10	U
ETHYLBENZENE	10	0.6	10	U
STYRENE	10	0.8	10	U
XYLENE (TOTAL)	10	0.6	10	U
VINYL ACETATE	10	2.6	10	U
DILUTION FACTOR:			1.0	

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			FB-2		EB-2		EB-3	
LABORATORY ID:			20715.02		20715.03		20730.02	

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL						
PHENOL	10	3.7	1	J	1	J	10	U
BIS(2-CHLOROETHYL)ETHER	10	4.0	10	U	10	U	10	U
2-CHLOROPHENOL	10	4.0	10	U	10	U	10	U
1,3-DICHLOROBENZENE	10	3.0	10	U	10	U	10	U
1,4-DICHLOROBENZENE	10	3.1	10	U	10	U	10	U
1,2-DICHLOROBENZENE	10	3.6	10	U	10	U	10	U
2-METHYLPHENOL	10	4.3	10	U	10	U	10	U
BIS(2-CHLOROISOPROPYL)ETHER	10	4.6	10	U	10	U	10	U
4-METHYLPHENOL	10	4.0	10	U	10	U	10	U
N-NITROSO-DI-N-PROPYLAMINE	10	3.0	10	U	10	U	10	U
HEXACHLOROETHANE	10	2.8	10	U	10	U	10	U
NITROBENZENE	10	3.6	10	U	10	U	10	U
ISOPHORONE	10	3.0	10	U	10	U	10	U
2-NITROPHENOL	10	3.5	10	U	10	U	10	U
2,4-DIMETHYLPHENOL	10	4.8	10	U	10	U	10	U
2,4-DICHLOROPHENOL	10	3.7	10	U	10	U	10	U
1,2,4-TRICHLOROBENZENE	10	2.9	10	U	10	U	10	U
NAPHTHALENE	10	3.7	10	U	10	U	10	U
4-CHLOROANILINE	10	9.8	10	U	10	U	10	U
BIS(2-CHLOROETHOXY)METHANE	10	3.3	10	U	10	U	10	U
HEXACHLOROBUTADIENE	10	3.0	10	U	10	U	10	U
4-CHLORO-3-METHYLPHENOL	10	3.2	10	U	10	U	10	U
2-METHYLNAPHTHALENE	10	3.3	10	U	10	U	10	U
HEXACHLOROCYCLOPENTADIENE	10	NA	10	U	10	U	10	U
2,4,6-TRICHLOROPHENOL	10	3.5	10	U	10	U	10	U
2,4,5-TRICHLOROPHENOL	25	3.4	25	U	25	U	25	U
2-CHLORONAPHTHALENE	10	3.2	10	U	10	U	10	U
2-NITROANILINE	25	3.0	25	U	25	U	25	U
DIMETHYL PHTHALATE	10	2.44	10	U	10	U	10	U
ACENAPHTHYLENE	10	3.3	10	U	10	U	10	U
2,6-DINITROTOLUENE	10	2.9	10	U	10	U	10	U
3-NITROANILINE	25	2.5	25	U	25	U	25	U
ACENAPHTHENE	10	3.3	10	U	10	U	10	U

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			FB-2		EB-2		EB-3	
LABORATORY ID:			20715.02		20715.03		20730.02	
TCL SEMIVOLATILE WATERS (UG/L)								
ANALYTE	CRQL	MDL						
2,4-DINITROPHENOL	25	2.6	25	U	25	U	25	U
4-NITROPHENOL	25	2.3	25	U	25	U	25	U
DIBENZOFURAN	10	3.2	10	U	10	U	10	U
2,4-DINITROTOLUENE	10	2.1	10	U	10	U	10	U
DIETHYLPHTHALATE	10	2.9	10	U	10	U	10	U
4-CHLOROPHENYL-PHENYL ETHER	10	3.6	10	U	10	U	10	U
FLUORENE	10	3.0	10	U	10	U	10	U
4-NITROANILINE	25	2.1	25	U	25	U	25	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	25	U	25	U	25	U
N-NITROSODIPHENYLAMINE	10	2.0	10	U	10	U	10	U
4-BROMOPHENYL-PHENYL ETHER	10	2.8	10	U	10	U	10	U
HEXACHLOROBENZENE	10	2.2	10	U	10	U	10	U
PENTACHLOROPHENOL	25	2.0	25	U	25	U	25	U
PHENANTHRENE	10	2.3	10	U	10	U	10	U
ANTHRACENE	10	2.4	10	U	10	U	10	U
CARBAZOLE	10	2.2	10	U	10	U	10	U
DI-N-BUTYL PHTHALATE	10	2.8	10	U	10	U	10	U
FLUORANTHENE	10	1.2	10	U	10	U	10	U
PYRENE	10	1.6	10	U	10	U	10	U
3,3'-DICHLOROBENZIDINE	10	1.8	10	U	10	U	10	U
BUTYLBENZYL PHTHALATE	10	0.7	10	U	10	U	10	U
BENZO(A)ANTHRACENE	10	1.4	10	U	10	U	10	U
CHRYSENE	10	1.7	10	U	10	U	10	U
BIS(2-ETHYLHEXYL)PHTHALATE	10	1.5	2	J	0.6	J	10	U
DI-N-OCTYL PHTHALATE	10	2.0	10	U	10	U	10	U
BENZO(B)FLUORANTHENE	10	1.4	10	U	10	U	10	U
BENZO(K)FLUORANTHENE	10	2.2	10	U	10	U	10	U
BENZO(A)PYRENE	10	0.9	10	U	10	U	10	U
INDENO(1,2,3-CD)PYRENE	10	1.5	10	U	10	U	10	U
DIBENZ(A,H)ANTHRACENE	10	2.0	10	U	10	U	10	U
BENZO(G,H,I)PERYLENE	10	1.6	10	U	10	U	10	U
BENZYL ALCOHOL	10	3.9	2	J	1	J	10	U
BENZOIC ACID	50	6.6	11	J	8	J	7	J
DILUTION FACTOR:			1.0		1.0		1.0	

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID: EB-4
LABORATORY ID: 20748.12

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL		
PHENOL	10	3.7	10	U
BIS(2-CHLOROETHYL)ETHER	10	4.0	10	U
2-CHLOROPHENOL	10	4.0	10	U
1,3-DICHLOROBENZENE	10	3.0	10	U
1,4-DICHLOROBENZENE	10	3.1	10	U
1,2-DICHLOROBENZENE	10	3.6	10	U
2-METHYLPHENOL	10	4.3	10	U
2,2'-OXYBIS(1-CHLOROPROPANE)	10	4.6	10	U
4-METHYLPHENOL	10	4.0	10	U
N-NITROSO-DI-N-PROPYLAMINE	10	3.0	10	U
HEXACHLOROETHANE	10	2.8	10	U
NITROBENZENE	10	3.6	10	U
ISOPHORONE	10	3.0	10	U
2-NITROPHENOL	10	3.5	10	U
2,4-DIMETHYLPHENOL	10	4.8	10	U
2,4-DICHLOROPHENOL	10	3.7	10	U
1,2,4-TRICHLOROBENZENE	10	2.9	10	U
NAPHTHALENE	10	3.7	10	U
4-CHLOROANILINE	10	9.8	10	U
BIS(2-CHLOROETHOXY)METHANE	10	3.3	10	U
HEXACHLOROBUTADIENE	10	3.0	10	U
4-CHLORO-3-METHYLPHENOL	10	3.2	10	U
2-METHYLNAPHTHALENE	10	3.3	10	U
HEXACHLOROCYCLOPENTADIENE	10	NA	10	U
2,4,6-TRICHLOROPHENOL	10	3.5	10	U
2,4,5-TRICHLOROPHENOL	25	3.4	25	U
2-CHLORONAPHTHALENE	10	3.2	10	U
2-NITROANILINE	25	3.0	25	U
DIMETHYL PHTHALATE	10	2.44	10	U
ACENAPHTHYLENE	10	3.3	10	U
2,6-DINITROTOLUENE	10	2.9	10	U
3-NITROANILINE	25	2.5	25	U
ACENAPHTHENE	10	3.3	10	U

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID: EB-4
LABORATORY ID: 20748.12

TCL SEMIVOLATILE WATERS (UG/L)

ANALYTE	CRQL	MDL		
2,4-DINITROPHENOL	25	2.6	25	U
4-NITROPHENOL	25	2.3	25	U
DIBENZOFURAN	10	3.2	10	U
2,4-DINITROTOLUENE	10	2.1	10	U
DIETHYL PHTHALATE	10	2.9	10	U
4-CHLOROPHENYL-PHENYLETHER	10	3.6	10	U
FLUORENE	10	3.0	10	U
4-NITROANILINE	25	2.1	25	U
4,6-DINITRO-2-METHYLPHENOL	25	2.5	25	U
N-NITROSODIPHENYLAMINE	10	2.0	10	U
4-BROMOPHENYL-PHENYLETHER	10	2.8	10	U
HEXACHLOROBENZENE	10	2.2	10	U
PENTACHLOROPHENOL	25	2.0	25	U
PHENANTHRENE	10	2.3	10	U
ANTHRACENE	10	2.4	10	U
CARBAZOLE	10	2.2	10	U
DI-N-BUTYL PHTHALATE	10	2.8	10	U
FLUORANTHENE	10	1.2	10	U
PYRENE	10	1.6	10	U
BUTYLBENZYL PHTHALATE	10	1.8	10	U
3,3'-DICHLOROBENZIDINE	10	0.7	10	U
BENZO(A)ANTHRACENE	10	1.4	10	U
CHRYSENE	10	1.7	10	U
BIS(2-ETHYLHEXYL)PHTHALATE	10	1.5	10	U
DI-N-OCTYL PHTHALATE	10	2.0	10	U
BENZO(B)FLUORANTHENE	10	1.4	10	U
BENZO(K)FLUORANTHENE	10	2.2	10	U
BENZO(A)PYRENE	10	0.9	10	U
INDENO(1,2,3-CD)PYRENE	10	1.5	10	U
DIBENZ(A,H)ANTHRACENE	10	2.0	10	U
BENZO(G,H,I)PERYLENE	10	1.6	10	U
BENZYL ALCOHOL	10	3.9	10	U
BENZOIC ACID	50	6.6	1	J
DILUTION FACTOR:			1.0	

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			FB-2		EB-2		EB-3	
LABORATORY ID:			20715.02		20715.03		20730.02	
TCL PESTICIDE/PCB WATERS (UG/L)								
ANALYTE	CRQL	MDL						
ALPHA-BHC	0.05	0.002	0.05	U	0.05	U	0.05	U
BETA-BHC	0.05	0.004	0.05	U	0.05	U	0.05	U
DELTA-BHC	0.05	0.002	0.05	U	0.05	U	0.05	U
GAMMA-BHC (LINDANE)	0.05	0.002	0.05	U	0.05	U	0.05	U
HEPTACHLOR	0.05	0.005	0.05	U	0.05	U	0.05	U
ALDRIN	0.05	0.002	0.05	U	0.05	U	0.05	U
HEPTACHLOR EPOXIDE	0.05	0.002	0.05	U	0.05	U	0.05	U
ENDOSULFAN I	0.05	0.002	0.05	U	0.05	U	0.05	U
DIELDRIN	0.1	0.007	0.1	U	0.1	U	0.1	U
4,4'-DDE	0.1	0.003	0.1	U	0.1	U	0.1	U
ENDRIN	0.1	0.005	0.1	U	0.1	U	0.1	U
ENDOSULFAN II	0.1	0.004	0.1	U	0.1	U	0.1	U
4,4'-DDD	0.1	0.003	0.1	U	0.1	U	0.1	U
ENDOSULFAN SULFATE	0.1	0.089	0.1	U	0.1	U	0.1	U
4,4'-DDT	0.1	0.004	0.1	U	0.1	U	0.1	U
METHOXYCHLOR	0.5	0.020	0.5	U	0.5	U	0.5	U
ENDRIN KETONE	0.1	0.004	0.1	U	0.1	U	0.1	U
ENDRIN ALDEHYDE	0.1	0.003	0.1	U	0.1	U	0.1	U
ALPHA-CHLORDANE	0.05	0.004	0.05	U	0.05	U	0.05	U
GAMMA-CHLORDANE	0.05	0.003	0.05	U	0.05	U	0.05	U
TOXAPHENE	5	0.030	5	U	5	U	5	U
AROCLOR-1016	1	0.030	1	U	1	U	1	U
AROCLOR-1221	2	0.040	2	U	2	U	2	U
AROCLOR-1232	1	0.010	1	U	1	U	1	U
AROCLOR-1242	1	0.010	1	U	1	U	1	U
AROCLOR-1248	1	0.040	1	U	1	U	1	U
AROCLOR-1254	1	0.050	1	U	1	U	1	U
AROCLOR-1260	1	0.040	1	U	1	U	1	U
DILUTION FACTOR:			1.0		1.0		1.0	

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID: EB-4
LABORATORY ID: 20748.12

TCL PESTICIDE/PCB WATERS (UG/L)

ANALYTE	CRQL	MDL		
ALPHA-BHC	0.05	0.002	0.05	U
BETA-BHC	0.05	0.004	0.05	U
DELTA-BHC	0.05	0.002	0.05	U
GAMMA-BHC (LINDANE)	0.05	0.002	0.05	U
HEPTACHLOR	0.05	0.005	0.05	U
ALDRIN	0.05	0.002	0.05	U
HEPTACHLOR EPOXIDE	0.05	0.002	0.05	U
ENDOSULFAN I	0.05	0.002	0.05	U
DIELDRIN	0.1	0.007	0.1	U
4,4'-DDE	0.1	0.003	0.1	U
ENDRIN	0.1	0.005	0.1	U
ENDOSULFAN II	0.1	0.004	0.1	U
4,4'-DDD	0.1	0.003	0.1	U
ENDOSULFAN SULFATE	0.1	0.089	0.1	U
4,4'-DDT	0.1	0.004	0.1	UJ
METHOXYCHLOR	0.5	0.020	0.5	U
ENDRIN KETONE	0.1	0.004	0.1	U
ENDRIN ALDEHYDE	0.1	0.003	0.1	U
ALPHA-CHLORDANE	0.05	0.004	0.05	U
GAMMA-CHLORDANE	0.05	0.003	0.05	U
TOXAPHENE	5	0.030	5	U
AROCLOR-1016	1	0.030	1	U
AROCLOR-1221	2	0.040	2	U
AROCLOR-1232	1	0.010	1	U
AROCLOR-1242	1	0.010	1	U
AROCLOR-1248	1	0.040	1	U
AROCLOR-1254	1	0.050	1	U
AROCLOR-1260	1	0.040	1	U
DILUTION FACTOR:			1.0	

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID:			FB-2		EB-2		EB-3	
LABORATORY ID:			20715.02		20715.03		20730.02	

TAL METAL WATERS (UG/L)

ANALYTE	CRQL	IDL						
ALUMINUM	200	9	20.0	U	11.1	U	28.7	U
ANTIMONY	60	4	4.0	U	4.0	U	4.0	U
ARSENIC	10	6	6.0	U	6.0	U	6.0	U
BARIUM	200	1	1.0	U	1.0	U	1.0	U
BERYLLIUM	50	1	1.0	U	1.0	U	1.0	U
BORON	50	3	14.1		17.2		11.5	
CADMIUM	5	1	1.0	U	1.0	U	1.0	U
CALCIUM	5000	11	21.8	U	14.6	U	11.0	U
CHROMIUM	10	1	1.0	U	1.0	U	1.0	U
COBALT	50	1	1.0	U	1.0	U	1.0	U
COPPER	25	2	2.0	U	2.0	U	2.0	U
IRON	100	7	7.0	U	7.0	U	7.0	U
LEAD	3	2	2.0	U	2.0	U	2.0	U
MAGNESIUM	5000	12	12.0	U	14.9	U	12.0	U
MANGANESE	15	1	1.0	U	1.0	U	1.0	U
MERCURY	0.2	0.2	0.21	J	0.20	J	0.20	U
NICKEL	40	1	1.0	U	1.0	U	1.0	U
POTASSIUM	5000	13	13.0	U	34.3	U	27.1	U
SELENIUM	5	5	5.0	UJ	5.0	UJ	5.0	UJ
SILVER	10	1	1.0	U	1.0	U	1.0	U
SODIUM	5000	9	89.9		69.2		52.8	
THALLIUM	10	6	6.0	U	6.5	J	6.0	U
VANADIUM	50	1	1.0	U	1.0	U	1.0	U
ZINC	20	1	11.8	J	8.0	J	1.0	UJ
CYANIDE	10	10	10.0	U	10.0	U	10.0	U

CTO 129, NSB NEW LONDON, GROTON, CONNECTICUT
LABORATORY: SOUTHWEST LABORATORY OF OKLAHOMA

CLIENT ID: EB-4
LABORATORY ID: 20748.12

TAL METAL WATERS (UG/L)

ANALYTE	CRDL	IDL		
ALUMINUM	200	9	9.0	UR
ANTIMONY	60	4	4.0	U
ARSENIC	10	6	6.0	U
BARIUM	200	1	1.0	U
BERYLLIUM	5	1	1.0	U
BORON	50	3	5.9	U
CADMIUM	5	1	1.0	U
CALCIUM	5000	11	35.5	U
CHROMIUM	10	1	1.0	U
COBALT	50	1	1.0	U
COPPER	25	2	2.0	U
IRON	100	7	7.0	UJ
LEAD	3	2	2.0	U
MANGANESE	5000	1	1.0	U
MAGNESIUM	15	12	12.0	U
MERCURY	0.2	0.2	0.27	J
NICKEL	40	1	1.0	U
POTASSIUM	5000	689	689	UJ
SELENIUM	5	5	5.0	U
SILVER	10	1	1.0	UJ
SODIUM	5000	143	143	U
THALLIUM	10	6	6.0	J
VANADIUM	50	1	1.0	U
ZINC	20	1	2.6	U
CYANIDE	10	10	10.0	UJ

Total Organic Carbon by EPA 9060

Sample ID	Total Organic Carbon, mg/kg
T1-A	32,100
T1-B	24,500
T2-A	39,000
T2-B	63,400
T3-A	31,100
T3-B	33,500
D-03	47,500
T4-A	9,960
T4-B	8,420
T5-A	16,900
T5-B	9,410
T6-A	11,200
T6-B	25,000
T7-A	54,800
T7-B	63,000
D-05	32,600
T8-A	84,100
T8-B	79,600
T9-A	34,700
T9-B	61,600
T10-A	52,400
T10-B	68,300

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T1-A
Location : Groton, CT
Soil Description : Saturated brown silty sand
Remarks : ---

Depth : ---
Test Date : 12/09/94
Test Method : ASTM D422

Filename : T1A
Elevation : ---
Tested by : gph
Checked by : gtt

HYDROMETER

Hydrometer ID : hy1
Weight of air-dried soil = 50.61 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	10.90	17.40	4.32	0.054	8	0.054
2.00	9.10	17.40	2.52	0.038	4	0.038
4.00	8.00	17.50	1.46	0.027	3	0.027
8.00	7.20	17.50	0.66	0.019	1	0.019
15.00	6.60	17.50	0.06	0.014	0	0.014

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	5.74	5.74	94
#10	0.079	2.00	6.76	12.50	88
#20	0.033	0.84	14.07	26.57	74
#40	0.017	0.42	16.69	43.26	58
#60	0.010	0.25	16.02	59.28	42
#100	0.006	0.15	13.05	72.33	29
#200	0.003	0.07	12.05	84.38	17
Pan			17.42	101.80	0

Total Dry Weight of Sample = 110.09

D85 : 1.6864 mm
D60 : 0.4668 mm
D50 : 0.3279 mm
D30 : 0.1555 mm
D15 : 0.0690 mm
D10 : 0.0584 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-2-4(0)
AASHTO Group Name : Silty Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T2-A
Location : Groton, CT
Soil Description : Black saturated sand with some silt
Remarks : Hydrometer not required, fines < 10%

Depth : ---
Test Date : 12/06/94
Test Method : ASTM D422

Filename : T2A
Elevation : ---
Tested by : gph
Checked by : gtt

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Sieve Openings Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	5.38	5.38	96
#10	0.079	2.00	15.83	21.21	84
#20	0.033	0.84	24.14	45.35	65
#40	0.017	0.42	25.05	70.40	46
#60	0.010	0.25	22.70	93.10	28
#100	0.006	0.15	15.52	108.62	16
#200	0.003	0.07	9.84	118.46	9
Pan			11.39	129.85	0

Total Dry Weight of Sample = 137.89

D85 : 2.1986 mm
D60 : 0.7006 mm
D50 : 0.4888 mm
D30 : 0.2629 mm
D15 : 0.1315 mm
D10 : 0.0829 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : D-03
Location : Groton, CT
Soil Description : Saturated dark brown silty sand with organics
Remarks : ---

Depth : ---
Test Date : 12/08/94
Test Method : ASTM D422

Filename : D03
Elevation : ---
Tested by : gph
Checked by : gtt

HYDROMETER

Hydrometer ID : hy1
Weight of air-dried soil = 50.14 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	10.20	16.50	3.31	0.055	6	0.055
2.00	9.30	16.50	2.41	0.039	4	0.039
4.00	8.90	16.50	2.01	0.028	3	0.028
8.00	8.10	16.50	1.21	0.020	2	0.020
15.00	7.90	16.50	1.01	0.014	2	0.014
30.00	7.10	16.60	0.25	0.010	0	0.010
61.00	6.80	16.90	0.05	0.007	0	0.007

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	1.11	1.11	99
#10	0.079	2.00	9.98	11.09	87
#20	0.033	0.84	14.24	25.33	70
#40	0.017	0.42	15.78	41.11	51
#60	0.010	0.25	15.55	56.66	32
#100	0.006	0.15	10.70	67.36	19
#200	0.003	0.07	7.07	74.43	11
Pan			8.76	83.19	0

Total Dry Weight of Sample = 91.48

D85 : 1.8380 mm
D60 : 0.5929 mm
D50 : 0.4133 mm
D30 : 0.2317 mm
D15 : 0.1069 mm
D10 : 0.0716 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-2-4(0)
AASHTO Group Name : Silty Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T3-A
Location : Groton, CT
Soil Description : Moist brown sand with some silt
Remarks : ---

Depth : ---
Test Date : 12/09/94
Test Method : ASTM D422

Filename : T3A
Elevation : ---
Tested by : gph
Checked by : gtt

HYDROMETER

Hydrometer ID : hy1
Weight of air-dried soil = 102.46 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	13.30	16.20	6.31	0.054	5	0.054
2.00	12.00	16.20	5.01	0.038	4	0.038
4.00	11.00	16.20	4.01	0.027	3	0.027
8.00	10.10	16.20	3.11	0.019	2	0.019
15.00	9.20	16.30	2.25	0.014	2	0.014
30.00	8.10	16.50	1.21	0.010	1	0.010
62.00	7.90	16.90	1.15	0.007	1	0.007
120.00	7.00	16.70	0.18	0.005	0	0.005

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Sieve Openings Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.75"	0.748	19.00	0.00	0.00	100
0.5"	0.500	12.70	5.44	5.44	96
#4	0.187	4.75	9.53	14.97	90
#10	0.079	2.00	16.18	31.15	80
#20	0.033	0.84	29.64	60.79	60
#40	0.017	0.42	31.83	92.62	40
#60	0.010	0.25	25.26	117.88	23
#100	0.006	0.15	13.59	131.47	14
#200	0.003	0.07	9.23	140.70	8
Pan			13.06	153.76	0

Total Dry Weight of Sample = 163.15

D85 : 3.0815 mm
D60 : 0.8280 mm
D50 : 0.5921 mm
D30 : 0.3086 mm
D15 : 0.1535 mm
D10 : 0.0682 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T4-A
Location : Groton, CT
Soil Description : Brown silty sand with some organics
Remarks : Hydrometer not required, fines < 10%

Depth : ---
Test Date : 12/06/94
Test Method : ASTM D422

Filename : T4A
Elevation : ---
Tested by : jdt
Checked by : gtt

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Sieve Openings Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	2.96	2.96	98
#10	0.079	2.00	18.73	21.69	83
#20	0.033	0.84	24.56	46.25	64
#40	0.017	0.42	23.07	69.32	47
#60	0.010	0.25	21.79	91.11	30
#100	0.006	0.15	15.27	106.38	18
#200	0.003	0.07	11.63	118.01	9
Pan			11.84	129.85	0

Total Dry Weight of Sample = 138.11

D85 : 2.2152 mm
D60 : 0.7086 mm
D50 : 0.4794 mm
D30 : 0.2513 mm
D15 : 0.1172 mm
D10 : 0.0793 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T5-A
Location : Groton, CT
Soil Description : Moist, black silty sand with some organics
Remarks : ---

