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NSB NEW LONDON
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DO NOT MARK UP

PROPOSED
INTERIM REMEDIAL ACTIONS

NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CONNECTICUT

MARCH 23, 1993

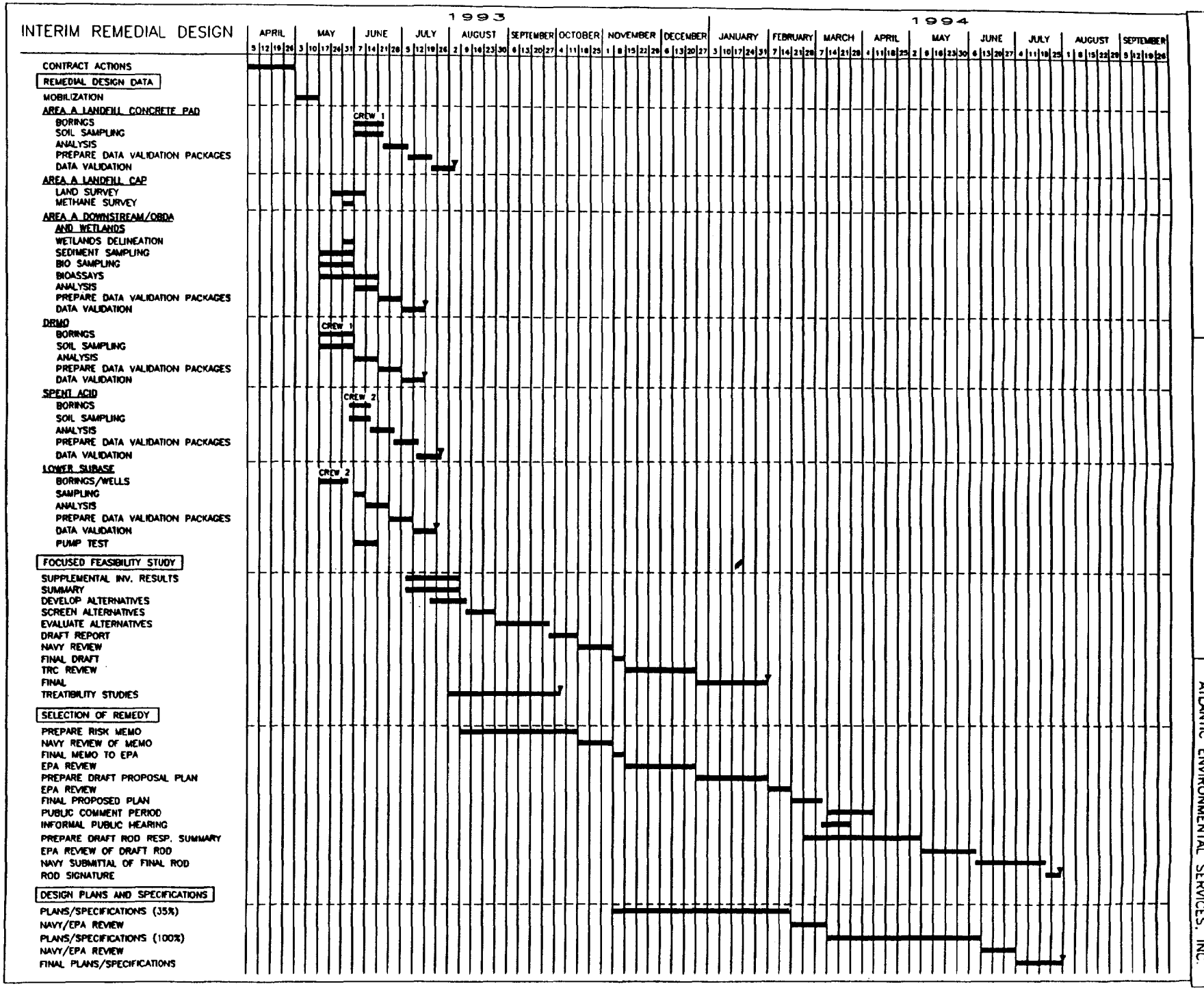
ATLANTIC
ENVIRONMENTAL SERVICES, INC. 188 NORWICH AVENUE COLCHESTER, CONNECTICUT 06415 (203) 537-0751

IRM SCHEDULE

INTERIM REMEDIAL MEASURES SCHEDULE
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CONNECTICUT

Activities	1993	1994	1995	Beyond 1995
Area A/OBDA				
Concrete Pad				
• Phase II RI Work Plan	●			
• Supplemental Sampling Test Analysis	⊕●			
• Focused Feasibility Study, Proposed Plan, ROD	⊕	●		
• Interim Remedial Design-PCB Soils		⊕●		
• Interim Remedial Action-PCB Soils			⊕●	
Landfill Cap				
• Phase II RI Work Plan	●			
• Focused Feasibility Study, Proposed Plan, ROD - Cap	⊕	●		
• Interim Remedial Design - Cap		⊕●		
• Cap Construction			⊕●	
• Cap Operation and Maintenance			⊕	●
Downstream/OBDA				
• Phase II RI Work Plan	●			
• Supplemental Sampling and Analysis	⊕●			
• Focused Feasibility Study, Proposed Plan, ROD	⊕	●		
• Interim Remedial Design - DDTR Sediments		⊕●		
• Interim Remedial Action - DDTR Sediments			⊕●	
DRMO - Soils				
• Phase II RI Work Plan	●			
• Supplemental Sampling and Analysis	⊕●			
• Focused Feasibility Study, Proposed Plan, ROD	⊕	●		
• Interim Remedial Design - Soils		⊕●		
• Interim Remedial Action - Soils			⊕●	
Lower Subase - Free Product				
• Phase II Work Plan	●			
• Supplemental Sampling and Analysis	⊕●			
• Focused Feasibility Study, Proposed Plan, ROD	⊕	●		
• Interim Remedial Design - Free Product (if present)		⊕●		
• Interim Remedial Action - Free Product (if present)			⊕●	
• Operation and Maintenance			⊕	●
Spent Acid Storage and Disposal Area - Soils				
• Phase II Work Plan	●			
• Supplemental Sampling and Analysis	⊕●			
• Focused Feasibility Study, Proposed Plan, ROD	⊕	●		
• Interim Remedial Design - Lead Soils		⊕●		
• Interim Remedial Action - Lead Soils			⊕●	