Depth : ---
Test Date : 12/09/94
Test Method : ASTM D422

Filename : T5A
Elevation : ---
Tested by : jdt
Checked by : gtt

HYDROMETER

Hydrometer ID : hy1-2
Weight of air-dried soil = 124.14 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	27.60	17.80	17.40	0.048	13	0.048
2.00	23.90	17.80	13.70	0.035	10	0.035
4.00	21.20	17.80	11.00	0.025	8	0.025
8.00	19.20	17.90	9.01	0.018	7	0.018
15.00	18.10	17.70	7.89	0.013	6	0.013
31.00	16.00	17.50	5.76	0.009	4	0.009
60.00	14.20	17.20	3.92	0.007	3	0.007
123.00	14.00	17.00	3.70	0.005	3	0.005
240.00	12.80	17.80	2.60	0.003	2	0.003
320.00	11.60	18.30	1.46	0.003	1	0.003
955.00	11.20	16.80	0.88	0.002	1	0.002

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	1.63	1.63	99
#10	0.079	2.00	10.56	12.19	92
#20	0.033	0.84	27.33	39.52	73
#40	0.017	0.42	31.04	70.56	52
#60	0.010	0.25	24.33	94.89	36
#100	0.006	0.15	13.46	108.35	27
#200	0.003	0.07	11.67	120.02	19
Pan			27.80	147.82	0

Total Dry Weight of Sample = 157

D85 : 1.4575 mm
D60 : 0.5424 mm
D50 : 0.3910 mm
D30 : 0.1797 mm
D15 : 0.0562 mm
D10 : 0.0341 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-2-4(0)
AASHTO Group Name : Silty Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T6-A
Location : Groton, CT
Soil Description : Brown silty, clayey sand with organics
Remarks : ---

Depth : ---
Test Date : 12/09/94
Test Method : ASTM D422

Filename : T6A
Elevation : ---
Tested by : jdt
Checked by : gtt

HYDROMETER

Hydrometer ID : hy1
Weight of air-dried soil = 29.33 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	13.20	16.70	6.38	0.054	20	0.054
2.00	11.30	16.70	4.48	0.038	14	0.038
4.00	10.40	16.70	3.58	0.027	11	0.027
8.00	10.00	16.70	3.18	0.019	10	0.019
15.00	9.10	16.80	2.32	0.014	7	0.014
30.00	8.00	17.00	1.29	0.010	4	0.010

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Sieve Openings Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	0.94	0.94	98
#10	0.079	2.00	2.46	3.40	91
#20	0.033	0.84	3.91	7.31	82
#40	0.017	0.42	3.75	11.06	72
#60	0.010	0.25	4.02	15.08	62
#100	0.006	0.15	4.43	19.51	51
#200	0.003	0.07	6.05	25.56	35
Pan			14.02	39.58	0

Total Dry Weight of Sample = 47.36

D85 : 1.1400 mm
D60 : 0.2290 mm
D50 : 0.1443 mm
D30 : 0.0661 mm
D15 : 0.0405 mm
D10 : 0.0196 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-4(0)
AASHTO Group Name : Silty Soils

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : D-05
Location : Groton, CT
Soil Description : Saturated, red/brwn sandy, clayey silt w/ organics
Remarks : ---

Depth : ---
Test Date : 12/08/94
Test Method : ASTM D422

Filename : D05
Elevation : ---
Tested by : jdt
Checked by : gtt

HYDROMETER

Hydrometer ID : hy1
Weight of air-dried soil = 38.84 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	20.00	16.50	13.61	0.051	34	0.051
2.00	18.10	16.50	11.21	0.037	28	0.037
4.00	17.00	16.50	10.11	0.026	25	0.026
8.00	15.30	16.50	8.41	0.019	21	0.019
15.00	14.00	16.50	7.11	0.014	18	0.014
30.00	12.20	16.60	5.35	0.010	13	0.010
60.00	10.00	16.90	3.25	0.007	8	0.007
120.00	9.00	17.40	2.42	0.005	6	0.005
240.00	7.90	17.10	1.22	0.004	3	0.004

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Sieve Openings Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	0.12	0.12	100
#10	0.079	2.00	2.33	2.45	96
#20	0.033	0.84	4.12	6.57	88
#40	0.017	0.42	4.08	10.65	81
#60	0.010	0.25	4.51	15.16	73
#100	0.006	0.15	5.64	20.80	63
#200	0.003	0.07	6.89	27.69	51
Pan			28.55	56.24	0

Total Dry Weight of Sample = 64.31

D85 : 0.6122 mm
D60 : 0.1254 mm
D50 : 0.0728 mm
D30 : 0.0421 mm
D15 : 0.0113 mm
D10 : 0.0080 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-4(0)
AASHTO Group Name : Silty Soils

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T7-A
Location : Groton, CT
Soil Description : Moist, black silty sand with organics
Remarks : ---

Depth : ---
Test Date : 12/08/94
Test Method : ASTM D422

Filename : T7A
Elevation : ---
Tested by : jdt
Checked by : gtt

HYDROMETER

Hydrometer ID : hyl-2
Weight of air-dried soil = 43.84 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	16.20	16.20	5.80	0.053	11	0.053
2.00	13.60	16.20	3.20	0.038	6	0.038
4.00	13.00	16.20	2.60	0.027	5	0.027
8.00	12.70	16.20	2.30	0.019	4	0.019
15.00	12.30	16.20	1.90	0.014	3	0.014
30.00	11.90	16.20	1.50	0.010	3	0.010
60.00	11.60	16.20	1.20	0.007	2	0.007

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	1.54	1.54	96
#10	0.079	2.00	6.45	7.99	80
#20	0.033	0.84	7.87	15.86	60
#40	0.017	0.42	6.37	22.23	44
#60	0.010	0.25	5.10	27.33	32
#100	0.006	0.15	3.59	30.92	23
#200	0.003	0.07	3.21	34.13	15
Pan			5.80	39.93	0

Total Dry Weight of Sample = 47.92

D85 : 2.6154 mm
D60 : 0.8308 mm
D50 : 0.5376 mm
D30 : 0.2286 mm
D15 : 0.0771 mm
D10 : 0.0508 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T8-A
Location : Groton, CT
Soil Description : Grey/brown silt
Remarks : ---

Depth : ---
Test Date : 12/08/94
Test Method : ASTM D422

Filename : T8A
Elevation : ---
Tested by : jdt
Checked by : gtt

HYDROMETER

Hydrometer ID : hyl-2
Weight of air-dried soil = 47.29 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	41.00	17.70	30.79	0.044	65	0.044
2.00	37.10	17.70	26.89	0.032	57	0.032
4.00	36.00	17.70	25.79	0.023	55	0.023
8.00	33.10	17.70	22.89	0.016	48	0.016
15.00	30.90	17.70	20.69	0.012	44	0.012
30.00	27.20	17.80	17.00	0.009	36	0.009
60.00	24.00	17.90	13.81	0.006	29	0.006
130.00	21.40	18.20	11.25	0.004	24	0.004
245.00	20.10	18.60	10.00	0.003	21	0.003
966.00	16.90	17.30	6.64	0.002	14	0.002

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
#4	0.187	4.75	0.00	0.00	100
#10	0.079	2.00	0.06	0.06	100
#20	0.033	0.84	0.15	0.21	99
#40	0.017	0.42	0.12	0.33	99
#60	0.010	0.25	0.10	0.43	99
#100	0.006	0.15	0.20	0.63	98
#200	0.003	0.07	1.31	1.94	95
Pan			35.76	37.70	0

Total Dry Weight of Sample = 45.71

D85 : 0.0621 mm
D60 : 0.0358 mm
D50 : 0.0179 mm
D30 : 0.0066 mm
D15 : 0.0018 mm
D10 : 0.0012 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-4(0)
AASHTO Group Name : Silty Soils

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T9-A
Location : Groton, CT
Soil Description : Brown sandy silt
Remarks : ---

Depth : ---
Test Date : 12/08/94
Test Method : ASTM D422

Filename : T9A
Elevation : ---
Tested by : jdt
Checked by : gtt

HYDROMETER

Hydrometer ID : hyl-2
Weight of air-dried soil = 47.72 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	33.50	20.50	23.79	0.045	47	0.045
2.00	27.30	20.50	17.59	0.033	34	0.033
4.00	25.00	20.50	15.29	0.024	30	0.024
8.00	22.00	20.40	12.26	0.017	24	0.017
18.00	19.00	20.10	9.19	0.012	18	0.012
31.00	16.80	19.80	6.91	0.009	14	0.009
60.00	15.00	19.30	4.99	0.007	10	0.007
121.00	13.40	18.30	3.26	0.005	6	0.005
240.00	13.00	17.50	2.76	0.003	5	0.003
1239.00	12.00	16.20	1.60	0.002	3	0.002

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Sieve Openings Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	1.62	1.62	97
#10	0.079	2.00	2.55	4.17	93
#20	0.033	0.84	3.06	7.23	88
#40	0.017	0.42	3.16	10.39	83
#60	0.010	0.25	3.26	13.65	78
#100	0.006	0.15	2.98	16.63	73
#200	0.003	0.07	4.60	21.23	65
Pan			39.85	61.08	0

Total Dry Weight of Sample = 69.61

D85 : 0.5501 mm
D60 : 0.0642 mm
D50 : 0.0490 mm
D30 : 0.0239 mm
D15 : 0.0098 mm
D10 : 0.0067 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-4(0)
AASHTO Group Name : Silty Soils

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T10-A
Location : Groton, CT
Soil Description : Brown silty sand with organics
Remarks : ---

Depth : ---
Test Date : 12/08/94
Test Method : ASTM D422

Filename : T10A
Elevation : ---
Tested by : jdt
Checked by : gtt

HYDROMETER

Hydrometer ID : hyl-2
Weight of air-dried soil = 142.98 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	36.60	16.20	26.20	0.046	18	0.046
2.00	31.20	16.20	20.80	0.034	14	0.034
4.00	27.00	16.20	16.60	0.025	11	0.025
8.00	22.60	16.20	12.20	0.018	8	0.018
15.00	18.50	16.20	8.10	0.013	5	0.013
38.00	15.80	16.20	5.40	0.009	4	0.009
60.00	15.00	16.40	4.63	0.007	3	0.007
120.00	14.00	16.80	3.68	0.005	2	0.005
257.00	13.00	16.90	2.69	0.003	2	0.003
1369.00	12.00	16.20	1.60	0.001	1	0.001

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Sieve Openings Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	0.39	0.39	99
#10	0.079	2.00	1.78	2.17	96
#20	0.033	0.84	6.86	9.03	83
#40	0.017	0.42	10.93	19.96	63
#60	0.010	0.25	11.43	31.39	41
#100	0.006	0.15	6.58	37.97	29
#200	0.003	0.07	4.64	42.61	21
Pan			11.01	53.62	0

Total Dry Weight of Sample = 61.58

D85 : 0.9526 mm
D60 : 0.3926 mm
D50 : 0.3078 mm
D30 : 0.1542 mm
D15 : 0.0370 mm
D10 : 0.0218 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-2-4(0)
AASHTO Group Name : Silty Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T1-B
Location : Groton, CT
Soil Description : Saturated brown silty sand
Remarks : ---

Depth : ---
Test Date : 12/09/94
Test Method : ASTM D422

Filename : T1B
Elevation : ---
Tested by : gph
Checked by : gtt

HYDROMETER

Hydrometer ID : hy1
Weight of air-dried soil = 84.49 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	19.40	18.10	13.06	0.051	12	0.051
2.00	16.00	18.10	9.66	0.037	9	0.037
4.00	12.30	18.10	5.96	0.026	6	0.026
8.00	10.20	18.10	3.86	0.019	4	0.019
16.00	9.00	18.20	2.70	0.013	3	0.013
31.00	7.60	17.70	1.13	0.010	1	0.010

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Sieve Openings Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	8.32	8.32	94
#10	0.079	2.00	22.94	31.26	79
#20	0.033	0.84	22.61	53.87	64
#40	0.017	0.42	18.00	71.87	52
#60	0.010	0.25	18.66	90.53	40
#100	0.006	0.15	13.59	104.12	31
#200	0.003	0.07	13.59	117.71	22
Pan			33.20	150.91	0

Total Dry Weight of Sample = 159.85

D85 : 2.7685 mm
D60 : 0.6546 mm
D50 : 0.3802 mm
D30 : 0.1378 mm
D15 : 0.0563 mm
D10 : 0.0401 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-2-4(0)
AASHTO Group Name : Silty Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T2-B
Location : Groton, CT
Soil Description : Black saturated silty sand with organics
Remarks : ---

Depth : ---
Test Date : 12/08/94
Test Method : ASTM D422

Filename : T2B
Elevation : ---
Tested by : gph
Checked by : gtt

HYDROMETER

Hydrometer ID : hyl-2
Weight of air-dried soil = 92.63 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	27.90	16.20	17.50	0.049	18	0.049
2.00	26.50	16.20	16.10	0.035	17	0.035
4.00	25.20	16.20	14.80	0.025	15	0.025
8.00	23.00	16.20	12.60	0.018	13	0.018
15.00	21.00	16.20	10.60	0.013	11	0.013
30.00	19.00	16.20	8.60	0.010	9	0.010
60.00	17.00	16.20	6.60	0.007	7	0.007
120.00	15.20	16.20	4.80	0.005	5	0.005
240.00	14.60	16.60	4.25	0.003	4	0.003
960.00	13.00	16.20	2.60	0.002	3	0.002

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Sieve Openings Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	0.24	0.24	100
#10	0.079	2.00	4.33	4.57	96
#20	0.033	0.84	19.63	24.20	80
#40	0.017	0.42	25.04	49.24	60
#60	0.010	0.25	19.81	69.05	44
#100	0.006	0.15	10.37	79.42	36
#200	0.003	0.07	9.21	88.63	29
Pan			35.37	124.00	0

Total Dry Weight of Sample = 131.93

D85 : 1.0768 mm
D60 : 0.4161 mm
D50 : 0.3007 mm
D30 : 0.0850 mm
D15 : 0.0236 mm
D10 : 0.0112 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-2-4(0)
AASHTO Group Name : Silty Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T3-B
Location : Groton, CT
Soil Description : Saturated black silty sand with organics
Remarks : ---

Depth : ---
Test Date : 12/08/94
Test Method : ASTM D422

Filename : T3B
Elevation : ---
Tested by : gph
Checked by : gtt

HYDROMETER

Hydrometer ID : hy1-2
Weight of air-dried soil = 88.95 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	22.40	16.20	12.00	0.051	11	0.051
2.00	20.10	16.20	9.70	0.037	9	0.037
4.00	19.00	16.20	8.60	0.026	8	0.026
8.00	17.90	16.20	7.50	0.019	7	0.019
15.00	16.10	16.20	5.70	0.014	5	0.014
30.00	15.10	16.20	4.70	0.010	4	0.010
60.00	14.00	16.20	3.60	0.007	3	0.007
122.00	12.20	16.20	1.80	0.005	2	0.005
240.00	11.80	16.60	1.45	0.003	1	0.003
960.00	11.20	16.20	0.80	0.002	1	0.002

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Sieve Openings Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	4.22	4.22	96
#10	0.079	2.00	14.82	19.04	83
#20	0.033	0.84	26.06	45.10	61
#40	0.017	0.42	20.70	65.80	42
#60	0.010	0.25	14.33	80.13	30
#100	0.006	0.15	9.07	89.20	22
#200	0.003	0.07	7.45	96.65	16
Pan			17.74	114.39	0

Total Dry Weight of Sample = 122.52

D85 : 2.2321 mm
D60 : 0.8227 mm
D50 : 0.5605 mm
D30 : 0.2505 mm
D15 : 0.0708 mm
D10 : 0.0420 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T4-B
Location : Groton, CT
Soil Description : Moist, brown silty sand with some organics
Remarks : Hydrometer not required, fines < 10%

Depth : ---
Test Date : 12/09/94
Test Method : ASTM D422

Filename : T4B
Elevation : ---
Tested by : jdt
Checked by : gtt

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Sieve Openings Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.5"	0.500	12.70	0.00	0.00	100
0.375"	0.374	9.51	4.18	4.18	98
#4	0.187	4.75	8.90	13.08	94
#10	0.079	2.00	38.99	52.07	76
#20	0.033	0.84	38.30	90.37	59
#40	0.017	0.42	34.59	124.96	43
#60	0.010	0.25	36.77	161.73	26
#100	0.006	0.15	25.12	186.85	14
#200	0.003	0.07	19.30	206.15	5
Pan			11.82	217.97	0

Total Dry Weight of Sample = 225.9

D85 : 3.0740 mm
D60 : 0.9038 mm
D50 : 0.5788 mm
D30 : 0.2845 mm
D15 : 0.1539 mm
D10 : 0.1063 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T5-B
Location : Groton, CT
Soil Description : Moist, brown silty sand
Remarks : Hydrometer not required, fines < 10%

Depth : ---
Test Date : 12/09/94
Test Method : ASTM D422

Filename : T5B
Elevation : ---
Tested by : jdt
Checked by : gtt

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Sieve Openings Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.5"	0.500	12.70	0.00	0.00	100
0.375"	0.374	9.51	1.24	1.24	99
#4	0.187	4.75	11.29	12.53	94
#10	0.079	2.00	34.19	46.72	79
#20	0.033	0.84	39.35	86.07	61
#40	0.017	0.42	35.14	121.21	45
#60	0.010	0.25	36.99	158.20	28
#100	0.006	0.15	27.91	186.11	15
#200	0.003	0.07	18.89	205.00	7
Pan			14.48	219.48	0

Total Dry Weight of Sample = 227.37

D85 : 2.8355 mm
D60 : 0.8129 mm
D50 : 0.5268 mm
D30 : 0.2665 mm
D15 : 0.1465 mm
D10 : 0.0976 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T6-B
Location : Groton, CT
Soil Description : Saturated, dark brown silty, organic sand w/ odor
Remarks : ---

Depth : ---
Test Date : 12/08/94
Test Method : ASTM D422

Filename : T6B
Elevation : ---
Tested by : jdt
Checked by : gtt

HYDROMETER

Hydrometer ID : hyl-2
Weight of air-dried soil = 57.21 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	24.70	16.20	14.30	0.050	23	0.050
2.00	23.80	16.20	13.40	0.036	22	0.036
4.00	23.20	16.20	12.80	0.025	21	0.025
8.00	22.90	16.20	12.50	0.018	21	0.018
15.00	22.00	16.20	11.60	0.013	19	0.013
30.00	21.00	16.20	10.60	0.009	17	0.009
67.00	19.90	16.20	9.50	0.006	16	0.006
125.00	18.20	16.40	7.82	0.005	13	0.005
240.00	17.20	17.50	6.96	0.003	11	0.003
980.00	17.00	16.20	6.60	0.002	11	0.002

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	0.36	0.36	99
#10	0.079	2.00	3.14	3.50	94
#20	0.033	0.84	9.75	13.25	76
#40	0.017	0.42	10.07	23.32	58
#60	0.010	0.25	8.20	31.52	44
#100	0.006	0.15	5.27	36.79	34
#200	0.003	0.07	4.90	41.69	26
Pan			14.27	55.96	0

Total Dry Weight of Sample = 64.06

D85 : 1.2947 mm
D60 : 0.4480 mm
D50 : 0.3128 mm
D30 : 0.1060 mm
D15 : 0.0059 mm
D10 : 0.0006 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-2-4(0)
AASHTO Group Name : Silty Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T7-B
Location : Groton, CT
Soil Description : Saturated, brown silty organic sand
Remarks : ---

Depth : ---
Test Date : 12/09/94
Test Method : ASTM D422

Filename : T7B
Elevation : ---
Tested by : jdt
Checked by : gtt

HYDROMETER

Hydrometer ID : hyl-2
Weight of air-dried soil = 17.02 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	15.40	16.20	5.00	0.053	18	0.053
2.00	14.20	16.20	3.80	0.038	13	0.038
4.00	13.80	16.20	3.40	0.027	12	0.027
8.00	13.10	16.20	2.70	0.019	10	0.019
15.00	12.80	16.20	2.40	0.014	9	0.014
30.00	12.40	16.20	2.00	0.010	7	0.010
60.00	11.90	16.20	1.50	0.007	5	0.007
120.00	11.20	16.20	0.80	0.005	3	0.005
250.00	10.40	16.50	0.04	0.003	0	0.003

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	6.73	6.73	76
#10	0.079	2.00	4.44	11.17	60
#20	0.033	0.84	4.12	15.29	46
#40	0.017	0.42	2.44	17.73	37
#60	0.010	0.25	1.77	19.50	31
#100	0.006	0.15	1.30	20.80	26
#200	0.003	0.07	1.22	22.02	22
Pan			6.15	28.17	0

Total Dry Weight of Sample = 37.41

D85 : 6.1502 mm
D60 : 1.9592 mm
D50 : 1.0835 mm
D30 : 0.2291 mm
D15 : 0.0427 mm
D10 : 0.0202 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-1-b(0)
AASHTO Group Name : Stone Fragments, Gravel and Sand

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T8-B
Location : Groton, CT
Soil Description : Gray silty fine sand
Remarks : ---

Depth : ---
Test Date : 12/01/94
Test Method : ASTM D422

Filename : T8B
Elevation : ---
Tested by : jdt
Checked by : gtt

HYDROMETER

Hydrometer ID : hyl-2
Weight of air-dried soil = 40.36 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	35.80	19.30	25.79	0.044	64	0.044
2.00	32.20	19.30	22.19	0.032	55	0.032
4.00	30.70	19.20	20.68	0.023	51	0.023
8.00	28.10	19.00	18.05	0.017	45	0.017
15.00	26.00	19.00	15.95	0.012	40	0.012
30.00	22.00	18.80	11.93	0.009	30	0.009
60.00	19.10	18.20	8.95	0.007	22	0.007
120.00	17.20	17.80	7.00	0.005	17	0.005
245.00	16.10	17.20	5.83	0.003	14	0.003
1221.00	14.10	16.20	3.70	0.002	9	0.002

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Sieve Openings Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
#4	0.187	4.75	0.00	0.00	100
#10	0.079	2.00	0.04	0.04	100
#20	0.033	0.84	0.15	0.19	99
#40	0.017	0.42	0.14	0.33	99
#60	0.010	0.25	0.11	0.44	99
#100	0.006	0.15	0.16	0.60	98
#200	0.003	0.07	0.44	1.04	97
Pan			33.28	34.32	0

Total Dry Weight of Sample = 42.47

D85 : 0.0615 mm
D60 : 0.0387 mm
D50 : 0.0218 mm
D30 : 0.0091 mm
D15 : 0.0036 mm
D10 : 0.0017 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-4(0)
AASHTO Group Name : Silty Soils

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T9-B
Location : Groton, CT
Soil Description : Brown silt
Remarks : ---

Depth : ---
Test Date : 12/08/94
Test Method : ASTM D422

Filename : T9B
Elevation : ---
Tested by : jdt
Checked by : gtt

HYDROMETER

Hydrometer ID : hyl-2
Weight of air-dried soil = 40.15 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	23.50	21.80	24.14	0.044	60	0.044
2.00	30.00	21.80	20.64	0.032	51	0.032
4.00	28.10	21.70	18.71	0.023	47	0.023
8.00	25.80	21.60	16.38	0.016	41	0.016
15.00	23.90	21.20	14.38	0.012	36	0.012
31.00	21.20	20.80	11.57	0.009	29	0.009
60.00	19.00	20.20	9.21	0.006	23	0.006
130.00	17.00	18.60	6.90	0.004	17	0.004
249.00	16.10	17.60	5.88	0.003	15	0.003
1243.00	14.00	16.20	3.60	0.002	9	0.002

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
#4	0.187	4.75	0.00	0.00	100
#10	0.079	2.00	0.06	0.06	100
#20	0.033	0.84	0.15	0.21	99
#40	0.017	0.42	0.13	0.34	99
#60	0.010	0.25	0.10	0.44	99
#100	0.006	0.15	0.25	0.69	98
#200	0.003	0.07	1.41	2.10	94
Pan			35.62	37.72	0

Total Dry Weight of Sample = 45.73

D85 : 0.0641 mm
D60 : 0.0437 mm
D50 : 0.0289 mm
D30 : 0.0092 mm
D15 : 0.0034 mm
D10 : 0.0018 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-4(0)
AASHTO Group Name : Silty Soils

GEOTECHNICAL LABORATORY TEST DATA

Project : Naval Submarine Base
Project No. : GTX-682
Boring No. : ---
Sample No. : T10-B
Location : Groton, CT
Soil Description : Brown silt with organics
Remarks : ---

Depth : ---
Test Date : 12/08/94
Test Method : ASTM D422

Filename : T10B
Elevation : ---
Tested by : jdt
Checked by : gtt

HYDROMETER

Hydrometer ID : hyl-2
Weight of air-dried soil = 42.82 gm
Specific Gravity = 2.65

Hydroscopic Moisture Content :
Weight of Wet Soil = 0 gm
Weight of Dry Soil = 0 gm
Moisture Content = 0

Elapsed Time (min)	Reading	Temperature (deg. C)	Corrected Reading	Particle Size (mm)	Percent Finer (%)	Adjusted Particle Size
1.00	38.60	20.00	28.76	0.043	67	0.043
2.00	34.90	20.00	25.06	0.031	59	0.031
4.00	33.00	20.00	23.16	0.023	54	0.023
8.00	30.80	20.00	20.96	0.016	49	0.016
15.00	28.00	19.90	18.13	0.012	42	0.012
30.00	25.20	19.50	15.23	0.009	36	0.009
60.00	22.40	19.10	12.36	0.006	29	0.006
138.00	19.20	18.00	9.02	0.004	21	0.004
255.00	18.30	17.40	8.05	0.003	19	0.003
1249.00	15.90	16.20	5.50	0.002	13	0.002

FINE SIEVE SET

Sieve Mesh	Sieve Openings Inches	Sieve Openings Millimeters	Weight Retained (gm)	Cumulative Weight Retained (gm)	Percent Finer (%)
0.375"	0.374	9.51	0.00	0.00	100
#4	0.187	4.75	0.04	0.04	100
#10	0.079	2.00	0.02	0.06	100
#20	0.033	0.84	0.14	0.20	99
#40	0.017	0.42	0.19	0.39	99
#60	0.010	0.25	0.18	0.57	98
#100	0.006	0.15	0.19	0.76	98
#200	0.003	0.07	1.15	1.91	95
Pan			35.78	37.69	0

Total Dry Weight of Sample = 45.69

D85 : 0.0610 mm
D60 : 0.0332 mm
D50 : 0.0173 mm
D30 : 0.0067 mm
D15 : 0.0020 mm
D10 : 0.0010 mm

Soil Classification
ASTM Group Symbol : N/A
ASTM Group Name : N/A
AASHTO Group Symbol : A-4(0)
AASHTO Group Name : Silty Soils

ATTACHMENT A.4
LANDFILL/WETLAND INTERFACE SAMPLE CHAIN OF CUSTODY FORMS

CHAIN OF CUSTODY RECORD

715

PROJECT NO.: 9594

SITE NAME: NSB - NLON

SAMPLERS (SIGNATURE): [signature]

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	40 ml VOC	1 L AMBER TCL SVOC's	1 L AMBER TCL SVOC's	1 L PE TCL PESTICIDES/PCB	1 L PE TOTAL METALS + BORON + MANGANESE	60 ml TCL VOC's	250 ml TCL SVOC's	1 L PE TOTAL METALS + BORON	REMARKS
TRIP BLANK	11/20/94	0940		✓	TB-6	2	2								
AREA A STANDS	11/20/94	0945		✓	FB-2	8	2	2	2	1			1		
		0912		✓	EB-2	8	2	2	2	1			1		
		1257		✓	T1-A						2	1			
		1311		✓	T1-B						2	1			
		1333		✓	T2-A						2	1			
		—		✓	DUPLICATE-03						2	1			
		1455		✓	T2-B						2	1			
		1515		✓	T3-A						2	1			
		1540		✓	T3-B						2	1			

TRANSECTS STIM WITS

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):
[signature]	11/28/94 1630	FED EX			
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE / TIME:	REMARKS:	
		[signature]	11-29-94 1000	AB# 169790913	

1344/1200

CHAIN OF CUSTODY RECORD

730

PROJECT NO.: 9594

SITE NAME: NSB - NCON

SAMPLERS (SIGNATURE): [signature] [signature]

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	TCL Inc. vols	TCL SVOCs L Aroclor	TCL PESTICIDES L Aroclor	TAL metals, Total Hardness, Alkalinity	CN, 1L PE	TCL VOCs 2 oz jars	TCL SVOCs, PESTICIDES, PCB soil, TAL metals, CN, Boron	REMARKS
Trip Blank	11/29/94	0940		—	TB-7	2	2							
Area A wetlands	11/29/94	0710		/	EB-3	8	2	2	2	1	1			
		0828		/	T4-A	3						2	1	
		0850		—	T4-B	3						2	1	
		0920		—	T5-A	3						2	1	
		0950		—	T5-B	3						2	1	
		1005		—	T6-A	3						2	1	
		0000		—	Duplicate - 05	3						2	1	
		1322		—	T6-B	6					A 4	2	2	MS/MSD
		1400		—	T7-A	3						2	1	
		1420		—	T7-B	3						2	1	

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):
[signature]	11/29/94 1630				
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE / TIME:	REMARKS: Air Bill # 1699904183 South West Labs	
		[signature]	11/30/94 1000		

Order No 70440 (0693)

PROJECT NO.: 9594/1200

SITE NAME: NSB/NLON

SAMPLERS (SIGNATURE): Tony Colmore

STATION NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	TCL VOCs 40ml vials	TCL SVOC + Amber	TCL PES/PCB + Amber	TAL metals, Hg Boron	CN	TCL VOCs 2 oz jar	TCL SVOC, PCB TAL metals, CN & Boron	REMARKS
Area A wetland	11/30/94	0730		—	EB-4 ✓	8	2	2	2	1	1			
		0919		—	T8-A ✓	3						2	1	
		0950		—	T8-B ✓	3						2	1	
		1020		—	T9-A ✓	3						2	1	
		1343			T9-B ✓	3						2	1	
		1426			T10-A ✓	3						2	1	
		1450			T10-B ✓	3						2	1	

RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):
Tony Colmore	12/2/94 630				
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED BY (SIGNATURE):
RELINQUISHED BY (SIGNATURE):	DATE / TIME:	RECEIVED FOR LABORATORY BY (SIGNATURE):	DATE / TIME:	REMARKS:	
		[illegible signature]	12/1/94 1000	Air Bill No. 1699904124 Southwest Labs	

Order No. 70440 (0693)

ATTACHMENT A.5
LANDFILL/WETLAND INTERFACE SAMPLE LOGSHEETS

HALLIBURTON NUS
Environmental Corporation

SAMPLE LOG SHEET

PA ___ OF ___

[X] SURFACE SOIL
[ ] SUBSURFACE SOIL
[ ] SEDIMENT
[ ] LAGOON/POND
[ ] OTHER

SAMPLERS SIGNATURE _____

SITE NAME NSB NLON / Area A Wetlands

SITE NUMBER 9594

ANALYSES

SAMPLE No.	SAMPLE METHOD	DEPTH (FT)	DATE	TIME	SAMPLED BY	CONCENTRATION (L)LOW (M)MEDIUM	(G)RAB (C)OMPOSITE	60 mL glass TCL VOC	250 mL glass TCL SVOC, P/P TAL Metals + CN	8oz glass TOC	8oz glass Grain Size	8oz glass TCL SVOC, P/P TAL Metals + CN + Hexavalent Chromium			No. OF CONT TOTAL	SOIL DESCRIPTION
T1 - A	HA	0 - 1	11-28-94	1257	TC/TC	L	G	2	1	1	1				5	F-M Gr Silty Sand (D Brn)
T3 - A	HA	0 - 1	11-28-94	1515	TC/TC	L	G	2	1	1	1				5	F-M Gr Silty Sand Tr Org *
T4 - A	HA	0 - 1	11-29-94	0828	TC/KS	L	G	2	1	1	1	1			5	M Gr Sand Tr Silt
T5 - A	HA	0 - 1	11-29-94	0900	TC/KS	L	G	2	1	1	1	1			5	Silty Sand
T6 - A	HA	0 - 1	11-29-94	1000	TC/KS	L	G	2	1	1	1	1			5	F Gr Silty Sand
Duplicate-05	HA	0 - 1	11-29-94	0000	TC/KS	L	G	2	1	1	1	1			5	Duplicate of T6-A

REMARKS: HA : Hand Auger
* : Split Sample w/ TRC

LAB: Chemical : Southwest Labs of Ok
Geotech : Geotesting

ACAD: FORMS\LOG DWG 2/11/93 MB

HALLIBURTON NUS
Environmental Corporation

SAMPLE LOG SHEET

☐ SURFACE SOIL
☐ SUBSURFACE SOIL
☒ SEDIMENT
☐ LAGOON/POND
☐ OTHER

PAGE 1 OF

SAMPLERS SIGNATURE _____

SITE NAME NSB NLON / Area A Wetlands

SITE NUMBER 9594

SAMPLE No.	SAMPLE METHOD	DEPTH (FT)	DATE	TIME	SAMPLED BY	CONCENTRATION (LOW/MEDIUM)	COMPOSITE (G/C)	ANALYSES: 60 mL glass TCL VOC	250 mL glass TCL SVOC, P/P TAL Metals &	8 oz glass TOC	8 oz glass Grain Size	8 oz glass TCL SVOC, P/P + CN TAL Metals + Boron + Hardness			No. OF CONT TOTAL	SOIL DESCRIPTION
T1-B	HA	0-1'	11-28-94	1311	TC/TR	L	G	2	1	1	1				5	M-C Gr Silty Sand Tr
T2-A	HA	0-1'	11-28-94	1333	TC/TC	L	G	2	1	1	1				5	VC Gr Silty Sand Tr
Duplicate-Ø3	HA	0-1'	11-28-94	0000	TC/TC	L	G	2	1	1	1				5	Duplicate of T2
T2-B	HA	0-1'	11-28-94	1455	TC/TC	L	G	2	1	1	1				5	M-C Gr Silty Sand
T3-B	HA	0-1'	11-28-94	1540	TC/TC	L	G	2	1	1	1				5	Fm Gr Silty Sand / Sand Silt Tr D
T4-B	HA	0-1'	11-29-94	0850	TC/KS	L	G	2	*	1	1	1			5	M Gr Sand Tr Silt
T5-B	HA	0-1'	11-29-94	0953	TC/KS	L	G	2	*	1	1	1			5	M-C Gr Sand Tr Silt
T6-B	HA	0-1'	11-29-94	1322	TC/KS	L	G	2	*	1	1	1			5	Silty Sand Tr Org + ~~Silt~~ *
T7-A	HA	0-8"	11-29-94	1403	TC/KS	L	G	2		1	1	1			5	Sandy Silt Tr Roots
T7-B	HA	0-1'	11-29-94	1420	TC/KS	L	G	2		1	1	1			5	Silt w/org D
T8-A	HA	0-1'	11-30-94	0919	TC/TC	L	G	2		1	1	1			5	Clayey Silt Peat
T8-B	HA	0-1'	11-30-94	0950	TC/TC	L	G	2		1	1	1			5	Silty Clay Oil
T9-A	HA	0-1'	11-30-94	1020	TC/TC	L	G	2		1	1	1			5	Silty Clay Oil
T9-B	HA	0-1'	11-30-94	1343	TC/TC	L	G	2		1	1	1			5	Silty Clay H_2S
T10-A	HA	0-1'	11-30-94	1426	TC/TC	L	G	2		1	1	1			5	Silty Sand H_2S
T10-B	HA	0-1'	11-30-94	1450	TC/TC	L	G	2		1	1	1			5	Silty Clay H_2S

REMARKS: HA: Hand Auger
*: Split Sample w/ TRC

LAB: Chemical: South West Labs of Oklahoma
Geotech · Geotesting

ACAD: FORMS\LOG.DWG 2/11/9

SAMPLE LOG SHEET

HALLIBURTON NUS
Environmental Corporation

Page ____ of ____

Case # ____

By ____

- [ ] Monitoring Well Data
- [ ] Domestic Well Data
- [x] Other Equipment Blank

Project Site Name: NSB - NLON Project Site Number: 9594

NUS Source No.: EB-2 Source Location: Area A Wetlands

	Purge Data				
Total Well Depth:					
Well Casing Size & Depth:	Volume	pH	S.C.	Temp. (°C)	Color & Turbidity
Static Water Level:					
One Casing Volume:					
Start Purge (hrs.):					
End Purge (hrs.):					
Total Purge Time (min.):					
Total Amount Purged (gal.):					
Monitor Reading:					
Purge Method:					
Sample Method:					
Depth Sampled:					

Sample Date & Time:	Sample Data			
11-28-94 0812	pH	S.C.	Temp. (°C)	Color & Turbidity
Sampled By: TC NK				

Signature(s):

Observations / Notes:

Equipment Blank on Stainless Steel Bucket Auger

Type of Sample

- [x] Low Concentration
- [ ] High Concentration
- [x] Grab
- [ ] Composite
- [ ] Grab - Composite

	Analysis:	Preservative	
	TCL VOC	HCl	4°C
	TCL SVOC	—	4°C
	TCL Pest/PCB	—	4°C
Total	TAL Metals +	HNO_3	4°C
	CN + Boron		
Diss	TAL Metals +	HNO_3	4°C
	CN + Boron		

SAMPLE LOG SHEET

HALLIBURTON NUS
Environmental Corporation

☐ Monitoring Well Data
☐ Domestic Well Data
☒ Other Equipment Blank

Page ____ of ____
Case # _____
By _____

Project Site Name: NSB - NLON
Project Site Number: 9594
NUS Source No.: EB-3
Source Location: Area A Wetlands

Total Well Depth:	Purge Data				
Well Casing Size & Depth:	Volume	pH	S.C.	Temp. (°C)	Color & Turbidity
Static Water Level:					
One Casing Volume:					
Start Purge (hrs.):					
End Purge (hrs.):					
Total Purge Time (min.):					
Total Amount Purged (gal.):					
Monitor Reading:					
Purge Method:					
Sample Method:					
Depth Sampled:					
Sample Date & Time: 11-29-94 0710	Sample Data				
	pH	S.C.	Temp. (°C)	Color & Turbidity	
Sampled By: TC					

Signature(s):

Observations / Notes:

Equipment Blank of decon of SS trowel

Type of Sample
☒ Low Concentration
☐ High Concentration
☒ Grab
☐ Composite
☐ Grab - Composite

Analysis:	Preservative				
TCL VOC	HCl pH<2 4°C				
TCL SVOC	4°C				
TCL Pest/PCB	4°C				
Total TAL Metals + B+	HNO3 pH<2 4°C				
CN- Hard	NaOH pH>12 4°C				

SAMPLE LOG SHEET

HALLIBURTON NUS
Environmental Corporation

- ☐ Monitoring Well Data
- ☐ Domestic Well Data
- ☒ Other Equipment Blank

Page ____ of ____

Case # _____

By _____

Project Site Name: NSB NLON Project Site Number: 9594

NUS Source No.: EB-4 Source Location: Area A Wetlands

	Purge Data				
Total Well Depth:					
Well Casing Size & Depth:	Volume	pH	S.C.	Temp. (°C)	Color & Turbidity
Static Water Level:					
One Casing Volume:					
Start Purge (hrs.):					
End Purge (hrs.):					
Total Purge Time (min.):					
Total Amount Purged (gal.):					
Monitor Reading:					
Purge Method:					
Sample Method:					
Depth Sampled:					

Sample Data & Time:	Sample Data			
11-30-94 0750	pH	S.C.	Temp. (°C)	Color & Turbidity
Sampled By: TC				

Signature(s):

Observations / Notes:

Equipment Rinsate Blank of Stainless Steel Bowl

Type of Sample

- ☒ Low Concentration
- ☐ High Concentration
- ☐ Grab
- ☐ Composite
- ☐ Grab - Composite

Analysis:	Preservative				
TCL VOC	HCl pH<2 4°C				
TCL SVOC	4°C				
TCL P/P	4°C				
TAL Metals + Hg	HNO3 pH<2 4°C				
Hexavalent					
CN	NaOH pH<12 4°C				

HALLIBURTON NUS
Environmental Corporation

SAMPLE LOG SHEET

☐ Monitoring Well Data
☐ Domestic Well Data
☒ Other Field Blank

Page ____ of ____
Case # ____
By ____

Project Site Name NSB-NLON Project Site Number 9594
NUS Source No. FB-2 Source Location Area A wetlands

	Purge Data				
Total Well Depth:					
Well Casing Size & Depth:	Volume	pH	S.C.	Temp. (°C)	Color & Turbidity
Static Water Level:					
One Casing Volume:					
Start Purge (hrs.):					
End Purge (hrs.):					
Total Purge Time (min.):					
Total Amount Purged (gal.):					
Monitor Reading:					
Purge Method:					
Sample Method:					
Depth Sampled:					

Sample Date & Time: 11-28-94 0745	Sample Data			
	pH	S.C.	Temp. (°C)	Color & Turbidity
Sampled By: NK TC				

Signature(s):

Observations / Notes:

Field Blank of Decon DI H_2O

Type of Sample
☒ Low Concentration
☐ High Concentration
☒ Grab
☐ Composite
☐ Grab - Composite

Analysis:	Preservative	
TCL VOC	HCl	4°C
TCL SVOC	—	4°C
TCL Pest/PCB	—	4°C
Total TAL Metals + CN + Boron	HNO_3	4°C
Diss TAL Metals + CN + Boron	HNO_3	4°C

SAMPLE LOG SHEET

HALLIBURTON NUS
Environmental Corporation

☐ Monitoring Well Data
☐ Domestic Well Data
☒ Other Trip Blank

Page ____ of ____
Case # ____
By ____

Project Site Name NSB-NLON Project Site Number 0594
NUS Source No. TB-6 Source Location Area A wetlands

	Purge Data				
Total Well Depth:					
Well Casing Size & Depth:	Volume	pH	S.C.	Temp. (°C)	Color & Turbidity
Static Water Level:					
One Casing Volume:					
Start Purge (hrs.):					
End Purge (hrs.):					
Total Purge Time (min.):					
Total Amount Purged (gal.):					
Monitor Reading:					
Purge Method:					
Sample Method:					
Depth Sampled:					

Sample Date & Time:	Sample Data			
10-26-94 0940	pH	S.C.	Temp. (°C)	Color & Turbidity
Sampled By: SW Labs of OK				

Signature(s):

Type of Sample
☒ Low Concentration
☐ High Concentration
☒ Grab
☐ Composite
☐ Grab - Composite

Observations / Notes:

Trip Blank

Lab Prepared

* For samples sent 11/28/94 (Fed Ex AB# 16999 0413)

Analysis:	Preservative
TCL VOCs	HCl 4°C

SAMPLE LOG SHEET

HALLIBURTON NUS
Environmental Corporation

☐ Monitoring Well Data
☐ Domestic Well Data
☒ Other Trip Blank

Page 1 of 1
Case # _____
By _____

Project Site Name: NSB NLON
Project Site Number: 9594
NUS Source No.: TB-7
Source Location: B-325 / Area A wetlands

	Purge Data				
Total Well Depth:					
Well Casing Size & Depth:	Volume	pH	S.C.	Temp. (°C)	Color & Turbidity
Static Water Level:					
One Casing Volume:					
Start Purge (hrs.):					
End Purge (hrs.):					
Total Purge Time (min.):					
Total Amount Purged (gal.):					
Monitor Reading:					
Purge Method:					
Sample Method:					
Depth Sampled:					

Sample Date & Time: 10-26-94 0940	Sample Data			
	pH	S.C.	Temp. (°C)	Color & Turbidity
Sampled By: SW Labs of OK				

Signature(s):

Type of Sample
☒ Low Concentration
☐ High Concentration
☒ Grab
☐ Composite
☐ Grab - Composite

Observations / Notes:

Labs prepared Trip Blank
For samples sent 11/29/94
FedEx AB# 1699904183

Analysis:	Preservative				
TCL VOC	HCl pH<2 4°C				

APPENDIX D

GEOTECHNICAL BORING LOGS

BORING 2GB1

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/28/93
DATE COMPLETED: 10/28/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: 4-1/4" HOLLOW STEM AUGER
SAMPLING METHOD: 2" SPLIT-SPOON
GROUND ELEVATION: 75.1 FT.
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	5,7 19,12	40		Brown, find SAND, some silt, trace roots, no odor, dry, TOPSOIL, SM. Light brown fine to coarse SAND and GRAVEL, dry, no odor, SW.											0
2-5	Auger	-													
5-7	1,WOH WOR,2	85		Dark gray CLAY, some silt, little sand, moist strong methane odor, CL.											5
7-10	Auger	-													
10-12	1,WOH 1,3	95		Dark gray CLAY, some silt, little sand, moist strong methane odor, CL.											10
12-15	Auger	-													
15-17	3,6 4,6	10		Dark brown, fine to medium SAND and SILT, little gravle, wet, no odor, SM.											15
17-20	Auger	-													
20-22	18,23 21,19	50		Gray, fine to coarse SAND and GRAVEL, wet weathered bedrock in end of spoon, SW.											20
				END OF BORING AT 22.0 FEET.											

ATLANTIC

BORING 2GB2

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/28/93
DATE COMPLETED: 10/28/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 2-IN. SPLIT-SPOON, CORE BARREL
GROUND ELEVATION: 75.1 FT.
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL, admixture, moisture, other notes, ORIGIN	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	ODOR: NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	18,7 5,5	25	N/A	Light brown to white, fine to medium sand and gravel, some crushed stone, dry, FL.	■								■		0
2-5	Auger			Not sampled.											
5-7	1,1 1,2	80		Dark gray CLAY, some silt and fine sand, trace organics, moist, strong organic odor, dredge spoils, OL.									■		5
7-10	Auger			Not sampled.											
10-12	1,1 WOH,1	95		Dark gray CLAY, some silt and fine sand, trace organics, moist, strong organic odor, dredge spoils, OL.									■		10
12-15	Auger			Not sampled.											
15-17	1,2 1,18	100		Dark gray CLAY, some silt and fine sand, trace organics, moist, strong organic odor, dredge spoils, OL.									■		15
				Auger refusal at 17 feet. END OF BORING.											

ATLANTIC

BORING 2GB3

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LO' TION: AREA A LANDFILL
DA'= STARTED: 10/28/93
DATE COMPLETED: 10/28/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 2-IN. SPLIT-SPOON
GROUND ELEVATION: 78.2 FT.
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	5,7 19,12	40	N/A	Brown fine to coarse SAND, some gravel, little organics, dry, no odor, SP.	■								■		0
2-5	Auger			Not sampled.											
5-7	1,WOH WOR,2	85		Dark gray CLAY, some silt and fine sand, trace organics, moist, strong organic odor, dredge spoils, OL.									■		5
7-10	Auger			Not sampled.											
10-12	1,WOH 1,3	95		Dark gray CLAY, some silt and fine sand, trace organics, moist, strong organic odor, dredge spoils, OL.									■		10
12-15	Auger			Not sampled.											
15-17	3,6 4,6	10		Dark brown fine to medium SAND and SILT, some gravel, saturated, no odor, SP.									■		15
	Auger			Not sampled.											
20-22	18,23 21,19	50		Gray, fine to coarse SAND and GRAVEL, saturated, highly weathered bedrock, GP.									■		20
				Auger refusal at 22 feet. END OF BORING.											

ATLANTIC

BORING 2GB4

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/27/93
DATE COMPLETED: 10/27/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 2-IN. SPLIT-SPOON, CORE BARREL
GROUND ELEVATION:
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL,admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	28,150/5"	35	N/A	Light brown, fine to coarse SAND and GRAVEL, trace red brick, dry, FILL, FL.											0
2-2.5	Auger	-	-	Not sampled.											
				Concrete (possible subsurface structure) cored through soft material to 3 feet 5 inches.											
2.5-7.8	Core	-	-	Gray granitic gneiss.											5
				END OF BORING AT 7 FT 10 IN.											10

ATLANTIC

BORING 2GB5

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/29/93
DATE COMPLETED: 10/29/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 2-IN. SPLIT-SPOON
GROUND ELEVATION:
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, density, SOIL,admixture, moisture, other notes, ORIGIN	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	7,18 23,15	60	N/A	Light brown, fine to medium SAND, little gravel, trace organics, dry, no odor, SP.	■								■		0
2-5	Auger			Not sampled.											
5-7	15,10 14,21	25		Light brown, fine to medium SAND, little gravel, trace organics, dry, no odor, SP.	■										5
7-8.5	Auger			Not sampled.											
8.5-9	19,100/1"	10		Gravel and fractured rock, little sand, dry, GP, cored through boulder drove spoon through overburden to 25', not cored, bedrock too deep.	■										
				END OF BORING AT 9 FT.											10

ATLANTIC

BORING 2GB6

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/27/93
DATE COMPLETED: 10/27/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 2-IN. SPLIT-SPOON, CORE BARREL
GROUND ELEVATION: 83.4 FT.
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL,admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	7,8 7,8	65		Brown, fine to coarse SAND, little gravel, trace roots, trace coal, dry, FILL, FL.											0
2-3	Auger	-		Not sampled.											
3-8	Core	-		Bedrock, grey gneiss, RQD=100%.											5
				END OF CORE AT 8.0 FEET.											10

ATLANTIC

BORING 2GB7

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/27/93
DATE COMPLETED: 10/27/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 2" SPLIT SPOON
GROUND ELEVATION: 80.3 FT.
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL,admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT)
0-2	4,6 9,11	75		Brown fine to medium sand, little gravel, trace silt, trace organics, pieces of plastic, slight petroleum odor, dry, FILL, FL.	■										0
				Not sampled.											
2-5	Auger	-													
5-7	WOH,1 WOH,WOH	70		Black stained fine to medium sand, little silt, pieces of plastic, moderate petroleum odor, FL.		■									5
				Not sampled.											
7-10	Auger	-													
				AUGER AND SAMPLER REFUSAL AT 10.0 FEET.											10

ATLANTIC

BORING 2GB8

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/26/93
DATE COMPLETED: 10/26/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 2-IN. SPLIT-SPOON, CORE BARREL
GROUND ELEVATION: 82.8 FT.
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL,admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	9,18 19,22	65		Brown, fine to medium sand and silt, little gravel, trace black ash, metal, FILL, FL.	■										0
2-4	Auger	-		Not sampled.											
4-8	Core	-		Fractured bedrock core, grey banded GNEISS, RQD=42%, BR.											5
				END OF BORING AT 8.0 FEET.											10

ATLANTIC

BORING 2GB9

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/26/93
DATE COMPLETED: 10/26/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 2" SPLIT SPOON
GROUND ELEVATION: 84.4 FT.
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, density, SOIL,admixture, moisture, other notes, ORIGIN	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	9,8 13,50/4"	60	-	Brown fine SAND, little gravel, trace silt, dry SW.											0
				White fine to coarse SAND and GRAVEL, weathered bedrock, SP.											
2-2.5	Auger	-	-	Not sampled.											
				AUGER REFUSAL AT 2.5 FEET.											5 10

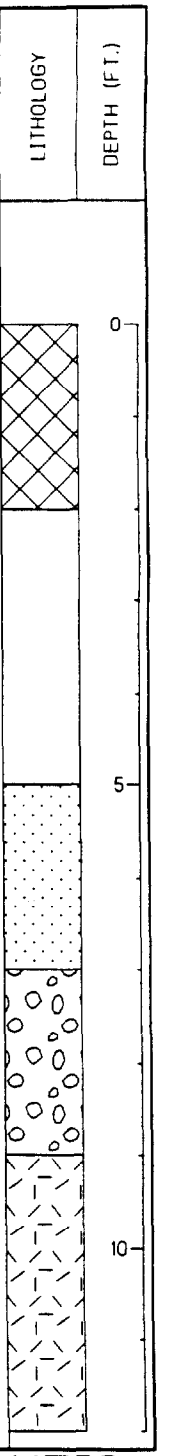
ATLANTIC

BORING 2GB10

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/26/93
DATE COMPLETED: 10/26/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 2-IN. SPLIT-SPOON, CORE BARREL
GROUND ELEVATION: 85.9 FT.
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL, admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS
0-2	4,3 2,8	30		Brown, fine to medium sand, little silt and gravel, trace organics, dry, no odor, FL.	■								
				Black-stained silt and peat, plastic material, strong petroleum odor, FL.		■							
2-5	Auger	-		Not sampled, miscellaneous rubble pulled up by augers.									
5-7	11,18 18,19	75		Brown fine SAND and SILT, little gravel, trace organics, moist, SP.	■								
7-9	Auger	-		Grey, fine to coarse SAND and GRAVEL, weathered bedrock, dry, GP. Began core run at 9.0 feet.									
9-14	Core	-		Fractured gneiss, BR. Encountered soft formation at 11.0 feet. Cored to 14.0 feet.									



ATLANTIC

BORING 2GB11

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: Area A Landfill
DATE STARTED: 10/26/93
DATE COMPLETED: 10/26/93
DRILLING CONTRACTOR: Columbia Environmental Drilling

DRILLER:
DRILLING METHOD: Hollow Stem Auger
SAMPLING METHOD: 2" Split Spoon, Core Barrel
GROUND ELEVATION:
DATUM:
INSPECTOR: Rob Cooney

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL, admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	4,3 21,5	30		Brown fine SAND, silt and clay, little gravel, dry, GC.	■				■						0
				Not sampled.											
2-5	Auger	-													
5-7	53,48 31,41	75		Brown fine SAND, silt and clay, little gravel, dry, GC.	■				■						5
				Not sampled.											
7-8.3	Auger	-													
				END OF BORING AT 8.3 FEET.											10

ATLANTIC

BORING 2GB12

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/22/93
DATE COMPLETED: 10/22/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: 4-1/4" HOLLOW STEM AUGER
SAMPLING METHOD: 2" SPLIT-SPOON, CORE BARREL
GROUND ELEVATION: 92.0 FT.
DATUM: SUBASE
INSPECTOR: JANE GRUENENFELDER

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL, admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	7,5 6,13	5		Brown to gray SAND and GRAVEL, trace organics, cobble in tip of spoon, SW.											0
2-5	Auger	-		Auger to refusal.											
5-10	Core	0		Bedrock core from 5 to 10 feet. Gray banded GRANITIC GNEISS. BR.											5
				END OF CORE AT 10.0 FEET.											10

ATLANTIC

BORING 2GB13

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/22/93
DATE COMPLETED: 10/22/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: 4-1/4" HOLLOW STEM AUGER
SAMPLING METHOD: 2" SPLIT-SPOON
GROUND ELEVATION: 91±
DATUM: SUBASE
INSPECTOR: JANE GRUENENFELDER

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL, admixture, moisture, other notes, ORIGIN	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	ODOR: NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	3,2 9,31	40		Brown, fine to medium SAND and GRAVEL, FL.											0
2-5	Auger	-		Auger through rubble and fill material containing plastic, glass, etc. refusal at 5.0 feet.											5
				END OF BORING AT 5.0 FEET.											10

ATLANTIC

BORING 2GB14

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/25/93
DATE COMPLETED: 10/25/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 2-IN. SPLIT-SPOON, CORE BARREL
GROUND ELEVATION: 94.4 FT.
DATUM: SUBASE
INSPECTOR: MATT PALFY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL,admixture, moisture, other notes, ORIGIN	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-.5	100/6"	25		Brown, medium SAND and GRAVEL, some organics, GP. Hit Bedrock at 0.5 feet.	■										0
0.5-5.4	Core	-		Bedrock - low metamorphic grade gneiss, BR, core taken from 0.5 to 5.4 feet, BR.									■		5
				END OF BORING AT 5.4 FEET.											10

ATLANTIC

BORING 2GB15

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/22/93
DATE COMPLETED: 10/22/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: 4-1/4" HOLLOW STEM AUGER
SAMPLING METHOD: 2" SPLIT-SPOON, CORE BARREL
GROUND ELEVATION:
DATUM: SUBASE
INSPECTOR: JANE GRUENENFELDER

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL, admixture, moisture, other notes, ORIGIN	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	ODOR: NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
				Bedrock exposed, no boring necessary.											0
															5
															10

ATLANTIC

BORING 2GB16

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/22/93
DATE COMPLETED: 10/22/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER, CORING ROD
SAMPLING METHOD: 2 IN. SPLIT-SPOON, 1-3/4 IN. CORE E
GROUND ELEVATION:
DATUM: SUBASE
INSPECTOR: MATT PALFY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL,admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	5,6 9,10	70	N/A	Light brown fine to medium SAND, dry, no odor, SP											0
				Dark brown PEAT, moist, PT											
2-4	Auger	-	-	Note: Not Sampled - Auger and sampler refusal at 4.0 feet, cored from 4.0 to 9.0 feet.											
4-8.83	Core			Bedrock - low-grade metamorphic gneiss, BR.											5
				END OF BORING AT 8 FT 10 IN.											10

ATLANTIC

BORING 2GB17

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/22/93
DATE COMPLETED: 10/22/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: 4-1/4" HOLLOW STEM AUGER
SAMPLING METHOD: 2" SPLIT-SPOON
GROUND ELEVATION: 92.4 FT.
DATUM: SUBASE
INSPECTOR: JANE GRUENENFELDER

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL, admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	11,9 50/5in.	30	-	Brown, medium to coarse SAND, FL.											0
				Brick fragments with rock fragments in bottom of spoon, FL.											
2-4.2	Auger	-	-	Not sampled.											
				Auger refusal at 4.2 ft. END OF BORING.											5
															10

ATLANTIC

BORING 2GB18

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/22/93
DATE COMPLETED: 10/22/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3 IN. SPLIT-SPOON, CORE BARREL
GROUND ELEVATION: 92.5 FT.
DATUM: SUBASE
INSPECTOR: JANE GRUENENFELDER

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL,admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	1,3 7,16	30		Brown, fine to medium SAND, trace coarse sand and silt, little organics, moist, no odor, SP.	■										0
2-5	Auger	-		Not sampled.											
5-7	2,2 2,4	90		Brown, fine to medium SAND, trace coarse sand and silt, little organics, moist, no odor, SP.	■										5
7-10	Auger	-		Not sampled.											
10-12	7,8 10,11	80		Brown, fine to medium SAND, trace coarse sand and silt, little organics, moist, no odor, SP.	■										10
				Fine gray SAND, little silt, orange staining in top 5 inches, dry, no odor, SW.	■	■									
12-18.8	Auger/ Core	-		Not sampled. Appeared to hit bedrock at 14 feet, but cored through boulder back into soil, hit actual bedrock at 18.8 feet.											15
18.8-23.16	Core	-		Bedrock - low-grade metamorphic gneiss, BR.											20
				END OF BORING AT 23.16 FEET.											

ATLANTIC

BORING 2GB19

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/28/93
DATE COMPLETED: 10/28/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 2-IN. SPLIT-SPOON, CORE BARREL
GROUND ELEVATION: 92.4 FT.
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL, admixture, moisture, other notes, ORIGIN	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	ODOR: NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	4,1 WOH,2	50	N/A	Light brown, fine SAND, SILT, and CLAY, trace organics, SC.	■										0
2-5	Auger	-	-	Not sampled.											
5-7	2,2 2,3	95		Light brown, fine SAND, SILT, and CLAY, trace organics, moist, SC.	■										5
7-10	Auger	-	-	Not sampled.											
10-11.1	11,15 100/1"	45		Light brown, fine SAND, SILT, and CLAY, trace organics, moist, SC.	■										10
				Gray, fine SAND, little silt and gravel, SW.	■										
				END OF BORING AT 11.1 FEET.											

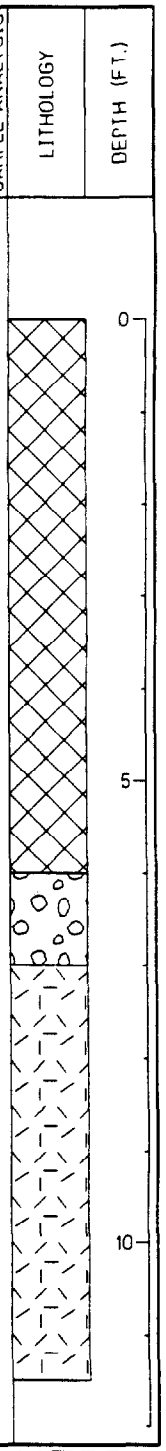
ATLANTIC

BORING 2GB20

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/28/93
DATE COMPLETED: 10/28/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 2-IN. SPLIT-SPOON, CORE BARREL
GROUND ELEVATION: 95.0 FT.
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL, admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS
0-2	19,14 50/0"	40		Brown, fine sand and silt, trace gravel, trace organics, FL.									
2-5	Auger	-	-	Not sampled.									
5-7	11,10 100/2"	55		Brown, fine to medium sand, little silt, trace roots, brick fragments, dry, FL.									
				Cored through boulder to 6.4 feet, through overburden, to reach bedrock at 7.0 feet, GP.									
7-11.5				Fractured bedrock, GNEISS, BR.									
				END OF BORING AT 11.5 FEET.									



ATLANTIC

BORING 2GB21

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/29/93
DATE COMPLETED: 10/29/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 2-IN. SPLIT-SPOON, CORE BARREL
GROUND ELEVATION:
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL, admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-4	Auger	-	-	Not sampled.											0
4-6	Shelby tube	60	N/A	Drove Shelby tube, 1.2 recovery of dredge spoils.	■								■	⊠	5
6-22	Auger	-	-	Auger to 22 feet, hit swamp soils (gray clay, some silt, little very fine sand, organic odor, moist) at approximately 10 feet.											10, 15, 20
22-26.3	Core			Fractured bedrock, BR. RQD = 84%											25
				END OF BORING AT 26.3 FEET.											

ATLANTIC

BORING 2GB22

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/29/93
DATE COMPLETED: 10/29/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 2-IN. SPLIT-SPOON, SHELBY TUBE
GROUND ELEVATION: 80.7 FT.
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, density, SOIL,admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	ODOR NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-5	Auger	-		Not sampled.											0
5-7	19,26 100/2"	35		Brown, fine to coarse sand and gravel, trace paint, plastic, moist, paint odor, FL.	■										5
7-9	39,38 22,11	50		Brown, fine to coarse sand, little gravel and silt, little red paint, paint thinner odor, FL.	■										
				Wood fragment, FL.	■										
9.0-10.0	17,13	0		Light brown very fine SAND, little silt, possible dredge spoils, dry, no odor, SM. No recovery.	■										
10-12.0	Shelby Tube	50		Drove Shelby tube; recovered approximately 1 foot of dredge spoils, gray, fine to medium SAND and SILT, wet, OL.	■								■		10
				END OF BORING AT 12.0 FEET.											

ATLANTIC

BORING 2GB23

PROJECT: NSB-NLON INTERIM REMEDIAL ACTIONS
PROJECT NO: 1256-31-03
LOCATION: AREA A LANDFILL
DATE STARTED: 10/29/93
DATE COMPLETED: 10/29/93
DRILLING CONTRACTOR: COLUMBIA ENVIRONMENTAL DRILLING

DRILLER: GENE LEVESQUE
DRILLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: 3-IN. SPLIT-SPOON
GROUND ELEVATION: 77.8 FT.
DATUM: SUBASE
INSPECTOR: ROB COONEY

SPLIT SPOON SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, density, SOIL, admixture, moisture, other notes, ORIGIN	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	ODOR: NONE	SLIGHT	MODERATE	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-7	Auger	-		Not sampled.											0, 5
7-9	Shelby tube	-		Drove Shelby tube - fill material, sheen on center bit, FL.			■							▨	
9-9.5	Auger	-		Not sampled.											
9.5-11.5	14,19 22,26	80		Brown, fine to coarse sand, some gravel, trace wood, metal, slag, oily liquid present, hydrocarbon odor, saturated FILL, FL.				■						▨	10
11.5-13.5	Auger	-		Not sampled.											
13.5-14.5	42,100/2"	40		Dark brown fine to medium sand and gravel, some wood, sheen, FL.			■							▨	
14.5-15	Auger	-		Not sampled.											
15-17	7,11 11,15	30		Brown fine to medium sand, little silt, gravel, wood, no odor, FL.	■									▨	15
				END OF BORING AT 17.0 FEET.											

ATLANTIC

APPENDIX E

AREA A LANDFILL RISK MEMORANDUM

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MEMORANDUM

File: 228

March 18, 1994

To: Barry Giroux
From: Charles Menzie
Subject: Risk Memo for the Area A Landfill

This memo summarizes the results of the Public Health Risk Assessment for the Area A Landfill and develops risk-based remedial objectives and associated target levels for selected contaminants in soils. This assessment is based on work performed at the site during 1991 and 1992 and presented in the Phase I Remedial Investigation Report. The assessment takes into account comments on that report resulting from a review of the document by USEPA Region I. Thus, the statements made concerning risks and remedial objectives are based on USEPA Region I as well as national guidance. In addition, the data generated for the Area A Landfill during the fall of 1993 by Atlantic Environmental were reviewed to ensure that the results were consistent with previous data.

Current and Future Land Use

The region referred to as Area A Landfill is approximately 7 acres in size, most (97%) of which is unpaved. The area is used primarily for storage, and Naval authorities refer to this site as "Alpha Area Storage and deployed parking".
Within the general landfill area, various materials are stored on wooden palettes. A concrete pad in the southwest portion of the landfill was used for above ground storage of transformers, removed underground storage tanks, and crane weights. Military serviceman store their cars in deployed parking in one section of the landfill area when on sea duty.

Current on-site activities entail daily movement of stored items onto the wooded pallets, preparation of sandbags in the summer, and occasional repair of storm sewers. Thus, most of the people present at the site are either civilian or military personnel.

The site is also visited by the public periodically. Public auctions are held to remove abandoned cars in the deployed parking area. In addition, there is a potential that children of Subase military personnel may visit the area. The North Lake recreational area and on-base residential housing are located west of the Area A landfill. The Area A landfill site is not

fenced. A standing watch exists when Alpha Area storage is closed, but access is possible from the road and the wooded hillside to the west. Children of junior officers living on the Subase may explore the wooded areas (Area A Downstream) adjacent to the landfill or might investigate the landfill itself. The likelihood that children may visit these areas is slight given the watch at the landfill and the existing fence around Area A Downstream. However, these activities were included in the risk assessment scenarios to comply with EPA guidance.

Recreational activities in close proximity to Area A landfill include military servicemen jogging along Wahoo Ave and playing tennis in nearby tennis courts.

Because of the existing uncovered dirt piles and current on-site activities in the unpaved areas, fugitive dust generation is likely. Receptors that could be exposed to fugitive dust include base personnel who are working on the site, base personnel who are jogging or playing tennis on base, and on-base and off-base residents. The nearest Groton/Ledyard resident who lives along Route 12 is only 425 meters from the site. Residential housing for junior officers and their families is approximately 490 meters from the landfill.

The future use is expected to be the same as current use.

Conditions Evaluated

Inorganic and organic compounds were detected at elevated levels in surface soils, subsurface soils, and groundwater at Area A Landfill during the Phase I investigation. These media were the focus of the investigation. The investigation itself focused on specific areas of Area A Landfill where contamination was suspected.

Selection of Chemicals of Concern for Evaluation

The Area A Landfill is one of a number of sites being evaluated at the Navy Base. Because of potential for cumulative risks from these sites, a single base-wide list of chemicals of concern was developed. This ensured that chemicals were consistently evaluated from location to location even though some of the chemicals on the list may not have been detected at a particular site. A brief overview of the chemicals evaluated for the Navy Base and Area A Landfill is provided below.

Non-carcinogenic PAHs (All HSL Compounds Included)	**Carcinogenic PAHs** (All HSL Compounds Included)	**PCBs** (Arochlors 1260 and 1254)

Other Semi-Volatiles (12 compounds: primarily phthalates and phenols)	**Pesticides** (7 compounds: DDT residues, endrin, methoxychlor)	**Metals** (14 compounds: Al, Sb, As, Be, B, Cd, Cu, Fe, Pb, Mn, Hg, Ni, Se, Zn)
BTEX Compounds (All BTEX compounds)	**Chlorinated Volatiles** (13 compounds)	**Other Volatiles** (4 compounds)

Receptors and Exposure Pathways Evaluated for Area A Landfill

Based on information obtained through site visits, inspections, and discussions with personnel working at the Area A Landfill or involved in future plans for the area, the following potential receptors were identified:

- Utility Worker Repairing Storm Sewers in Area A Landfill;
- Weapons Center Personnel Exposed to Fugitive Dust from Area A Landfill;
- Military Servicemen Moving Palettes in Alpha A Storage;
- Military Servicemen Exposed to Fugitive Dust While Engaging in Nearby Recreational Activities;
- Groton/Ledyard Residents Exposed to Fugitive Dust;
- Citizens Attending Car Auctions in Deployed Parking.

Conduct of the Risk Assessment

Risk calculations were made for chemicals with regard to their potential carcinogenic health risks and other (non-carcinogenic) health risks. These calculations were carried out in accordance with standard USEPA guidance and also reflect specific guidance provided by USEPA Region I in their guidance documents and in discussions.

Lead exposure for workers was evaluated by comparison to the 500 to 1,000 mg/kg range for soils identified as a guidance cleanup level for Superfund sites by USEPA (1989 and 1990). These guidance levels were developed by the Centers for Disease Control (CDC; 1985) to protect children when the current or predicted land use residential. The CDC found that soil and dust lead concentrations above this range are associated with blood lead levels above background in children. Therefore, the 500 to 1000 mg/kg range is expected to be

conservative for the protection of workers or potential child trespassers.

The Fall 1993 sampling of subsurface soils revealed the presence of PCBs, PAHs, pesticides, and some metals at concentrations higher than those reported in the Phase I report. The maximum values reported by Atlantic Environmental for each of these chemicals in subsurface soils was used to estimate risks to identified receptors. In addition, the most recent USEPA guidance concerning exposure factors and toxicity values was used in making estimates of risk.

For scenarios involving exposures to fugitive dust from Area A landfill, dust concentrations were either modeled or an ambient particulate concentration was selected. There are storm sewers to depths of eight feet in Area A Landfill. Thus, soil samples collected to a depth of eight feet were used to calculate the soil exposure point concentrations during repair of storm sewers. The depth of ground water in Area A Landfill ranges from approximately 8 to 25 feet below the surface. Thus, for the most part, exposures to ground water are not likely while repairing storm sewers. Slight incidental exposure to ground water may be possible if there are locations within the landfill where storm drains and ground water are encountered at the depth of 8 feet.

Results of the Risk Assessment

Non-carcinogenic health risks were evaluated using the Hazard Index. Risks are presumed to exist for a particular receptor when the Hazard Index exceeds "1" for all the compounds and pathways combined. When the Hazard Index is less than "1", non-carcinogenic health risks are judged to be negligible. If Hazard Indices exceed "1", compounds contributing to the risk and target organs are reviewed to evaluate whether different non-carcinogenic effects are being assessed.

Lead was also judged to pose a potential risk where concentrations exceeded the 500 to 1,000 mg/kg guidance level in soils. This range of levels developed for the protection of children in residential scenarios is expected to be conservative for the conditions and scenarios at Area A Landfill.

Carcinogenic health risks were evaluated with respect to the incremental lifetime risk of cancer for an exposed individual. These risk estimates were compared to the one in one million (1 E-6) to one in ten thousand (1 E-4) range identified by the USEPA. Risks less than 1 E-6 are generally considered negligible while risks greater than 1 E-4 are generally considered indicative of the need for a remedial action. Within the range of 1 E-6 to 1 E-4, risk management decisions are made based on a variety of factors.

Exposure associated with sandbagging activity was judged to be small compared to the other Area A Landfill exposure scenarios because of the short duration of this activity. Therefore, health risks were not quantified for this less frequent activity.

Ground water within Area A contains VOCs and cadmium at levels above ARAR and TBC drinking water standard/guidance values, indicating a potential health risk if the water were to be consumed. No potable water supply wells exist or are planned by the Navy in the potentially affected downgradient area.

The results of the quantitative risk assessment are provided below.

Utility Worker Repairing Storm Sewers in Area A Landfill

The hazard indices do not exceed the benchmark of "1" established by EPA.
The carcinogenic incremental lifetime risk associated with soil contaminant exposure was between one in one million (1 E-6) and one in one hundred thousand (1 E-5). This risk was due primarily to the presence of PCBs in subsurface soils and, to a lesser extent, the presence of carcinogenic PAH compounds. Combined, the PAH compounds contributed a maximum of approximately 1 E-6 risk. The distribution of PCBs and PAHs in soil was patchy. Thus, the average risk is expected to be lower than that estimated using maximum values. Based on the results of these analyses, risks to these workers are judged to be low.

Weapons Center Personnel Exposed to Fugitive Dust from Area A Landfill

Non-carcinogenic health risks and incremental risks of cancer are all within levels considered acceptable.

Military Servicemen Moving Palettes within Area A Landfill

Non-carcinogenic health risks were negligible for these workers. Incremental lifetime cancer risks of 8.5 E-6 fall within EPA's range of 1 E-6 to 1 E-4. Most of the risk is due to the presence of PCBs in surface soils within Area A Landfill.

Military Servicemen Exposed to Fugitive Dust While Engaged in Recreational Activities Near Area A Landfill

Risks to this exposure group from fugitive dust from Area A Landfill are negligible.

Groton/Ledyard Residents Exposed to Fugitive Dust from Area A Landfill

Risks to off-site residents due to the transport of fugitive dusts from Area A Landfill are negligible.

Citizens Attending Car Auctions in Deployed Parking

Risks to people participating in car auctions are estimated to be negligible.

Summary of Risk

Receptors at Risk

Estimated cancer risks for all groups were less than one in ten thousand (1 E-4) and most receptors were near or below the one in one million (1 E-6) risk level. The two group for which risk estimates exceeded one in one million were workers involved in moving pallets and workers involved in maintaining subsurface utility lines. These findings are consistent with the nature, frequency, and duration of these workers' activities. Risks to both groups were due to the presence of PCBs in either surface or subsurface soils. PAH compounds contributed to some of the risk to workers involved in excavation activities. As is consistent with EPA guidance, the risks assessment assumed that workers involved in these activities did not use protective equipment such as gloves, dust masks, respirators, etc.

Exposure Routes and Media Contributing to Risk

Potential incidental ingestion of contaminants in surface soils or subsurface soils is the most important contributor to the estimated risks; dermal exposure for individuals involved in excavations is also important for PCBs.

Chemicals Contributing to Risk

PCBs is the primary group of chemicals contributing to the carcinogenic risk. PAH compounds make a small contribution to the risk for individuals involved in excavations. Lead concentrations slightly exceeded 1,000 mg/kg in one sample. Overall, metals, while elevated in some soil samples, do not pose an unacceptable health risk.

Development of Risk-Based Target Levels

Based on the information presented above, several risk reduction objectives were developed:

- Reduce exposure of workers to PCBs in surface soils
- Reduce exposure of workers to PCBs in subsurface soils

The risk reduction objectives are established for soils that are accessible. This is defined as

the upper six inches for surface soils and the upper eight feet for subsurface soils. The depth of accessible subsurface soils is established based on the depth of excavation for the purpose of maintaining storm sewers.

Workers (moving pallets and working on storm sewers) are the individuals most at risk at the site and PCBs are the compounds that contribute most to the estimated risks. Risk reduction objectives and associated target levels developed for these individuals and chemicals will ensure that risks to other receptors are at acceptable levels.

The target levels suggested below are designed to insure: 1) that there is little opportunity for individuals to encounter hot spots where patches of contaminants may be present at elevated levels, and 2) to insure that overall risks associated with activities at the Area A Landfill are less than one in ten thousand (1 E-4). Because contaminants have been observed to occur in patches within the Area A Landfill, remediation focused at addressing these patches will likely insure that both risk reduction objectives are met. To insure that overall risks are at or less than 1 E-4, target levels for PCBs are developed for a target risk level of one in one hundred thousand (1 E-5).

Target levels are developed for surface soils (upper 6 inches) based on the exposure scenario for individuals involved in moving and working with pallets. Target levels for subsurface soils (upper 8 feet but below 6 inches) are based on the exposure scenario for individuals involved in excavation. In brief, the major exposure factors used in the scenario involving movement of pallets are: frequency of exposure (260 days/year), duration of exposure (3 years), soil ingestion rate (100 mg/day), absorption factor for ingestion (0.3), soil adherence on skin (0.5 mg/cm^2), fraction of skin area exposed (0.19), absorption of PCBs through skin (6%), body weight (70 kg), and lifetime (70 years). The major exposure factors used in the exposure involving excavation are: frequency of exposure (1 day/year), duration of exposure (20 years), soil ingestion rate (480 mg/day), absorption factor for ingestion (0.3), soil adherence on skin (0.5 mg/cm^2), fraction of skin area exposed (0.19), absorption of PCBs through skin (6%), body weight (70 kg), and lifetime (70 years).

Target Levels for PCBs in Surface Soils

Workers involved with moving pallets may come into contact with surface soils over long periods of time and be exposed to PCBs present within these surface soils. A Risk Reduction Objective has been identified to "*Reduce exposure of workers to PCBs in surface soils of the Area A Landfill.*" The objective is based on the continued industrial use of the Area A Landfill.

A target level of 10 mg/kg (ppm) for PCBs in surface soils is suggested because it is consistent with levels that have been used elsewhere, including within Connecticut, to guide remediation efforts. The 10 mg/kg maximum concentration is consistent with the following guidance and regulations:

The PCB Spill Cleanup Policy (FR 10693, Vol. 52, No. 63) suggests a clean up level of 10 mg/kg for a residential scenario assuming that soils are covered with 10 inches of clean soil. This is based on a incremental carcinogenic risk of 1 E-5 direct contact exposures to soils containing 1 mg/kg of PCBs. The policy assumes that the clean cover will reduce risks by an order of magnitude.

Superfund guidance (U.S. EPA, 1990) suggests PCB Recommended Soil Action Levels or 10 to 25 mg/kg for industrial areas. These levels are based on an incremental carcinogenic risk estimate of less than 1 E-4 for a residential scenario. The guidance acknowledges that these levels will result in a lower level of risk in industrial areas due to the reduced frequency of exposure.

State of Connecticut draft clean up levels for PCBs are 2 mg/kg in areas where the ground water is classified as GA and 10 mg/kg (with 10 inches of clean cover) where the ground water is classified as GB. These levels are based on Federal Toxic Substances Control Act (TSCA) regulations 40CFR761 but have been interpreted by the State of Connecticut. The TSCA regulations are also based on a residential scenario.

A concentration of 10 mg/kg will ensure that there are no "hot spots" for exposure to soils within the Area A Landfill area.

In addition, this concentration would yield an estimated risk of 7 E-6 for the workers moving pallets. Application of this target level as a site-wide average for Area A Landfill will insure that the residual risk is within the 1 E-6 to 1 E-4 target range identified by EPA. Conservative assumptions have been incorporated into the estimate of risk and the derived target level should be protective of workers. The target level of 10 mg/kg will also ensure that risks to other receptors within or near Area A Landfill are low.

Target Level for PCBs in Subsurface Soils

Workers involved in excavation activities could periodically encounter PCBs in subsurface soils. A Risk Reduction Objective has been identified to "*Reduce exposure of workers to PCBs in subsurface soils of the Area A Landfill.*" The objective is based on the continued industrial use of the Area A Landfill.

A target level of 50 mg/kg (ppm) for PCBs in subsurface soils is suggested because it is consistent with levels that have been used to evaluate PCBs (under TSCA) and to guide remediation efforts.

Excavation of subsurface soils will occur infrequently as compared to the pallet moving activities and, therefore, a concentration of 50 mg/kg (as compared to 10 mg/kg) should provide adequate protection. In addition, this concentration would yield an estimated risk of 2.5 E-6 for a utility worker involved in storm sewer repair. Application of this target level as a site-wide average for Area A Landfill will insure that the residual risk is within the 1 E-6 to 1 E-4 target range identified by EPA. Conservative assumptions have been incorporated into the estimate of risk and the derived target level should be protective of workers.

References

Centers for Disease Control, 1985. Preventing Lead Poisoning in Young Children, U.S. Department of Health and Human Services, 99-2230.

U.S. Environmental Protection Agency, 1989. Interim guidance on establishing soil lead cleanup levels at Superfund sites. OSWER Directive #9355.4-02.

U.S. Environmental Protection Agency, 1990. Supplement to interim guidance on establishing soil lead cleanup levels at Superfund sites. OSWER Directive #9355.4-02A.

U.S. Environmental Protection Agency, 1990. Supplement to interim guidance on establishing soil lead cleanup levels at Superfund sites. OSWER Directive #9355.4-02A.

U.S. Environmental Protection Agency, 1990. Guidance on Remedial Actions for Superfund Sites with PCB Contamination. Office of Emergency and Remedial Response, EPA 540 G-90 007.

APPENDIX F

EVALUATION OF PROCESS OPTIONS (STEP 5)

1.0 EVALUATION OF PROCESS OPTIONS: SOILS (STEP 5)

This appendix contains the evaluation of process options retained after an initial screening. The evaluation not only pertains to Area A Landfill, but also to the other site where interim remedial actions are planned, and which are to be evaluated in separate FFSs. The evaluation process is described in detail in Section 2.0 of the FFS. Also presented in this section of the FFS is the identification and initial screening of technologies.

1.1 Limited Action

The limited action response actions include no action and access restriction process options such as deed restrictions and fencing.

1.1.1 No Action

Description. This alternative provides the baseline against which technologies are compared, and is required under CERCLA for this purpose. Under the no action response, contaminated materials would be left intact on the site. No action would be undertaken to remove, treat, or dispose of soils or sediments containing hazardous substances above cleanup levels. The existing security and fences surrounding the sites would remain in place. No other institutional controls such as signs or public information would be initiated. Some passive remediation such as natural biodegradation may take place.

Effectiveness. No action is not classified as permanent. Because of the existing fence in the Area A Downstream, no action would be partially effective in reducing current or potential human exposure via direct contact route with respect to the sediments. Direct contact would not be minimized or prevented at the Area A Landfill, DRMO, or the Spent Acid Storage and Disposal Area. The quantity and toxicity of waste left on site will not be reduced by this process option.

No action would not reduce the potential risks due to wind dispersal and inhalation of contaminated surface soil at DRMO or Area A. Ecological receptors would also still be exposed to contaminated sediment and soil in OBDA and Area A Downstream. In addition, the potential for downstream transport of the sediment would still exist. Although a slow process, the mobility, toxicity and volume of contaminated sediments and soils will be slightly reduced with time due to natural attenuation and degradation of the organic contaminants. ARARs would not be achieved by use of this process option.

Implementability. During implementation, there would be no short-term risk to human health or the environment. No technical or institutional obstacles are present which would impact the immediate implementation of the no action response. No materials, labor, or equipment would be required. Removal, treatment, and/or disposal of soil would also not be necessary.

Cost. No action would not involve any expenditure of funds. Essentially, all actions (including inspections, maintenance, and monitoring) would cease and no additional response

actions would be undertaken.

Screening. The no action response is included in the development of remedial action alternatives as required by CERCLA. No action could be easily implemented at a low cost. In Area A Downstream, this response would be partially effective in reducing short-term exposure due to direct contact or ingestion, due to an existing fence surrounding the contaminant sediments. However, exposure to trespassers to the site may still occur and future effectiveness could be limited due to deterioration of the fence. No action would not reduce the potential for wind dispersal and inhalation of soil above cleanup levels at any sites. No action would not reduce the mobility, volume, or toxicity of soil above cleanup levels at any sites. This alternative would not meet the response objectives any of for the sites. However, for compliance with CERCLA and development of a baseline alternative for comparison, the no action response was retained for further evaluation.

1.1.2 Access Restrictions

Description. Access restrictions would involve the prevention of direct contact with contaminated soils through the use of barriers such as fences and institutional controls such as deed restrictions. Deed restrictions would only be implemented at such time as the referenced property might be transferred from federal to private ownership. The release of chemicals-of-interest might continue to occur at the site, potentially affecting groundwater and other media. The potential migration pathways for releases from the site would be monitored.

Effectiveness. Access restrictions are not permanent remedies and do not reduce the volume or toxicity of waste left on site. Access restrictions could be effective in reducing current or potential human exposure via the direct contact route with respect to the contaminated soil present at the ground surface and sediments. Access restrictions could be implemented quickly and implementation would present no short-term hazards to human health and the environment. The potential impacts to human health posed by the site are, therefore, partially reduced. This response of controlling access could be readily undertaken and is a proven and reliable technology. This measure would not be very effective for reducing ecological risks. Smaller animals could easily pass through or burrow under the fence and other species already inhabit the sites. ARARs will not be achieved by this process option at any of the sites. This is not a permanent remedy and it will not reduce the volume or toxicity of hazardous substances.

Deed and lease restrictions could prohibit certain uses of the property (i.e., excavation or construction in contaminated areas) or specify limitations on such activities (i.e., require appropriate engineering controls and testing and adequate health and safety procedures and equipment) to minimize health and environmental risks. RCRA-type notations in the deed would provide potential purchasers/lessees with knowledge that hazardous substances are present on site. These restrictions would be imposed on the property owner or, in the event of a future sale or lease, these would be imposed on the purchaser/lessee. As such, deed and lease restrictions could be effective in limiting direct contact to contaminated soils to reduce risks to human health but would not be effective in reducing ecological risks, or in achieving ARARs.

Implementability. Except for fencing to prevent access by birds and small mammals (which would require some maintenance), no technical or institutional obstacles are present which would impact the immediate implementation of institutional controls. Fencing has already been completed to prevent access to Area A Downstream. Deed restrictions could be prepared to include the areas where contaminated soil is present. The public could be readily made aware of the consequences of exposure to the site and measures being taken to reduce the exposure risks. Work space is limited at NSB-NLON and, other than Area A and OBDA, access restrictions would be difficult to implement. At DRMO and the Spent Acid Storage and Disposal Area, work space is needed to perform functions vital to NSB-NLON. The materials and labor required to implement this response action are minimal and readily available. No special approvals or permits are required to implement institutional controls.

Cost. Comparatively, both capital and long-term monitoring costs are expected to be very low with respect to other remedial response actions.

Screening. Institutional controls effectively limit direct contact and ingestion of soils by humans above cleanup criteria. This option could be implemented in a short time period at a relatively low cost. Although potential exposure to soils above cleanup goals is limited, contact with or ingestion of soil or contamination of other media by trespassers may still occur. This alternative would not reduce the potential for wind dispersal and inhalation of soil above cleanup levels, reduce ecological risks or achieve ARARs. Institutional controls were retained for further evaluation due to their low cost and since at least partial long-term reductions in exposure would occur and, in conjunction with other technologies, could be effective.

1.2 Containment

Containment technologies include horizontal barriers, and surface water controls. Process options that are appropriate and feasible include caps, site grading and storm-water management for use at all sites.

1.2.1 Horizontal Barriers

The only horizontal barrier process option retained for evaluation after the preliminary screening of technologies is capping.

1.2.1.1 Capping

Description. Capping consists of a low permeability cover placed over wastes to prevent precipitation infiltration, direct contact, and erosion. This technology is commonly used in conjunction with a groundwater pump and treat system and/or vertical barrier technology to isolate a contaminated area and minimize the amount of water which enters the zone of contamination, and in conjunction with storm-water management, to prevent run-on and promote run-off. Numerous cap designs have been used at waste disposal sites. Caps can be constructed of soil, clay, synthetic membrane liners, asphalt and concrete or some combination of the above. Site-specific conditions will dictate the type of cap selected.

Effectiveness. Properly designed caps will prevent erosion of, and direct contact with, contaminated materials. Provided that waste materials are located above the elevation of groundwater, low permeability caps will minimize the leaching of contaminants to the environment by reducing infiltrating precipitation.

There is little to no health risk during construction of a cap unless it is necessary to disturb waste to provide the proper grading. Neither are there substantial environmental impacts provided there is proper sediment and erosion control. The only exception is that a cap installed in the Area A Wetlands or Downstream area could destroy wetlands habitat if not properly implemented.

A cap could be installed relatively quickly (one to six months) and, if properly constructed and operated, would remain effective for many years (greater than 50).

Capping is not considered a permanent remedy and does not reduce the quantity or nature of materials left on site.

Implementability. Capping is a proven, reliable technology that is easy to implement provided its design adequately addresses subsurface geology, climate, topography and future land use. Contractors with experience and materials are readily available. Subsurface materials will impact the potential for subsidence, which may result in cracking or deformation of the cap. Subsurface layers of degradable organic material, improperly compacted waste materials, and loose soil are examples of undesirable subsurface conditions. Based on boring logs, there does not appear to be large quantities of degradable organic material in Area A, OBDA, DRMO, or Spent Acid Storage and Disposal Area. Implementation could be delayed in Area A and OBDA due to coordination required with wetland regulatory agencies. Future land use is also an important concern. Any future subsurface construction in a capped area may jeopardize the effectiveness of the cap and would result in potential exposure to contaminated materials. Therefore, capping is an implementable option only if restrictions on future land use are acceptable. No special permits or approvals are required for construction of a cap.

Cost. Capping costs range from about $0.50 to $15 per square foot, varying from a simple soil cover to a multi-layer composite cap. Specific costs will depend on the subsurface conditions, capping materials, number of components, thickness, and area covered. Containment costs are relatively low in comparison to other process options.

Screening. Capping the zones of contamination would be effective in eliminating direct contact with contaminated soils, erosion of contaminated materials and, in the Area A Landfill, DRMO, and Spent Acid Storage and Disposal Area, will have the additional benefit of reducing leachate generation. This process will be retained for the development of alternatives.

1.2.2 Surface Water Controls

Based on initial screening, the only surface water control determined to be an appropriate and feasible process option for use at all sites is site grading and storm-water management.

1.2.2.1 Site Grading and Storm-water Management

Description. This process consists of site grading and construction of storm-water structures such as culverts, dams and sedimentation ponds in conjunction with erosion controls such as hay bales, filter fabric, rip-rap and vegetation. These measures are used to prevent transport of contaminated surface soils or sediments and to prevent infiltration of storm water in specified areas by promoting run-off and preventing run-on of storm water.

Effectiveness. This process will be effective in preventing migration of contaminants absorbed to erodible soils and sediments, and can help reduce infiltration. However, this process is not completely effective in preventing infiltration of direct precipitation unless implemented in conjunction with a surface cap.

These measures can be implemented relatively quickly and present little risk to human health or the environment. In wetlands, there could be some environmental impacts if wetland habitats are destroyed or if water is diverted from existing streams/wetlands.

This process option is not considered permanent and does not change the quantity or nature of materials to be left on site.

Implementability. Storm-water management structures are easily constructed and represent a reliable technology which is easily implemented. Qualified contractors and construction materials are readily available locally. Implementation could be somewhat delayed in Area A/OBDA due to the coordination required with wetlands regulatory agencies. Soil or sediments that accumulate in structures will require routine removal to retain the effectiveness of this process option.

Cost. This is a relatively inexpensive option with costs ranging from the low costs of simple erosion control such as hay bales to the cost of a concrete culvert of approximately $7 to $10 per linear foot. Specific costs will vary with construction materials used and the size of the project. Comparatively, the cost of this remedial measure is low.

Screening. Storm-water management by itself may be effective in preventing the downstream migration of sediments in Area A Downstream and OBDA, and in preventing erosion of surface soils to the Thames River at DRMO. In addition, in conjunction with a cap at the Area A Landfill, Spent Acid Storage and Disposal Area, and DRMO, it will prevent infiltration of surface waters. Therefore, it is retained for further evaluation.

1.3 Removal

Removal technologies include excavation process options for removing soils or sediments and dredging process options for removing sediments. These are the only practical methods for removing soils or sediments for aboveground treatment or disposal. There are no sediments at Area A Landfill, DRMO, or the Spent Acid Area.

1.3.1 Excavation

The only excavation process option retained for evaluation is the backhoe for use at Area A Landfill, Spent Acid Storage and Disposal Area, and DRMO.

Description. This process option consists of the removal of contaminated materials by mechanical equipment such as a backhoe or excavator.

The following construction tasks are frequently associated with excavation of contaminated material.

- Exclusion zone development, redirection of current work activities around the proposed excavation, and development of water and air monitoring programs for the local community.
- Access development, such as roadways, ramps, staging areas, and decontamination areas.
- Preparation of stockpiling areas with containment features for excavated wastes and contaminated materials.
- Control the entrance of surface water and groundwater into the excavation and exclusion zone.
- Pretreatment of excavated materials to improve consistency or lower water content for improved stockpiling, treatment, or hauling characteristics.
- Treatment or disposition of excavated materials.
- Confirmation sampling.
- Regrading of excavated areas.
- Decontamination of adjacent areas and equipment.

Effectiveness. Excavation with a backhoe is an effective method of removing soils and sediment for aboveground treatment or off-site disposal. Contaminated and uncontaminated soil can be segregated more effectively by excavation for further treatment whereas segregation would not be as effective for *in situ* methods. By excavation, all contaminated materials can be completely removed, leaving no residuals above established cleanup levels. Effective removal can be verified by sampling once excavation is complete. There are some potential risks due to airborne migration of fugitive dusts during excavation operations; however, dust suppressants can be used to minimize these risks.

Implementability. Excavation is the most common method for removing soils and sediment for aboveground treatment or off-site disposal. Excavation in wet areas would require

diversion of surface water. Removal of soils substantially below the water table would require dewatering of the excavation and may be very difficult to implement. This is particularly true at DRMO where there is a strong hydraulic connection to adjacent surface waters. Seepage controls such as sheetpiles would be required to minimize the amount of groundwater that would require treatment. In addition, the area of VOC contamination is not clearly delineated; this would be necessary prior to the installation of seepage controls to insure completed removal of contaminants. Depending on the volume of groundwater and soil consistency, other removal methods (i.e., dredging) are available for sediments. Materials with high water content can be difficult to manage with conventional excavation equipment. Excavation contractors and equipment are readily available locally.

Cost. Cost estimates for excavation may range from $5 to $12 per cubic yard. The difference in cost is due to several factors, including depth of excavation, equipment used, and the type, quantity and hazardousness of the material being excavated. It is estimated that all excavation at NSB-NLON will be completed using Level C or Level D personal protection. The anticipated depth of excavation is shallow. Based on these considerations, the actual excavation cost may be one to five times the estimated cost for "clean" soil. Excavation by itself has a relatively low cost; however, dewatering and associated water treatment costs could substantially increase the excavation costs.

Screening. Excavation with a backhoe is an effective and implementable removal technology and will be retained for removal of shallow soils at DRMO, Spent Acid Storage and Disposal Area, and Area A Landfill hotspots. This option will not be retained for removal of deep soils contaminated with VOC at the DRMO. These soils do not pose a health risk; more appropriate and cost-effective process options are available, to address the contribution of these soils to the groundwater contamination.

1.4 *In situ* Treatment

This section presents a discussion of appropriate and feasible *in situ* treatment options which include biological, physical/chemical and thermal technologies. Primary advantages of *in situ* treatment include:

- no removal of contaminated materials is required;
- as no removal or disposal takes place, RCRA land disposal restriction requirements are not triggered; and
- total project costs may be less than conventional remove, treat, and disposal options.

1.4.1 Biological

Biological treatment processes use microorganisms to degrade hazardous substances by biological activity. The only appropriate biological process option that was retained after initial screening is aerobic degradation. Aerobic degradation takes place by the addition of oxygen,

nutrients and sometimes cultured microorganisms.

1.4.1.1 Aerobic Biological Degradation

Description. *In situ* treatment generally involves establishing a hydraulic gradient through the area of contamination. Water is placed onto the site so that it will flow through the area of contamination, carrying nutrients, oxygen compounds, and possibly organisms to the contaminants. Once the water has passed through the site, it is pumped up through wells and returned to the beginning of the system. This recirculation is carried on until the site has been determined to be clean.

Effectiveness. This is a permanent remedy capable of degrading some toxic organic compounds to levels that no longer present a risk. Little to no hazard is posed to human health during implementation. The time to implement this remedy is comparatively long and could take two to five years although compared to standard pump-and-treat technologies this is a faster process option. Potentially, there are environmental risks posed during remediation if all of the percolating water is not recovered. If all the water is not recovered, the flushing operation could mobilize hazardous constituents further downgradient. Hazards to workers and community during implementation are minimal.

In situ biodegradation has not been proven effective in treating chlorinated aromatic compounds such as DDTR and PCBs to low levels. Also, inorganic contaminants such as lead cannot be biodegraded. Under proper hydrogeologic conditions, volatile organic compounds, petroleum hydrocarbons, and polyaromatic hydrocarbons can be biodegraded. This is a permanent remedy for biodegradable constituents. These biodegradable compounds are present at DRMO.

The degree of treatment achievable cannot be accurately predicted without performing a pilot scale treatment of the actual soils. Remedial action objectives for risk reduction and obtaining ARARs for biodegradable constituents can probably be achieved by this process option.

Implementability. Constructing a biological treatment process uses standard technologies, such as well drilling, and can be implemented easily. Contractors are readily available. This technology has been used successfully; however, it is not completely reliable. There are many unknown subsurface conditions that could prevent successful bioremediation. For example, if liquids cannot be transported to, through, and removed from the contaminated medium zone, then natural rates of *in situ* bioremediation of contaminants will resist enhancement. Many systems rely on the ability to capture groundwater and recirculate it. In some situations, there may not be a way of reliably collecting all groundwater, thereby creating the potential to increase contaminant migration. Coordination with regulatory agencies regarding the underground injection of groundwater would be required.

Cost. Successful *in situ* bioremediation requires a high degree of site characterization and pilot scale testing. At larger sites, these costs will be offset and total costs have the potential to be low in comparison to many alternatives. Cost range from $70 to $100 per ton

at larger sites (i.e., greater than 5,000 cubic yards of contaminated soil). For larger sites, these costs are in the low to medium range compared to other alternatives.

Screening. The effectiveness of *in situ* treatment is severely limited by constraints of geohydrology and biotechnology. With the proper site conditions, and for contaminants subject to biodegradation, this process option offers great potential as it is a permanent remedy and it is very cost-effective. However, treatment of degradable compounds such volatile organics and petroleum hydrocarbons has not been determined to be necessary at any of the sites based on established remedial action objectives. In addition, nonhomogeneous subsurface conditions at DRMO and Area A Landfill, which consist of landfilled materials, do not lend themselves to this technology.

1.4.2 Physical/Chemical

In situ physical/chemical process options that have been retained after initial screening include stabilization for use at all soil/sediment operable units and soil venting/air sparging for use at the DRMO.

1.4.2.1 Stabilization

Description. *In situ* stabilization is a chemical process that reduces the mobility of waste constituents by solidification, fixation, or encapsulation processes. In its simplest form, chemical stabilization may involve the addition of cement-like materials (pozzolans) to adsorb free liquids present in the wastes. Other process options involve chemical reactions between the waste constituents and the treatment agent. In some instances, the process may produce a monolith or solid block of treated material which, by virtue of its reduced surface area, limits the potential for contaminant mobility. Pozzolanic mixtures and a variety of proprietary formulations are commonly used to accomplish the solidification of waste materials.

Common methods of *in situ* stabilization utilize mechanical drilling/mixing equipment or can be performed with standard backhoe buckets.

Effectiveness. Chemical fixation is a proven effective means of reducing the mobility of many soil contaminants; especially for inorganic contaminants. Because contaminants themselves remain unaltered, there would be no net reduction in toxicity. As a result, only remedial action objectives regarding contaminant mobility or leaching can be met by this process. The very long-term reliability of stabilization processes has not been completely demonstrated. In addition, this method has limited experience at the field scale in treating soils. Most field scale *in situ* stabilization projects completed to date have been treatments of sludge in surface impoundments. Aboveground stabilization has significant field scale experience in effectively treating metals. For metals, there are no available treatment options capable of destroying contaminants. Stabilization also has been effective (based on the results of above-grade treatments) in reducing the leaching rate of PCBs, VOCs, and other organics. Once chemically fixed, *in situ* soils would still need to be capped to prevent direct contact or ingestion of soil, to prevent erosion, and to assure the long-term integrity of the chemically stabilized soil matrix. There are potential short-term hazards during implementation due to fugitive dusts and

vapors if the process is not properly controlled.

Implementability. The necessary equipment and skilled personnel are available, particularly regarding stabilization of metal-contaminated soils. Experienced vendors for organic contaminants are not as numerous. Implementation in areas with subsurface obstacles such as boulders or building foundations will be difficult. Assuring complete mixing in some soils also could present some difficulties in implementing this alternative. No special permits or approvals are required for implementation of this process option.

Cost. Costs of stabilization based upon a variety of field scale treatments range from $50 to $200 per ton with a mobilization/demobilization cost of $100,000. As with other *in situ* technologies, this is a cost-effective option at large sites with costs in the moderate range.

Screening. Stabilization is not as effective as other treatment options as it does not destroy or remove the contaminants present; however, it is one of the few options for metal-contaminated soils and it is also potentially effective at reducing the mobility of many organic contaminants. Stabilization is not effective if the sole hazard presented by a material is due to direct human contact such as PCB-contaminated soils at Area A Landfill. This option is cost-effective and proven. As a result, this option will be retained for evaluation regarding soils with metal contamination which also present a potential hazard due to leaching located at the DRMO and Spent Acid Storage and Disposal Area and for contaminated sediments at the Area A Downstream/OBDA which also present an ecological risk.

1.4.3 Thermal

Based upon the initial screening of technologies, the only *in situ* thermal process option that is feasible and appropriate is vitrification for use at DRMO, Spent Acid Storage and Disposal Area, and Area A.

1.4.3.1 Vitrification

Description. This process uses an electrical network to melt soil at temperatures of 1600-2000°C. Organics are destroyed by pyrolysis. Inorganics are immobilized within the vitrified mass. All off-gases must be collected and treated.

Effectiveness. This is a permanent remedy capable of destroying organics and stabilizing metals to meet remedial action objectives. During implementation, off-gases must be properly controlled to prevent potential hazards to human health and the environment.

Based upon a few pilot scale tests and one field scale demonstration at the Hanford Nuclear Reservation, *in situ* vitrification has proven to be very effective in destroying organic contaminants and in immobilizing inorganics. The residues remaining do not contain organic contamination and do not leach inorganic contaminants above levels of concern. As opposed to stabilization techniques, the vitrified mass would not present a hazard due to direct contact and incidental ingestion as it consists of a large glass-like solid. This technique cannot be used on permeable soils located below the water table or on materials that do not contain the proper

elements to form a slag. Materials could be staged above grade in piles to avoid problems presented by high groundwater.

Implementability. In areas that do not contain subsurface utilities or foundations, this technology could be implemented if transmission voltages of 12,500 to 13,800 volts at four megawatts are available. These electrical requirements can be met at NSB-NLON. Off-gases require collection and a substantial amount of treatment. As this treatment does not take place in a controlled vessel, there is some concern that all off-gases are collected and that these gases do not present a fire hazard. Treatment of the off-gases is performed by a series of unit processes consisting of quenching, pH controlled scrubbing, mist elimination, heating for dew point control, particle filtration, and carbon adsorption. There is presently only one vendor available who has limited field scale experience.

Cost. Treatment costs range from $400 to $500 per ton with mobilization/demobilization costs ranging from $150,000 to $250,000. Costs vary upon the geometry of waste deposits and moisture content. This is one of the more expensive *in situ* process options.

Screening. Due to the high cost of this option, limitations regarding application to saturated soils/sediments, and potential implementation difficulties, it will not be retained for further evaluation. Other technologies such as incineration are as effective and are more cost-effective for the contaminants present.

1.5 Aboveground Treatment

This section presents a discussion of appropriate and feasible aboveground treatment options which include biological, physical/chemical and thermal technologies. Aboveground technologies require the removal and transportation of contaminated materials. This additional step can be costly and poses additional risks to site workers and potentially to area residents. Aboveground treatment is advantageous regarding control of process reactions. Complete mixing is possible and process variables such as temperature and pH can be controlled reliably. Aboveground treatment processes have been eliminated for application at the DRMO regarding deep VOC-contaminated soil, due to the high cost of deep excavation and the availability of cost-effective and proven *in situ* technologies.

1.5.1 Biological

Biological process options that have been retained after initial screening include landfarming, composting, bioslurry, and anaerobic treatment methods. Biological treatment processes use microorganisms, primarily bacteria, to degrade hazardous organic substances into various gases and cell tissue.

1.5.1.1 Landfarming

Description. Landfarming is also referred to as solid phase bioremediation and usually involves placing excavated soil in an above grade soil treatment area. If required, nutrients and microorganisms are added to the soil, which is tilled at regular intervals to optimize aeration and

contact between the microorganisms and the contaminants. In lieu of tilling, aeration could be provided by pulling a vacuum through the soil pile and nutrients could be added by simple irrigation techniques. During operation, pH, nutrient concentrations, and moisture content are maintained within ranges conducive to microbial activity. Landfarming systems can be designed to contain and treat soil leachate and volatile organic compounds.

Effectiveness. For biodegradable constituents, this is a permanent remedy that significantly reduces hazardous substance concentration. Pilot or bench scale testing would be necessary to determine if residual concentrations meet remedial action objectives. There are potential hazards due to air emissions and leachate from this process if not properly controlled. The constituents of concern in soils/sediments at NSB-NLON include lead, beryllium PCBs, DDTR, PAHs, and VOCs. Lead and beryllium are inorganic and, therefore, cannot be degraded biologically. PCBs and DDTR cannot be degraded solely by aerobic processes with any great success. Removal efficiencies from laboratory scale treatments of PCB and DDTR range from 15 to 54 percent. One vendor reported a removal efficiency of 83 percent for these compounds using white rot fungus. Aerobic processes have been used at field scale in landfarming operations with removal rates for VOCs and PAHs ranging between 79 to 99 percent and 70 to 90 percent, respectively. Typically, the landfarming of petroleum and wastes containing PAHs has resulted in half lives of total PAHs ranging from 30 to 150 days.

Implementability. Landfarming uses standard mechanical equipment that is readily available, as are experienced contractors. Several field scale operations have been completed. Sufficient acreage would be required for landfarming or composting. Finding areas of sufficient size other than in Area A would be difficult at NSB-NLON as flat open space is not available. Sediments would require dewatering and may not be well suited for landfarming due to their small grain size. No special coordination is required with regulatory agencies for implementation of this process option.

Cost. Costs for landfarming operations are approximately $60 to $120 per ton. Costs are site-specific and will vary with the amount of material which needs to be treated, waste characteristics, and the land area requirements. Costs of landfarming are relatively low.

Screening. Biological treatment technologies are considered to be effective technologies for the treatment of soils/sediments contaminated with PAHs and VOCs. Of these, only VOCs at DRMO are constituents of concern at NSB-NLON. However, soils in DRMO may also be contaminated with PCBs and metals which are not degradable and the metals could inhibit biological degradation. Other process options are more effective at treating VOCs. For these reasons, landfarming will not be retained for further evaluation.

1.5.1.2 Composting

Description. This process involves the storage of highly biodegradable wastes such as hay or woodchips with a small percentage of wastes containing biodegradable hazardous constituents. Adequate aeration, optimum temperature, moisture and nutrient contents, and the presence of an appropriate microbial population are necessary. Thermophilic aerobic microorganisms that occur naturally in the decaying organic matter biodegrade the contaminants

of concern.

Effectiveness. For biodegradable constituents, this is a permanent remedy that significantly reduces hazardous constituent concentrations. Bench or pilot scale testing would be necessary to determine if remedial action objectives can be met. There is some concern with air emissions and leachate from this process if they are not properly controlled. The constituents of concern in soils/sediments at NSB-NLON include lead, beryllium PCBs, DDTR, PAHs, and VOCs. Lead and beryllium are inorganic and, therefore, cannot be degraded biologically. PCBs and DDTR cannot be degraded solely by aerobic processes with any great success. Removal efficiencies from laboratory scale treatments of PCB and DDTR range from 15 to 54 percent. Aerobic processes have been used at field scale in composting operations with removal rates for VOCs and PAHs ranging between 79 to 99 percent and 70 to 90 percent, respectively. Typically, the composting of petroleum and wastes containing PAHs has resulted in half lives of total PAHs ranging from 30 to 150 days.

Implementability. Composting uses standard mechanical equipment that is readily available, as are experienced contractors. Sufficient acreage would be required for composting. Finding areas of sufficient size other than in Area A would be difficult at NSB-NLON as flat open space is not available. Sediments would require dewatering and may not be well suited for composting due to their small grain size.

Cost. Estimated costs for composting are $80 to $120 per cubic yard. The costs are higher than landfarming costs due to the need for more specialized equipment to turn the windrows and, in some cases, for the collection and treatment of off-gases. Although higher than landfarming costs, these costs are still relatively low.

Screening. Composting is potentially an effective technology for the treatment of soils/sediments contaminated with PAHs and VOCs. These constituents (PAHs and VOCs), however, are only of concern at the DRMO. However, soils in DRMO are also contaminated with PCBs and metals which are not degradable and the metals could inhibit biological degradation. Other processes are more effective at treating VOCs. For these reasons, composting will not be retained for further evaluation.

1.5.1.3 Bioslurry

Description. In this process, soils or sediments are mixed with water to form a slurry which is treated. Biodegradation is enhanced as the mass transfer of organics into the aqueous phase is increased. If required, nutrients, microorganisms or surfactants are added to the slurry to enhance the biodegradation process. Once biodegradation of the contaminants is completed, the treated slurry is typically dewatered.

Effectiveness. This is a permanent remedy for biodegradable constituents. As with other biological processes, bench or pilot scale testing would be necessary to verify that remedial action objectives can be met. Air emissions are easier to control in this process than landfarming or composting and leachate generation is not a concern.

The constituents of concern in soils/sediments at NSB-NLON include lead, beryllium PCBs, DDTR, PAHs, and VOCs. Lead and beryllium are inorganic and, therefore, cannot be degraded biologically. PCBs and DDTR cannot be degraded solely by aerobic processes with any great success. Removal efficiencies from laboratory scale treatments of PCB and DDTR range from 15 to 54 percent. Aerobic processes have been used at field scale in bioslurry operations with removal rates for VOCs and PAHs ranging between 79 to 99 percent and 70 to 90 percent, respectively. Bioslurry options are capable of achieving or exceeding the removal efficiencies of landfarming and are substantially quicker with half lives for total PAHs less than 20 days.

Implementability. There are only a few vendors available with the necessary equipment and expertise to operate a bioslurry process. Limited field scale operations have been completed. Sediments would not require dewatering and are suitable for bioslurry processes. Applications of bioslurry technology are site-specific and the principal design concern has been to ensure adequate dispersion of oxygen, nutrients and other chemicals to promote microbial growth. Chemical additives such as surfactants have been used to enhance the biological process by increasing the solubility of the waste constituents. Aeration is provided by oxygen diffusers such as floating aerators and mixers. In some applications, dredges have been used to bring contaminated bottom sediments into suspension. Bioslurry systems typically operated in the range of less than 20 percent solids content. The application of this technology to the soils at NSB-NLON would require liquefying the soils in treatment tanks or engineered impoundments. Treatment tanks or reactors would be utilized if the construction of an impoundment was determined to be infeasible. This would necessitate excavating and liquefying the contaminated soils, and then treating the soil slurry in the bioslurry system. The treated slurry would require dewatering prior to disposal in the site. Coordination would be required with regulatory agencies regarding the discharge of waste waters generated.

Cost. Cost for bioslurry operations are estimated to range from $75 to $225 per ton. Factors affecting costs include the degree of material handling required (i.e., in-place treatment for the closure of a lagoon vs. tank treatment), waste characteristics including solids and oil content, process and air monitoring requirements, and treatment goals. Costs for treating wastes that are high in solids content, such as soils, are expected to be closer to the upper end of this range. The cost ranges for estimated treatment, although higher for landfarming and composting, are still moderate in comparison to other process options.

Screening. Bioslurry treatment technologies are considered to be effective technologies for the treatment of soils/sediments contaminated with PAHs and VOCs. Of these, only VOCs at DRMO are constituents of concern. However, soils in DRMO may also be contaminated with PCBs and metals which are not degradable and the metals could inhibit biological degradation. Other proven effective process options are available for VOCs. For these reasons, bioslurry treatment technologies will not be retained for further evaluation.

1.5.1.4 Anaerobic Process Options

Description. Anaerobic biological treatment processes consist of the reduction of organic matter in an oxygen-free environment to form methane and carbon dioxide. The system design

for anaerobic soil treatment would include placing soil in an airtight reactor vessel or lined impoundment, mixing the appropriate organic and inorganic nutrients into the soil, and then flooding the reactor vessel or impoundment to promote anaerobic conditions. A methanogenic enrichment culture would then be introduced into the system. In the event that anaerobic treatment by itself cannot achieve remedial action objectives, subsequent aerobic treatment could be applied to the soils to degrade anaerobic decomposition products and other constituents.

Effectiveness. This is a permanent remedy for biodegradable organics; however, pilot or bench scale testing would be required to verify that remedial action objectives are achievable. As reactions would probably be performed in a vessel, the only air emission would be from methane generation which could be easily burned on site or vented. This process option is potentially most applicable to constituents not amendable to standard aerobic techniques. At NSB-NLON, the constituents in this category are PCBs and DDTR. Laboratory studies using anaerobic degradation by itself or followed by aerobic degradation have shown that anaerobic degradation can be successful in degrading PCBs and DDTR with removal efficiencies ranging from 48 to 82 percent. These removal efficiencies will not meet remedial action objectives. There have been no reported field scale anaerobic treatments of soils containing PCBs or DDTR.

Implementability. This option would be difficult to implement as equipment and skilled operators are not readily available. Reactors presently used for sewage sludges are not suitable for soils due to the weight and abrasion of soils. No special permits or coordination with regulatory agencies would be required for implementation of this process option.

Cost. Specific costs are not available; however, costs are presumably similar to but higher than the costs of bioslurry techniques ($75 to $225 per ton). Not including development costs, this process option is comparatively moderate.

Screening. Anaerobic processes are partially effective for treating organic contaminants present at NSB-NLON, in particular when used in series with aerobic processes. However, this technology is not sufficiently developed to be easily implemented. Extensive bench and pilot scale testing would be necessary. In addition, other contaminants are present that may interfere with this process. For these reasons, this proven option will not be retained for further evaluation.

1.5.2 Physical/Chemical

Appropriate and feasible physical/chemical treatment process options based upon an initial screening of technologies include dechlorination, oxidation, dewatering, soil washing, solvent extraction, and stabilization.

1.5.2.1 Dechlorination

Description. Chemical dechlorination is an innovative process used to dehalogenate certain classes of chlorinated organics in contaminated soils and sediments. For example, glycolate compound solutions have been used on waste soils containing PCBs to convert the PCBs into lower toxicity, water soluble materials. The solution reacts with the chlorinated

organic and displaces a chlorine molecule. These processes involve heating and physical mixing of contaminated soils/sediments with the chemical reagents. During the reaction, water vapor and volatile organics are removed and condensed. The treated soil/sediment is rinsed to remove reactor by-products and reagent and then dewatered prior to disposal.

Effectiveness. This process has only been proven effective with aromatic halides. The only constituents of concern at NSB-NLON in this chemical group are PCBs and DDTR. Field scale treatments of PCBs and bench scale treatments of DDTR have been successfully completed with 95 to 100 percent removal of chlorine. This is a permanent remedy potentially capable of meeting remedial action objectives. Treatment could be completed relatively quickly. The only short-term hazards to human health or the environment presented by this process involve the emissions of volatile organics, which can be easily controlled. Process residues are reportedly non-toxic; however, end products of treatment have not been completely characterized. High moisture content and soil organic content reduce treatment effectiveness.

Implementability. There are potential materials handling problems with this process which requires specialized equipment and lengthy reaction times, especially for silty/clayey soils and high organic content soils. Dewatering would be required for materials with greater than 20 percent moisture as materials with high moisture require excessive volumes of reagent. No field scale units have been constructed to date and there are only a couple of available vendors.

Coordination with air pollution control regulatory agencies will be required; however, air emissions should not be significant.

Cost. Total cost exclusive of removal and backfill costs would range from $200 to $600 per ton. These costs are comparatively moderate.

Screening. As the end products from this process are not well defined, and as implementation may be difficult due to the long reaction times and use of specialized equipment, it will not be retained for further evaluation. Other physical/chemical treatment process options achieve similar levels of treatment for PCBs and DDT, are more cost-effective, and therefore, will be selected as representative physical/chemical process options.

1.5.2.2 Oxidation

Description. Oxidation consists of the addition of a chemical oxidizer such as hydrogen peroxide, hypochlorite, or ozone to oxidize organic compounds contained in a soil or sediment. Those processes would involve physical mixing of contaminated soils/sediments with the chemical reagents.

Effectiveness. Conceptually, chemical oxidation offers the advantage of incineration (complete destruction) without the disadvantages of large air emissions. This is a permanent remedy that can be implemented relatively quickly. The only short-term hazards to human health and the environment consist of minor VOC emissions that can be easily controlled, and hazards to workers associated with handling strong oxidizers. Oxidation has been evaluated primarily to treat materials that are not biodegradable, such as pesticides. Ozonation, which is

one available oxidation process, is only appropriate for aqueous streams which contain less than one percent oxidizable compounds. Hypochlorite oxidation, which is another available process, may produce toxic chlorinated organic compounds. Recent laboratory scale treatments have shown that a range of biorefractory contaminants can be treated in soils by catalyzed hydrogen peroxide. Complete disappearance and mineralization of the parent compound has been demonstrated in some treatments. Treatments for materials with low solubilities and high $LogK_{ow}$ such as DDT have not been as successful. These hydrophilic compounds may be so strongly sorbed that the oxidants in the bulk solution may be limited by mass transfer to the adsorbed contaminants. The treatment efficiency may not be high enough to meet remedial action objectives for DDT or PCBs.

Implementability. As only laboratory scale treatments have been completed, this is not a demonstrated technology and would be difficult to implement. Only one vendor was located who claims to have a mobile chemical oxidation treatment process for soils and sediments. Efficient treatments rely on rapid mixing which cannot easily be done in soils reactors. Materials after treatment may require dewatering and extensive characterization to insure destruction and complete mineralization of the compound being treated. Bench and pilot scale treatability studies would be necessary to assess the efficiency of treatment on a site-by-site basis using a matrix of H_2O_2 concentrations and catalysts due to the complexity of peroxide treatment systems. No special permits or coordination is required from or with environmental regulatory agencies.

Cost. Accurate estimates are not available as no pilot scale operations have been completed. Costs for handling are probably similar to those of soil washing; however, total treatment costs will be higher based upon the amount of the hydrogen peroxide required for successful treatments. Costs may range from $200 to $600 per ton. Comparatively, these costs are moderate to high.

Screening. Oxidation processes are only applicable to organics and, due to their potentially high costs and developmental stage, should only be considered for use on materials that cannot be treated biologically. The only contaminants of concern at NSB-NLON in this category are PCBs and DDT. As both of these compounds are hydrophilic, oxidation does not appear to be a very effective treatment option. For this reason, and due to difficulties in implementation and potentially high costs, this process option will not be retained for further evaluation.

1.5.2.3 Dewatering

Description. Dewatering consists of mechanical methods capable of separating or filtering liquids from solids. Dewatering may be required for saturated or near-saturated soil and sediments as a pretreatment step prior to chemical treatment or incineration or as a post-treatment operation for process options such as soil washing or bioslurry technologies. Typical process equipment includes settling tanks, centrifuges, plate and frame filter presses, gravity settling, and vacuum drum filters.

Effectiveness. Dewatering is a proven reliable process option with numerous industrial

and waste treatment applications that could be quickly implemented. No short term environmental hazards are associated with this process. Dewatering would be most effective as a pre- or post-treatment associated with other process options. By itself, it is only a separation technique producing water and solids; both of which may require treatment and do not meet remedial action objectives. It is not a permanent remedy.

Implementability. This is a well-accepted treatment method that could be easily implemented without any specialized equipment. Several experienced contractors are available. No special permits or coordination with environmental regulatory agencies are required.

Cost. Total treatment costs range from $10 to $60 per ton. Costs vary based on the percent solids desired and the percent solids, grain size, and physical characteristics of the soils/sediments that require dewatering. Comparatively, these treatment costs are low; however, total alternative costs will be governed by the process option being used in series with dewatering.

Screening. This is an effective and easily implemented process option that will be retained if dewatering is necessary for further evaluation only in conjunction with other process options that more effectively reduce the hazards of the contaminated materials being treated.

1.5.2.4 Soil Washing

Description. Soil washing is primarily a volume reduction technique for treating excavated soils. Attrition scrubbing disintegrates soil aggregates resulting in the liberation of the highly contaminated fine particles. Detergents, acids, etc. can be added to the washing water to facilitate removal of contaminants adsorbed to soil surfaces. This process is carried out in equipment that is designed for contacting contaminated soil with the wash water and then recovering it. After contact with the soil, the washing solution is treated for removal of the contaminants and then recycled for additional washing. Multiple washes are often required to reduce the contaminant concentration to acceptable low levels.

No field scale treatments have been performed in the United States; however, several projects are in the design stage and full scale units are in operation in Europe.

Effectiveness. Soil washing has been effective primarily as a volume reduction technique. Therefore, by itself it is not a permanent remedy. Coarse materials after washing may meet remedial action objectives. Typically, the majority of contaminants adhere to fine-grained particles. As a result, this process option would be most effective on sandy soils. Site soils are relatively sandy, except for the sediments in Area A. However, further characterization would be required to quantify soil particle size distribution and treatability studies would be required to verify that the coarse materials will be free of contaminants after treatment. Optimally, five tons of treatment residual are produced from each 100 tons treated. For sandy soils, this process option would probably meet remedial action objectives for the coarse fraction. The fine fraction would require further treatment or off-site disposal.

Implementability. This process option requires specialized equipment which is not

readily available. Treatability studies would be required. Implementation would require specialized equipment and personnel. Potentially toxic washing chemicals may pose a health and safety concern. No special permits or coordination from or with DEP/EPA are required except for some soil washing processes for the discharge of waste waters.

Cost. Total treatment costs are estimated to range from $50 to $205 per ton. The lower costs are for large volumes of sands and gravels where water alone is used as the washing fluid. Comparatively, these costs are low to moderate.

Screening. This process is only proven effective as a volume reduction technique and is not as effective with inorganic contaminants. It could be difficult to implement due to the specialized equipment required. However, this technology will be retained for further evaluation at the Spent Acid Storage and Disposal Area as costs are potentially low and volume reductions could be quite high. It will not be retained for use at DRMO and Area A Landfill due to the difficult soil matrix and complex mix of contaminants. The sediments at Area A Downstream are fine-grained and therefore not suitable for treatment by this technology. Bench or pilot scale testing would be necessary to determine the effectiveness of this process.

1.5.2.5 Solvent Extraction

Description. Solvent extraction is similar to soil washing except that a solvent is used as the washing fluid. After washing, contaminated soils/sediments are separated into four fractions: solvent, hydrocarbon, water, and dry solids. The solvent is recycled and used in subsequent washing cycles. If treatment has been effective, the soil is redeposited into the excavation area. The water stream requires treatment, generally with activated carbon prior to discharge, and the hydrocarbons phase which contains the removed contaminants are sent off site for incineration or other suitable disposal method. This is a permanent remedy capable of removing hazardous constituents to a level at which remedial action objectives will probably be met. Bench or pilot scale testing would be required to verify this treatment efficiency.

Effectiveness. This process is potentially effective for any material soluble in the washing or extraction solvent such as oils and hydrocarbons including VOCs, PCBs and DDTR. As with soil washing, this process option is most effective on sandy soils. Two hundred and fifty bench scale, and ten pilot scale projects have been completed, demonstrating that under proper conditions, removal of contaminants to 1 ppm is possible. Solvent residues in soils are low, and the solvents used are believed to be non-toxic and biodegradable. No field scale projects have been completed. This process could treat soils in a relatively short time and presents no short-term hazards to human health or the environment other than the hazards to workers associated with handling flammable solvents.

Implementability. The implementation concerns are the same as for soil washing. In addition, the complexity of unit processes required to recycle the solvent also present potentially significant implementation problems. The washing solvent presently used is flammable and does present a safety concern. Only two vendors are available that only have pilot scale units. There would be delays in implementation involved in bringing a pilot scale technology to field scale. No special permits or approaches are required.

Cost. Total treatment costs are estimated to range from $100 to $500 per ton. Comparatively, these costs are moderate with a mobilization/demobilization cost of $100,000. Accurate cost estimates based on field scale demonstrations are not available.

Screening. This process can be effective for non-volatile substances such as DDTR and PCBs which are not readily removed from soils or sediments by other process options except by thermal technologies. As no field scale demonstrations have been completed, some difficulties will be encountered during implementation due to the specialized equipment and personnel required, and the cost-effectiveness of this process has not been demonstrated. Regardless of these concerns this process is potentially very effective and will be retained for further evaluation as the representative physical/chemical process option.

1.5.2.6 Stabilization

Description. Stabilization is a chemical process that reduces the mobility of waste constituents by solidification, fixation, or encapsulation processes. In its simplest form, chemical stabilization may involve the addition of cement-like materials (pozzolans) to adsorb free liquids present in the wastes. Other process options involve chemical reactions between the waste constituents and the treatment agent. For example, silicate reagents adsorb organic and inorganic contaminants prior to encapsulating the soil/sediment in a cementitious material. In some instances, the process may produce a monolith or solid block of treated material which, by virtue of its reduced surface area, limits the potential for contaminant mobility. Pozzolanic mixtures and a variety of proprietary formulations are commonly used to accomplish the solidification of waste materials.

Most often materials are mixed in a pug mill or with a backhoe bucket in a waste pile.

Effectiveness. Stabilization is a permanent remedy as it is an effective means of reducing the mobility of soil contaminants. Treatment times are relatively quick. The long-term effectiveness has not been fully demonstrated; however, it is believed that these processes are not reversible. Contaminants themselves remain unaltered, therefore, there would be no net reduction in toxicity. The physical form of the soil/sediment will affect its availability for human exposure regarding direct contact via adsorption, inhalation, and incidental ingestion. Standard pozzolonic methods do not significantly affect the physical form of a soil/sediment, whereas some innovative technologies produce a monolith with high physical stability. The degree to which stabilization reduces the hazard due to direct contact has not been quantified and all vendors contacted recommended that a cover be placed over stabilized waste to prevent hazards due to direct contact. In particular, this method has been proven effective at field scale for lead and other metals. For metals, there are no available treatment options capable of destroying contaminants. This process has also been demonstrated to be effective at reducing the leaching of PCBs and other organics. Once chemically fixed, backfilled soils would still need to be capped to prevent direct contact or ingestion of soil and to assure the long-term stability of the chemically stabilized soil matrix. The requirements for the cap could be reduced for stabilized wastes.

Implementability. Stabilization could be implemented fairly easily. The necessary

equipment and skilled personnel are readily available, particularly regarding stabilization of metal-contaminated soils. Experienced vendors for organic contaminants are not as numerous. In either case, treatability studies would be required. No special permits or approvals are required.

Cost. Total treatment costs are estimated to range from $50 to $200 per ton. Solidification reagent costs and soil particle size distribution both significantly affect cost. Comparatively, these costs are low.

Screening. Stabilization is not as effective as other treatment options as it does not destroy or remove the contaminants present; however, it is one of the few options for metal-contaminated soil and it is also potentially effective for some organic contaminants. It is not effective if the sole hazard presented by a material is due to direct human contact, such as PCB-contaminated soils at Area A Downstream/OBDA. This option is cost effective and could also be easily implemented regarding contaminated soils/sediments. As a result, this option will be retained for evaluation regarding soils with metal contamination which also present a potential hazard due to leaching located at the DRMO and Spent Acid Area and for contaminated sediments at Area A Downstream/OBDA which also present an ecological risks.

1.5.3 Thermal

Appropriate and feasible thermal treatment process options based upon an initial screening of technologies include incineration, pyrolysis, and low temperature thermal desorption. To facilitate the evaluation of thermal process options, the following discussions will be limited to an evaluation of high and low temperature process options.

1.5.3.1 High Temperature

Description. Incineration is the high temperature oxidation (1600°F to 2200°F) of organics in a controlled combustion process. Pyrolysis consists of the breakdown of organic compounds under high temperatures in the absence of air. Organics are driven off and incinerated in an afterburner. Several high temperature incineration processes are currently available. Several of the more established thermal processes are listed in Table 1-1 along with supplemental information regarding manufacturer, operating temperatures, and energy source.

Effectiveness. Pilot scale demonstration tests and full scale applications have demonstrated the capability of high temperature thermal process options to treat soils contaminated with most organic materials. Incineration is generally capable of reducing contaminant concentrations in contaminated soils/sediments to levels unattainable by most other remedial technologies. This is a permanent remedy. Destruction/removal efficiencies of greater than 99.99 percent can be achieved by high temperature thermal treatment. There are potential short-term hazards due to stack emissions; however, with adequate air pollution control devices these risks are minimal. Treatment times are relatively quick. Inorganics, such as metals, cannot be treated by incineration and the more volatile metals could pose air pollution control problems.

TABLE 1-1 SUMMARY OF HIGH AND LOW TEMPERATURE PROCESS OPTIONS			
Technology	**Manufacturer or Developer**	**Reactor Operating Temperatures**	**Energy**
High Temperature			
Shirco Process	Shirco Infrared Systems, Inc.	500 - 1850°F	Infrared (electric)
Conventional Rotary Kiln	Numerous Manufacturers	1500 - 2900°F	Direct firing using heat content of waste and supplemental fuel.
Conventional Fluidized Bed Incinerator	Several Manufacturers	1400 - 2200°F	Direct firing using heat content of waste and supplemental fuel.
Circulating Fluidized Bed Incinerator	Ogden Environmental Systems	1400 - 1600°F	Direct firing using heat content of waste and supplemental fuel.
Plasma-Fired Cupola	Westinghouse, EPRI and Modern Equipment Company	9000°F	Plasma Torch
Oxygen Burner	Linde Division Union Carbide and Advanced Combustion Technologies	500 - 3000°F	Direct firing using heat content of the waste and supplemental fuel.
Electric Pyrolyzer	Westinghouse	9000°F	Plasma Touch
Low Temperature			
X*TRAX	Chemical Waste Management	450 - 850°F	Indirect firing using supplemental fuel.
Low Temperature Thermal Action (LTTA)	Canonie Environmental	300°F	Direct firing using supplemental fuel.
Low Temperature Thermal Stripping (LTSM)	Roy F. Weston, Inc.	<450°F	Non-contact heat transfer from hot oil system.

Implementability. Implementation of high temperature thermal treatment is feasible, particularly due to the advent of mobile systems. Several vendors are available who offer on-site incineration in transportable units.

Depending upon the type of incinerator used, pretreatment may be required to reduce the moisture content and screen out large diameter particles.

Air pollution controls are readily available and use proven technologies with many industrial and waste management applications. Regardless, there is the potential for public opposition to an incinerator and a high degree of coordination is required with air pollution control agencies which could delay implementation.

Cost. Estimated costs for on-site incineration range from $350 to $950 per ton, for a small volume (5,000 to 15,000 cubic yards) of waste. Mobilization/demobilization costs would be $500,000. Comparatively, these costs are moderately high.

Screening. A number of incineration options exist for contaminated soils and sediments. Each is feasible from a technical and regulatory standpoint. Selection of the most appropriate incineration process will be based primarily on cost and availability. Some differences exist in the amount of processing required prior to incineration, but any such limitation can generally be overcome from a technical standpoint and becomes an economic concern. Incineration will

be retained for further evaluation and the rotary kiln will be selected as the representative incineration process for further consideration in the development of treatment alternatives, particularly for DDTR-contaminated sediments in Area A and PCB-contaminated soils at the DRMO and Area A Landfill. If selected, prior to implementation of this remedy, other incineration processes should be evaluated, particularly the infrared systems and circulating fluidized bed systems.

1.5.3.2 Low Temperature

Description. Low temperature thermal desorption units separate VOCs and SVOCs from soils by heating the mixture to drive off the contaminant. The desorption process is used in conjunction with separate processes, such as incineration or condensation, to control the volatized constituents. The desorption process can be accomplished by several types of equipment. Table 1-1 is a listing of some of the more established thermal desorption processes.

Effectiveness. This is a permanent option capable of reducing contaminant levels to meet remedial action objectives. Several pilot scale and a few field scale demonstration tests have shown the capability of low temperature thermal desorption systems to remove VOCs and SVOCs from contaminated soils/sediments.

Removal efficiencies are lower than those for incineration and depend highly on the volatility of the organic constituent being treated. Removals of 25 to 99 percent have been observed for VOCs such as benzene, xylene, and toluene.

Treatment times are short and the only short-term hazards regard air emissions, which can be effectively controlled.

Implementability. Low temperature thermal treatment processes could be implemented fairly easily despite the small number of vendors with field scale testing for hazardous substances units ready to go. As with incineration, some pretreatment of soils is necessary (screening) or desirable (dewatering). A high degree of coordination would be required with air pollution control agencies; however, air emissions are not nearly as substantial as those from an incinerator especially for units which condense desorbed contaminants rather than burn them in an afterburner.

Cost. Estimated costs for indirect fired kiln systems range from $80 to $350 per ton with mobilization/demobilization costs around $100,000, whereas the cost for a screw type dryer ranges from $200 to $400 per ton. The higher end of this range is for temperatures of 600° to 800°F which would be required for PCBs and DDTR. These costs are less than incineration and are comparatively moderate.

Screening. Thermal desorption of soil to meet remedial action objectives is technically feasible. Limited commercial thermal desorption units are now available. Although specialized labor would be required to operate the unit, skilled operators are available. Thermal desorption potentially could achieve remedial action objectives at a lower cost than incineration. Therefore, thermal desorption was retained for further evaluation for organic contaminated soils and

sediments, particularly at Area A (DDTR), Area A Landfill (PCB), and DRMO.

1.6 Disposal

The following disposal process options, based on an initial screening of technologies, are appropriate and feasible process options for DRMO, Spent Acid Storage and Disposal Area, and Area A Landfill. These disposal process options include disposal in a on-site and off-site RCRA waste disposal area, reuse on site as backfill after treatment, and reuse as a raw material in cement manufacturing.

1.6.1 On-Site Landfill

Landfilling or engineered land disposal refers to the removal and transportation of wastes from their existing location to the site of a newly constructed on-site RCRA landfill.

1.6.1.1 RCRA Landfill

Description. A RCRA landfill is an engineered facility which provides long-term isolation and disposal or degradation of waste materials while minimizing the release of contaminants to the environment. Secure landfills are designed to limit the release of contaminants to the groundwater, control runoff to surface waters, and limit dispersion into the air. The type of secure landfill required depends on the characteristics of the material to be disposed. Hazardous wastes would be disposed of in a hazardous waste (RCRA) landfill, and PCB items would be disposed in a TSCA landfill.

The requirements for hazardous waste RCRA landfills are provided in 40 CFR 265, Subpart N and those for a TSCA landfill are provided in 40 CFR 761.75. These facilities have low permeability liners, leachate collection systems and leak detection zones. They also have low permeability caps that encapsulate the waste and prevent any migration of wastes from the landfill. Presently, there are only a dozen or so commercial facilities in the United States permitted to accept PCBs and hazardous waste material, provided that the material has been treated to comply with land disposal restriction requirements. Landfills cannot accept liquid material as defined by the U.S. EPA. Thus, liquid material must first be stabilized or dewatered so that it passes the Paint Filter Test under 40 CFR 265.314 (d).

EPA guidance for the design of a RCRA landfill include the following:

Cap

- two feet of cover soil suitable for vegetation
- a one-foot drainage layer with a permeability of at least 10^{-3} cm/sec
- a synthetic membrane liner with a permeability less than 10^{-7} cm/sec
- two feet of low permeability material, permeability less than 10^{-7} cm/sec

Liner

- soil protective layer

- synthetic layer
- leachate collection zone, permeability of at least 10^{-3} cm/sec
- synthetic liner
- leachate detection zone, permeability of at least 10^{-3} cm/sec
- two feet of low permeability material, permeability less than 10^{-7} cm/sec

The function of a RCRA landfill is to provide a long-term, environmentally secure repository for the disposal of hazardous materials for which no alternative treatment or disposal alternative are feasible. Once full, a RCRA landfill is covered with an impervious cap as described above. Other provisions of a secure chemical landfill include leachate collection system within the cell liners, containment and treatment systems for the leachate, gas venting, leak detection systems, and closure/post-closure care requirements.

Although there are some differences between the TSCA and RCRA landfill requirements, the term "RCRA landfill" will be used in this study and will refer to a secure chemical landfill design to meet RCRA and/or TSCA standards as appropriate for the waste being disposed.

Effectiveness. Landfills are demonstrated effective techniques for disposal of contaminated organic and inorganic materials and are capable of meeting remedial action objectives. Landfilling would be particularly effective for metal-contaminated soils that have been immobilized, but may also be effective for organic contaminants. Long-term monitoring would have to be performed on a continual basis to assure that the material is still contained and not contaminating the groundwater. Any leachate generated during and after operation of the landfill would have to be treated if it contains leached contaminants. The ability of a particular landfill to contain hazardous constituents is a function of its design and location. Any potential land disposal facilities would have to be carefully evaluated to insure that they are not leaking and not likely to be. This is a containment technology and, therefore, is not a permanent remedy in that volume or toxicity of contaminants is not reduced. Time to construct a landfill is relatively short and could be completed in six months.

Implementability. Soil/sediment containing free liquids could not be disposed without pretreatment. Any free water present in the soil could be removed by gravity dewatering and evaporation. In addition to containing no free liquids, soils that are characterized as hazardous waste could not be landfilled unless they met the land disposal restriction requirements. Siting a RCRA landfill at NSB-NLON would be difficult as there is limited available space which is suitable for use as a landfill.

Depending upon the degree of pretreatment, soils previously considered hazardous could be used as backfill on site. Long-term liability is of concern when landfilling is used, as the wastes are not necessarily treated. Or, in the future, if the landfill is listed as a Superfund site, certain liabilities could be held against landfill contributors.

A high level of coordination would be required with waste disposal agencies. Experienced contractors and materials are readily available.

Cost. The estimated costs for an on-site hazardous waste disposal are expected to range

from $200 to $300 per ton. On-site land disposal would require significant costs for coordination with regulatory agencies and construction of a RCRA approved landfill, but operational costs would be minimal. Comparatively, these costs are low.

Screening. Landfilling can be a cost-effective option considering a landfill can accept a multitude of waste and soil types. However, as landfilling alone does not reduce the volume or toxicity of contamination, it should be viewed as a containment option. The on-site RCRA landfill may be difficult to implement and is no more effective and not much more economical than an off-site RCRA landfill. The on-site RCRA landfill will not be retained for further evaluation for this reason and as reuse, as backfilling is more appropriate for disposal of treatment residues.

1.6.2 Off-Site Landfill

Landfilling or engineered land disposal refers to the removal and transportation of wastes from their existing location to the site of an existing RCRA landfill.

1.6.2.1 RCRA Landfill

Description. An existing off-site RCRA landfill is designed to the same standards as an on-site RCRA landfill which is described in subsection 1.6.1.1 above. For purposes of this FFS, a RCRA landfill is any disposal and designed to meet the RCRA hazardous waste standards (i.e., double liners with leachate collection systems), regardless of permits.

Effectiveness. Effectiveness of an off-site RCRA landfill is the same as an on-site RCRA except that implementation time would be reduced as construction is not necessary. Its effectiveness at a particular site is based on the effectiveness of the removal operation.

Implementability. This option is very easy to implement as it uses existing facilities. Implementation concerns between on-site and off-site RCRA landfills are similar; however, a major advantage of off-site disposal is that permits and requirements at the disposal facility would be the responsibility of the facility operator. Transportation of hazardous materials would require manifesting the cargo and hauling it by a licensed operator. Off-site landfilling, however, is somewhat more expensive than on-site landfilling due to transportation costs.

Cost. The estimated cost for disposal at a RCRA landfill, including transportation, ranges from $250 to $400 per ton. Comparatively, these costs are low to moderate.

Screening. Landfilling although it is not a permanent remedy can be a cost-effective option that is easy to implement considering a landfill can accept a multitude of waste and soil types. It is also very effective at reducing the amount of contamination on site. Off-site landfilling may be appropriate for DDTR sediments and PCB soils in Area A Landfill, as well as soils from the DRMO and Spent Acid Storage and Disposal Area.

1.6.3 On-Site Reuse

Feasible and appropriate on-site reuse process options retained for soils include on-site reuse as backfill after treatment.

1.6.3.1 On-Site Reuse as Backfill

Description. This disposal response action merely consists of placing soil back into the excavation from which it was removed after its treatment. It should be noted that placing treated soil into other than its original excavation would be considered landfilling and for hazardous waste trigger the land disposal restriction requirements.

Effectiveness. The effectiveness of this option is determined by the treatment performed on the material prior to backfilling.

Implementability. This process option is easy to implement, with the necessary equipment and operators readily available.

Backfilling of sediments in streambeds and wetlands could cause suspension of soil particles into the surface water and, therefore, is not desirable unless these areas are first dewatered or appropriate sediment control measures are implemented.

Cost. Cost is from $1 to $10 per ton, depending upon the amount of compaction required. Comparatively, these costs are low.

Screening. For soils which have been adequately treated, this option will be retained.

1.6.4 Off-Site Reuse

Feasible and appropriate off-site reuse process options retained for soil include use as a raw material in cement manufacturing.

1.6.4.1 Use in Cement Manufacturing

Description. In this process, raw materials (limestone, clay, and soil) are crushed and mixed to specified proportions. The mixture is then heated in a kiln to material temperatures greater than 2700°F until it chemically reacts to become clinker an intermediate product. The clinker is subsequently mixed with gypsum and ground to a fine powder to produce cement.

Effectiveness. This is a permanent remedy that oxidizes organic contaminants and stabilizes metal contaminants. Soils may require pretreatment to reduce moisture content or larger diameter particles. Volatile emissions from mixing and grinding operations could present a hazard if not properly controlled. Destruction removal efficiencies (DRE) are equal to or greater than those of incineration processes (i.e., 99.99 percent DRE). Reuse is specified as a preferential treatment technology in the NCP.

Implementability. This is an off-site option with only a few facilities to choose from, each with its own acceptance criteria and processing rates. None of the facilities are presently permitted to handle hazardous waste, DDT, or PCBs; however, one facility is pursuing permits to manage these waste types. Any one of the facilities has adequate capacity to manage the volume of waste present at NSB-NLON.

Cost. Costs range from $100 to $500 per ton, including transportation. The major variables that effect cost are soil moisture content and particle size. For an incineration process, these costs are low. Comparatively overall, these costs are moderate.

Screening. Off-site reuse is a potentially viable disposal option for nonhazardous materials that do not contain PCBs or DDTR as it incorporates the favorable concept of recycling. The implementability of this option is highly influenced by the physical characteristics of the soil, including moisture content, grain size distribution, and concentration of contaminants. If the soil meets these and other applicable criteria, it could prove most cost-effective to use this option as some financial advantages could be realized. This option will not be retained for further evaluation as there are presently no kilns permitted to handle soils with the contaminants present at NSB-NLON.

APPENDIX G

UNIT COST DOCUMENTATION

SUMMARY OF UNIT COSTS

PROCESS OPTION	UNIT	COST RANGE		SC	TC	M/D	O&M S/Y/U	COMMENTS/DESCRIPTION	COST REFERENCES(1)
		—CAPITAL—					O&M		
SOIL/SEDIMENT									
LIMITED ACTION									
NO ACTION									
NO ACTION	LS			0					
ACCESS RESTRICTION									
DEED RESTRICTION	LS			1000				ATTORNEY'S FEES	ENGINEERING JUDGEMENT
FENCING	LF			13			1.30	CHAIN LINK, 8' WITH BARBED WIRE - O&M COSTS = 10% OF CAPITAL COST	VENDOR QUOTE (MILLER)
CONTAINMENT									
HORIZONTAL BARRIERS									
CAP	SF	1	10	3.5			0.025	SURFACE CAP - O&M COSTS = 0.5% OF CAPITAL COST. SELECTED COST BASED ON	GRI, WAGNER
							0.025	MEANS (1994) AND VENDOR QUOTE (1994)	
SURFACE WATER CONTROL									
SITE GRADING AND STORMWATER MGMNT	LF			60					AES, MEANS
	LF						0.3	5% OF CAPITAL COST	AES, MEANS
SUBSURFACE DRAINAGE TRENCH	LF			40					AES, MEANS
GAS VENTING TRENCH	LF			15					AES, MEANS
REMOVAL									
EXCAVATION									
BACKHOE	CY	5	12	8				EXCAVATION	GRI, EPA
	CY	5	15	10				BACKFILL - PROCURE AND PLACE	MEANS
DREDGING									
MECHANICAL	CY	5	20	12					WAGNER, EPA
HYDRAULIC	CY	5	20	12				SEE DEWATERING	VENDOR QUOTE (ACES), MEANS, GRI
IN-SITU TREATMENT									
PHYSICAL/CHEMICAL									
SOIL VENTING	CY	20	100					SEE REFERENCE FOR APPROPRIATE COSTING, PP 103-118 (20-100 PER SECTION 2)	EPA2
STABILIZATION	TON	50	210	150	10K	100K			VENDOR QUOTE (GEO-CON), EPA3
THERMAL									
VITRIFICATION	TON	400	500	450	100K	250K			VENDOR QUOTE (GEOSAFE)
ABOVE-GROUND TREATMENT									
PHYSICAL/CHEMICAL									
DEWATERING	TON			6.00				STOCK PILE WITH UNDERDRAIN SYSTEM	MEANS, ENG'G JUDGEMENT

Refer to the end of this table for references and acronymns explanation.

SUMMARY OF UNIT COSTS

(continued)

		—CAPITAL—				O&M			
PROCESS OPTION	UNIT	COST RANGE		SC	TC	M/D	$/Y/U	COMMENTS/DESCRIPTION	COST REFERENCES(1)
SOIL WASHING	TON	60	300	180	35K	50K			VENDOR QUOTE (BIOTROL)
SOLVENT EXTRACTION	TON	200	300	250	10K	100K		BASIC EXTRACTIVE SLUDGE TREATMENT (B.E.S.T) PROCESS	VENDOR QUOTE (RCC), GRI
	TON	150	460		--	--		CF SYSTEMS SOILS TREATMENT EXTRACTION - LARGE SCALE 63K-800K TONS	EPA4
STABILIZATION	TON	50	210	150	10K	20K			VENDOR QUOTE (GEO-CON)
ON-SITE THERMAL									
INCINERATION	TON	200	500	500	10K	500K		HIGHER VALUE SELECTED DUE TO SMALL VOLUME OF WASTE	VENDOR QUOTE (CWM), GRI
LOW TEMPERATURE THERMAL DESORPTION	TON	50	500	200	25K	500K		CONTINGENT UPON SOIL & WASTE CHARACTERISTICS	VENDOR QUOTES (CWM, CANONIE, CB)
	TON	200	300		10-25K			INCLUDES MOB/DEMOB	VENDOR QUOTE (ACES)
	TON	45	115					INCLUDES MOB/DEMOB, (AFTERBURNER CHARPER THAN CONDENSER)	VENDOR QUOTE (USPCI)
OFF-SITE THERMAL									
INCINERATION	TON	600	1000	800				INCLUDES TRANSPORTATION AND DISPOSAL	VENDOR QUOTE (ACES)
LOW TEMPERATURE THERMAL DESORPTION	TON	100	300	175				INCLUDES TRANSP. & DISP; CONTINGENT UPON SOIL & WASTE CHARACTERISTICS	ATLANTIC EXPERIENCE
DISPOSAL									
ON-SITE REUSE									
BACKFILL AFTER TREATMENT	TON	1	10	3.50				PLACEMENT	VENDOR QUOTE (ACES), MEANS
OFF-SITE LANDFILL									
SOLID WASTE DISPOSAL AREA	TON	50	100	75				INCLUDES TRANSPORTATION AND DISPOSAL	ATLANTIC EXPERIENCE, VENDOR QUOTE (BFI), GRI
RCRA CHEMICAL LANDFILL	TON	150	500	300				INCLUDES TRANSPORTATION AND DISPOSAL	VENDOR QUOTES (EWT, ACES, ENVIROTECH)
	TON			320				INCLUDES TRANSPORTATION AND DISPOSAL AND STABILIZATION	VENDOR QUOTE (ENVIROTECH)
OFF-SITE REUSE									
ASPHALT BATCH PLANT (AGGREGATE)	TON	100	500	300				INCLUDES TRANSP. & DISP; CONTINGENT UPON SOIL & WASTE CHARACTERISTICS	VENDOR QUOTE (ETMA)
CEMENT MANUFACTURING (RAW MATERIAL)	TON	100	500	300				INCLUDES TRANSP. & DISP; CONTINGENT UPON SOIL & WASTE CHARACTERISTICS	VENDOR QUOTE (GRRI)
OTHER									
PAVEMENT REPLACEMENT	SF			1.50					MEANS, ENGINEERING JUDGEMENT
SITE PREPERATION	LS			1000				OFFICE, UTILITIES	ATLANTIC EXPERIENCE
SITE RESTORATION	LS			1000				GRADING, SEEDING	ATLANTIC EXPERIENCE
MOB/DEMOB - CONST., EQUIP., WORKERS	LS			1000				CAP AND COVER ALTERNATIVES	ATLANTIC EXPERIENCE
MOB/DEMOB - CONST., EQUIP., WORKERS	LS			2000				REMAINING TREATMENT ALTERNATIVES	ATLANTIC EXPERIENCE
OTHER - CAP/COVER	LS			20000				HEALTH AND SAFETY, DECONTAMINATION, PROJECT MANAGEMENT, SAMPLING & TESTING, TRAVEL AND EXPENCES	ATLANTIC EXPERIENCE
OTHER - ACCESS RESTRICTION	LS			10000				HEALTH AND SAFETY, DECONTAMINATION, PROJECT MANAGEMENT, SAMPLING & TESTING, TRAVEL AND EXPENCES	ATLANTIC EXPERIENCE
OTHER - REMAINING ALT. TREATMENT TECH.	LS			50000				HEALTH AND SAFETY, DECONTAMINATION, PROJECT MANAGEMENT, SAMPLING & TESTING, TRAVEL AND EXPENCES	ATLANTIC EXPERIENCE
GROUNDWATER MONITORING	LS/YR			125000				ASSUMED FULL CLP ANALYSIS, 28 WELLS, AND SEMI-ANNUAL MONITORING	ATLANTIC ESTIMATE

Refer to the end of this table for references and acronymns explanation.

SUMMARY OF UNIT COSTS
(continued)

PROCESS OPTION	UNIT	CAPITAL COST RANGE		SC	TC	M/D	O&M $/Y/U	COMMENTS/DESCRIPTION	COST REFERENCES(1)
WATER									
LIMITED ACTION									
NO ACTION									
NO ACTION	LS			0					
ACCESS RESTRICTION									
DEED RESTRICTION	LS			1000				ATTORNEY'S FEES	ENGINEERING JUDGEMENT
FENCING	LF			13			1.30	CHAIN LINK, 8' WITH BARBED WIRE - O&M COSTS = 10% OF CAPITAL COST	VENDOR QUOTE (MILLER)
CONTAINMENT									
GROUND WATER CONTROL									
SUBSURFACE DRAINS	LF	10	200	75			7.50	DEPENDS ON COMPLEXITY AND DEPTH OF TRENCH - O&M COST = 10% OF CAPITAL	MEANS, HMC, EPA, WAGNER
WELLS	EACH	7000	18000	15000			1125	DRILLED AND CASED (50', 6"PVC, W/PUMPS) - O&M COST = 7.5% OF CAPITAL	HMC, EPA, WAGNER
HORIZONTAL BARRIERS									
CAPS	SF	5	15	15			0.075	RCRA CAP - O&M COSTS = 0.5% OF CAPITAL COST	GRI, WAGNER
	SF	1	10	5			0.025	SURFACE CAP - O&M COSTS = 0.5% OF CAPITAL COST	GRI, WAGNER
VERTICAL BARRIERS									
GROUT BARRIERS/CURTAINS	CF	5	20						HMC
SLURRY WALLS	SF	5	20	19				SOIL -BENTONITE BACKFILL - SF OF VERTICAL FACE	VENDOR QUOTE (GEO-CON), HMC, WAGNER, GRI, EPA
DIAPHRAGM WALLS	SF	25	60						ENGINEERING JUDGEMENT
SHEET PILES	SF	8	20						WAGNER, GRI, MEANS
REMOVAL									
SUBSURFACE DRAINS									
TRENCH DRAIN								SEE SUBSURFACE DRAINS UNDER CONTAINMENT ABOVE.	
PUMPING									
EXTRACTION WELLS								SEE WELLS UNDER CONTAINMENT ABOVE	
IN-SITU TREATMENT									
BIOLOGICAL									
AEROBIC								HIGH COST DUE TO O&M	
ABOVE-GROUND TREATMENT									
BIOLOGICAL									
ACTIVATED SLUDGE	GPM			4200			540	INCLUDES AERATION, CLARIFICATION, PUMPS & PIPING, RESIDUAL MANAGEMENT	MCARDLE
AERATION BASIN	GPM			1200			500		MCARDLE
SPRAY IRRIGATION								SPRAY IRRIGATION COST ESTIMATED ON A CASE BY CASE BASIS - INCLUDE O&M	

Refer to the end of this table for references and acronymns explanation.

SUMMARY OF UNIT COSTS

(continued)

		----CAPITAL----					O&M		
PROCESS OPTION	UNIT	COST RANGE		SC	TC	M/D	$/Y/U	COMMENTS/DESCRIPTION	COST REFERENCES(1)
FIXED BED	GPM			2700			520		EPA5
FLUIDIZED BED								ASSUME COST SIMILAR TO FIXED BED	
POWDERED ACTIV CARBON TREATMENT	GPM			5600			1600	INCLUDES AERATION, CLARIFICATION, P&P, RESIDUAL MANAGEMENT, CARBON	MCARDLE
ROTATING BIOLOGICAL CONTACTORS	GPM			4400			510	INCLUDES ROTATING BIOLOGICAL CONTACTORS, CLARIF., P&P, RESID. MGMNT	MCARDLE
SEQUENCING BATCH REACTOR	GPM			2500			300	INCLUDES SEQUENCING BATCH REACTOR, AERATORS, P&P, RESID. MGMNT	MCARDLE
TRICKLING FILTER	GPM			3900			600	INCLUDES TRICKLING FILTER, CLARIFICATION, P&P, RESIDUAL MANAGEMENT	MCARDLE
PHYSICAL/CHEMICAL									
AIR STRIPPING	GPM			2400			85	INCLUDES PACKED TOWER, AIR COMPRESSOR, P&P, RESIDUAL MANAGEMENT	MCARDLE, GRI2
CARBON ADSORPTION	GPM			1900			350	INCLUDES PRESSURE VESSEL, CARBON, P&P, RESIDUAL MANAGEMENT	MCARDLE, GRI2
DEWATERING								SEE DEWATERING UNDER SOIL/SEDIMENT	
DISSOLVED AIR FLOTATION	GPM			360			47		ENGINEERING JUDGEMENT
EVAPORATION				3000			300		ENGINEERING JUDGEMENT
FILTRATION	GPM			660			85	GRANULAR MEDIA GRAVITY FILTER - PARKSON SAND FILTER	VENDOR QUOTE (WESCOR/PARKSON)
FLOCCULATION PRECIPITATION GRAVITY SEPARATION	GPM			3500			660	INCLUDES FLOCCULATOR/CLARIFIER, CHEMICAL FEED, P&P, RESIDUAL MGMNT	MCARDLE
ION EXCAHANGE/RESIN ADSORPTION	GPM			1300			300	INCLUDES EQUIPMENT, RESIN, RESIDUAL MANAGEMENT	MCARDLE
NEUTRALIZATION	GPM			600			45	INCLUDES EQUIPMENT, CHEMICALS	MCARDLE
OXIDATION	GPM			1800			850	INCLUDES EQUIPMENT, CHEMICALS	MCARDLE, GRI2
PHOTOLYSIS								GROUPED TOGETHER WITH OXIDATION	
REDUCTION	GPM			1800			850	INCLUDES EQUIPMENT, CHEMICALS	MCARDLE
REVERSE OSMOSIS	GPM			2700			860	INCLUDES PACKAGED UNIT, FILTER MODULES, RESIDUAL MANAGEMENT	MCARDLE
STEAM STRIPPING	GPM			1300			85	INCLUDES ALL CAPITAL - O&M COST ASSUMED SIMILAR TO AIR STRIPPING	MCARDLE
ON-SITE THERMAL									
WET AIR OXIDATION	GPM			9400			3100	INCLUDES W.A.O REACTOR, HEAT EXCHANGER, COMPRESSOR, P&P, SEPARATOR	MCARDLE
DISPOSAL									
OFF-SITE									
DISCHARGE TO POTW	TGAL	1.00	1.10	1.10				PLUS CONNECT FEE $1000 PER 625 GPD - CONTINGENT UPON POTW ACCEPTANCE	VENDOR QUOTE (TOWN OF GROTON POTW), GRI
DISCHARGE TO THAMES RIVER	LS			51000			510		MEANS
TRANSPORTATION TO OFFSITE FACILITY	GAL	0.20	0.30	0.30					ATLANTIC EXPERIENCE
ON-SITE									
DISCHARGE TO SURFACE WATER	GPM			50			5		ENGINEERING JUDGEMENT
DISCHARGE TO GROUND WATER	GPM			500			50		ENGINEERING JUDGEMENT
ON-SITE REUSE									
BOILER FEED WATER	TGAL			-0.15					ENGINEERING JUDGEMENT

Refer to the end of this table for references and acronymns explanation.

SUMMARY OF UNIT COSTS

(continued)

REFERENCES:

EPA - COMPENDIUM OF COSTS OF REMEDIAL TECHNOLOGIES AT HAZARDOUS WASTE SITES, 1987 (COSTS IN 1982 DOLLARS UPDATED TO 1992)

EPA2 - SOIL VAPOR EXTRACTION TECHNOLOGY REFERENCE HANDBOOK; FEB 1991; CAMP, DRESSER AND MCKEE UNDER EPA CONTRACT. AVAILABLE THROUGH NTIS. EPA/540/2-91/003.

EPA3 - TECHNOLOGY EVALUATION REPORT: SITE PROGRAM DEMONSTRATION TEST; INTERNATIONAL WASTE TECHNOLOGY; IN SITU STABILIZ/SOLIDIF; HIALEAH, FLA; VOLUME I; EPA RISK RED. ENG'G LABORATORY; CINN, OH; JUNE 1989.

EPA4 - CF SYSTEMS ORGANICS EXTRACTION PROCESS, NEW BEDFORD HARBOR, MA, APPLICATIONS ANALYSIS REPORT, USEPA - OFFICE OF RESEARCH AND DEVELOPMENT, AUGUST 1990. EPA/540/A5-90/002.

EPA5 - BIOLOGICAL TREATMANT OF WOOD PRESERVING SITE GROUNDWATER BY BIOTROL INC, APPLICATIONS ANALYSIS REPORT, USEPA - OFFICE OF RESEARCH AND DEVELOPMENT, SEPTEMBER 1991. EPA/540/A5-91/001.

EPA6 - INNOVATIVE TREATMENT TECHNOLOGIES, USEPA OFFICE OF SOLID WASTE AND EMERGENCY RESPONSE, WASHINGTON D.C., OCTOBER 1991, EPA/540/9-91/002.

GRI - REMEDIATION ALTERNATIVE AND COSTS FOR THE RESTORATION OF MGP SITES, PREPARED BY REMEDIATION TECHNOLOGIES, INC FOR GAS RESEARCH INSTITUTE, MARCH 1990.

GRI2 - LABORATORY AND PILOT-SCALE EVALUATIONS OF PHYSICAL/CHEMICAL TREATMENT TECHNOLOGIES FOR MGP SITE GROUNDWATERS, PREPARED BY REMEDIATION TECHNOLOGIES FOR GAS RESEARCH INSTITUTE, MAY 1990.

HMC - HAZARDOUS MATERIALS CONTROL, JULY/AUGUST 1990.

MCARDLE - TREATMENT OF HAZARDOUS WASTE LEACHATE - UNIT OPERATIONS AND COSTS, J.L. MCARDLE ET AL, PREPARED BY SAIC FOR EPA'S OFFICE OF RESEARCH AND DEVELOPMENT, NOYES DATA CORPORATION, 1988

MEANS - R.S. MEANS HEAVY CONSTRUCTION COST DATA, 1991

WAGNER - REMEDIAL ACTION TECHNOLOGY FOR WASTE DISPOSAL SITES, 2nd EDITION, K. WAGNER ET AL, PREPARED BY SAIC FOR EPA OFFICE OF RESEARCH AND DEVELOPMENT, NOYES DATA CORP., 1986

A&S - ATLANTIC ENVIRONMENTAL SERVICES, INC., COST ESTIMATE, JUNE 28, 1994, INTERIM REMEDIAL ACTION: AREA "A" LANDFILL CAP, FOR NORDIV

VENDORS:

ACES - ASSOCIATED CHEMICAL AND ENVIRONMENTAL SERVICES
BIO-TROL INC.
BFI - BROWNING FERRIS INDUSTRIES
CANONIE ENVORONMENTAL SERVICES CORPORATION
CWM - CHEMICAL WASTE MANAGEMENT
CB - CLEAN BERKSHIRES
EWT - ENVIRONMENTAL WASTE TECHNOLOGY
ETMA - ENVIRO-TECH MID-ATLANTIC (VIRGINIA)
GEO-CON INC. GEOTECHNICAL CONSTRUCTION
GEOSAFE CORPORATION
GRR! - GIANT RESOURCE RECOVERY! (SOUTH CAROLINA)
JDM - J.D. MEAGHER
MILLER FENCE COMPANY
RCC - RESOURCES CONSERVATION COMPANY
USPCI
WESCOR/PARKSON - WESCOR ASSOCIATES INC./PARKSON CORPORATION

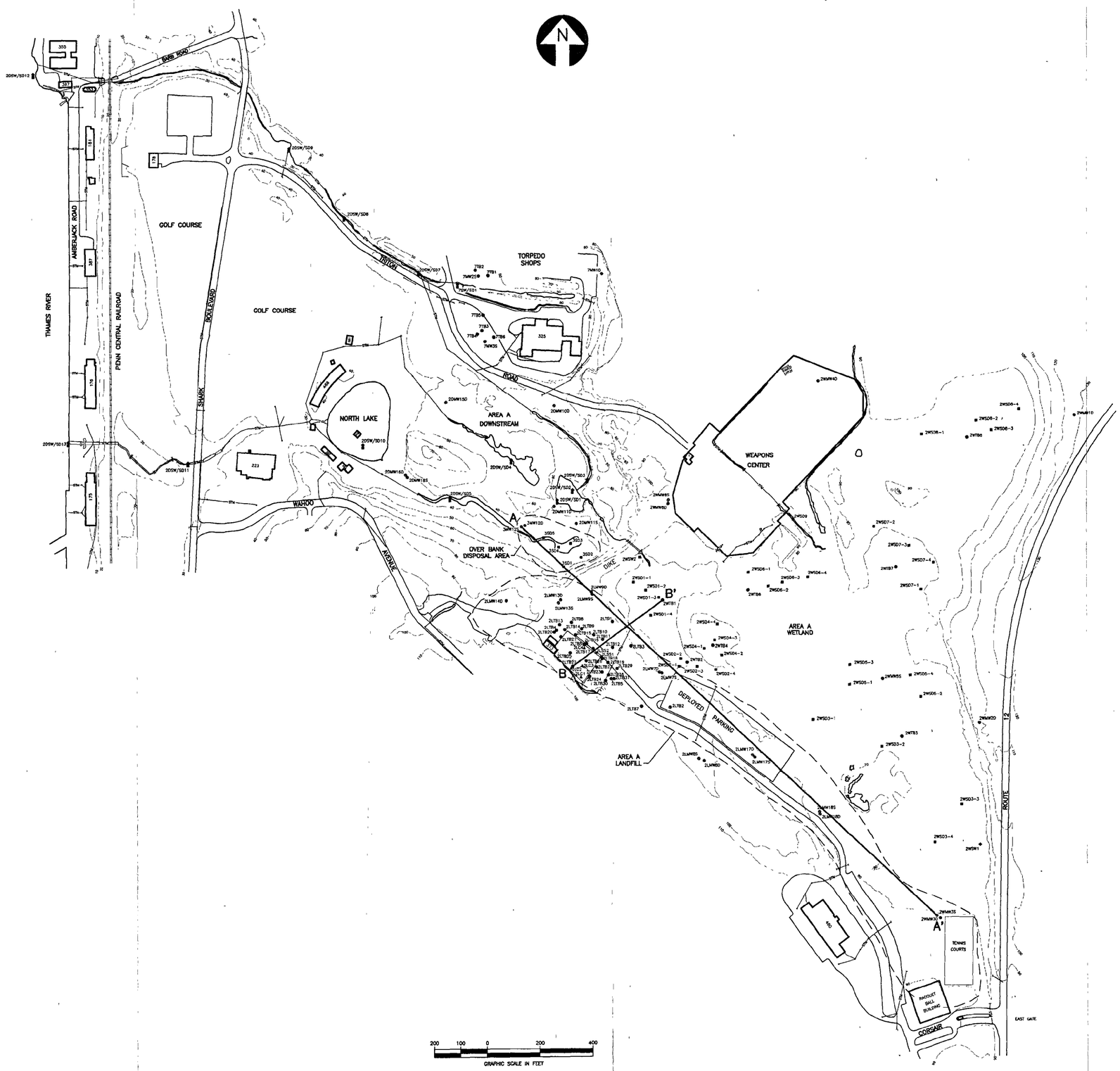
LEGEND:

UNIT - BASIS OF UNIT COST
RANGE - RANGE OF CAPITAL UNIT COSTS GIVEN IN DOLLARS PER UNIT.
SC - SELECTED COST USED IN ALTERNATIVE COST ESTIMATE, GIVEN IN DOLLARS PER UNIT.
TS - COST OF A TREATABILITY STUDY IF APPLICABLE
M/D - COSTS OF MOBILIZATION/DEMOBILIZATION IF NOT INCLUDED IN UNIT COST
$/Y/U - COST OF OPERATION AND MAINTENANCE PER YEAR PER UNIT IF NOT INCLUDED IN UNIT COST
LS - LUMP SUM
SF - SQUARE FEET
CF - CUBIC FEET
CY - CUBIC YARD
LF - LINEAR FEET
GPM - GALLONS PER MINUTE
TGAL - THOUSAND GALLONS
P&P - PUMPS AND PIPING

NOTES:

(1) SEE "EXPLANATION OF THE DERIVATION OF UNIT COSTS FOR THE COST ESTIMATING OF ALTERNATIVES FOR THE NSB-NLON PROJECT" FOR A MORE COMPLETE DESCRIPTION OF THE BASIS FOR COST SELECTION.

ALL SOURCES ARE UPDATED TO FEBRUARY 1992 DOLLARS BASED ON ENR'S CONSTRUCTION COST INDEX.



NOTE.
THE ONLY UTILITIES SHOWN ARE STORM DRAINAGE.
LOCATIONS ARE APPROXIMATE.

INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE-NEW LONDON
GROTON, CONN.

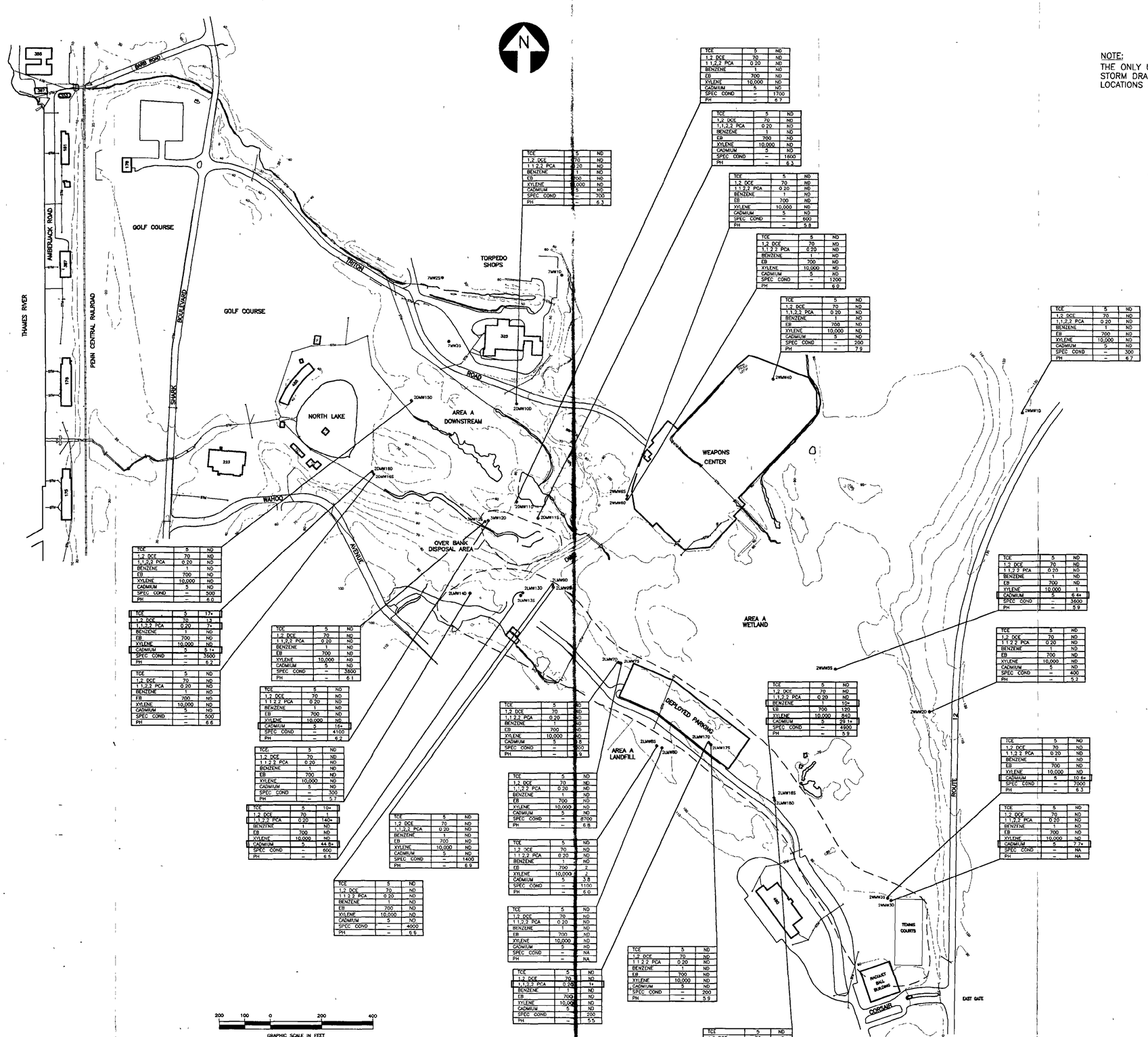
LEGEND

6MW1	MONITORING WELL	A——A'	CROSS-SECTION
6TB1	TEST BORING	—10—	EXISTING CONTOUR
2D6S1	SEDIMENT SAMPLE	123	BUILDING NUMBER
6SS1	SURFACE SOIL SAMPLE		WATERCOURSE
2D0W1	SURFACE WATER SAMPLE	—SN—	STORM SEWER

PLATE 1
FIELD SAMPLING PLAN AND GEOLOGIC CROSS-SECTION LOCATIONS AREA A

ATLANTIC ENVIRONMENTAL SERVICES, INC.

0072411X



TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	1700
PH	–	6.7

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	1600
PH	–	6.3

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	600
PH	–	5.9

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	1200
PH	–	6.9

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	200
PH	–	7.9

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	300
PH	–	6.7

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	1
CADMIUM	5	6.4+
SPEC COND	–	3600
PH	–	5.9

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	400
PH	–	5.2

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	10.6+
SPEC COND	–	7000
PH	–	6.3

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	7.7+
SPEC COND	–	NA
PH	–	NA

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	1300
PH	–	6.3

TCE	5	17+
1,2 DCE	70	13
1,1,2,2 PCA	0.20	7+
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	5.1+
SPEC COND	–	3500
PH	–	6.2

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	500
PH	–	6.6

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	500
PH	–	6.0

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	3600
PH	–	6.1

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	4100
CADMIUM	5	16+
SPEC COND	–	700
PH	–	6.3

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	300
PH	–	5.7

TCE	5	10+
1,2 DCE	70	
1,1,2,2 PCA	0.20	140+
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	44.8+
SPEC COND	–	600
PH	–	6.5

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	1400
PH	–	6.9

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	4000
CADMIUM	5	ND
SPEC COND	–	6.6

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	8700
PH	–	6.8

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	2
XYLENE	10,000	2
CADMIUM	5	3.8
SPEC COND	–	1100
PH	–	6.0

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	NA
PH	–	NA

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	1+
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	200
PH	–	5.5

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	ND
SPEC COND	–	200
PH	–	5.9

TCE	5	ND
1,2 DCE	70	ND
1,1,2,2 PCA	0.20	ND
BENZENE	1	ND
EB	700	ND
XYLENE	10,000	ND
CADMIUM	5	7.2+
SPEC COND	–	200
PH	–	5.7

NOTE:
THE ONLY UTILITIES SHOWN ARE STORM DRAINAGE.
LOCATIONS ARE APPROXIMATE

CONSTITUENTS		ARAR/TBC	CONCENTRATIONS
TRICHLOROETHENE	TCE	5	ND
1,2 DICHLOROETHENE	1,2 DCE	70	ND
1,1,2,2 TETRACHLOROETHANE	1,1,2,2 PCA	0.20	1
	BENZENE	1	ND
ETHYL BENZENE	EB	700	ND
	XYLENE	10,000	ND
	CADMIUM	5	ND
SPECIFIC CONDUCTIVITY	SPEC COND	–	200
	PH	–	5.5

ND=NOT DETECTED
NA=NOT ANALYZED
+ EXCEEDANCE OF ARAR/TBC

LEGEND

INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE–NEW LONDON
GROTON, CONN.

LEGEND

6MW1	MONITORING WELL
—10—	EXISTING CONTOUR
123	BUILDING NUMBER
	WATERCOURSE
STM	STORM SEWER

PLATE 2
SUMMARY OF GROUND WATER QUALITY
AREA A

ATLANTIC ENVIRONMENTAL SERVICES, INC

0072412X