⊕ Activity starts
● Activity completed
o Activity on stand-by



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

LEGEND
TASK TIME LINE
ENDING MILESTONE

SCHEDULE
PROPOSED INTERIM REMEDIAL MEASURES

ATLANTIC ENVIRONMENTAL SERVICES, INC.

RISK SUMMARY

SUMMARY OF RISKS
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CONNECTICUT

Receptor	Pathway of Concern	Cancer Risks		Systematic Health Risks		Contributing Factors to Risk	
		Mean	Maximum	Mean	Maximum	Cancer	Systematic
AREA A LANDFILL							
Utility Worker Sewer Repair	Soil Ingestion/Dermal Abs.	1.7E-07	1.1E-06	2.3E-02	8.2E-02	PCBs	
	Fugitive Dust Inhalation	7.3E-09	2.1E-08	6.3E-04	2.1E-06		
Weapons Center Personnel	Fugitive Dust Inhalation	8.2E-08	2.6E-07	6.3E-04	1.5E-07		
Servicemen Unloading Palettes	Soil Ingestion/Dermal Abs.	9.2E-06	4.2E-05	1.3E-01	3.3E-01	PCBs	
	Fugitive Dust Inhalation	1.3E-09	2.6E-09	1.1E-04	1.7E-04		
Servicemen Recreational Activities	Fugitive Dust Inhalation	7.9E-10	1.6E-09	3.6E-05	5.4E-05		
Groton/Ledyard Residents	Fugitive Dust Inhalation	1.5E-08	2.9E-08	3.1E-04	5.8E-04		
Citizens at Car Auctions	Soil Ingestion	3.2E-07	5.7E-07	6.4E-03	1.0E-02		
AREA A DOWNSTREAM WATERCOURSES							
Children Exploring Woods including Landfill Area	Soil Ingestion/Dermal Abs.	3.4E-06	1.5E-05	7.1E-02	1.7E-01	PCBs, Be	
	Fugitive Dust Inhalation	1.2E-08	2.2E-08	6.1E-04	8.7E-04		
Children Exploring Streambeds & Wetland	Sed Ingestion/Dermal Abs.	5.6E-06	5.9E-05	5.2E-01	5.5E+00	DDD, DDT, DDE, Be	DDD
Children Swimming in North Lake	Sed Ingestion/Dermal Abs.	3.5E-08	5.2E-08	1.6E-01	1.9E-01		
	SW Ingestion/Dermal Abs.	7.8E-08	1.7E-07	5.2E-02	2.2E-01		
Utility Worker Downstream Watercourses	Soil Ingestion/Dermal Abs.	2.7E-08	3.7E-08	6.4E-04	8.5E-04		
	Fugitive Dust Inhalation	6.0E-09	7.0E-09	9.1E-05	9.8E-05		
	Ground Water Dermal Abs.	0.0E+00	0.0E+00	1.2E-04	2.1E-04		

SUMMARY OF RISKS (continued)
NAVAL SUBMARINE BASE - NEW LONDON
GROTON, CONNECTICUT

Receptor	Pathway of Concern	Cancer Risks		Systematic Health Risks		Contributing Factors to Risk	
		Mean	Maximum	Mean	Maximum	Cancer	Systematic
DRMO							
Citizens at Monthly Auctions	Soil Ingestion	1.6E-06	4.7E-06	3.0E-02	5.5E-02	PAHs, PCBs	
	Fugitive Dust Inhalation	9.7E-09	1.8E-08	2.0E-04	3.6E-04		
Citizens at Weekly Public Sales	Soil Ingestion	1.7E-06	5.1E-06	3.2E-02	5.0E-02	PAHs, PCBs	
	Fugitive Dust Inhalation	8.4E-09	1.6E-08	1.7E-04	3.1E-04		
Navy Workers Sorting Scrap Metal	Soil Ingestion/Dermal Abs.	7.0E-05	1.9E-04	3.5E-01	6.6E-01	PCBs, PAHs	
	Fugitive Dust Inhalation	2.7E-07	5.2E-07	4.7E-03	8.7E-03		
Utility Worker (Current Conditions)	Soil Ingestion/Dermal Abs.	2.7E-07	1.1E-06	6.3E-04	2.5E-03	PCBs	
	Fugitive Dust Inhalation	6.4E-09	1.7E-08	1.2E-04	2.6E-04		
	Ground Water Dermal Abs.	1.2E-11	1.5E-11	9.9E-05	1.2E-04		
Utility Worker (Future Conditions)	Soil Ingestion/Dermal Abs.	2.3E-07	1.6E-06	2.8E-03	3.9E-02	PCBs, PAHs	
	Fugitive Dust Inhalation	8.4E-09	3.8E-08	2.4E-04	2.2E-03		
	Ground Water Dermal Abs.	1.4E-11	2.9E-11	1.1E-04	1.7E-04		
Construction Worker Waste Storage Facility	Soil Ingestion/Dermal Abs.	1.4E-06	9.5E-06	2.2E-01	6.0E-01	PCBs, PAHs	Lead
	Fugitive Dust Inhalation	5.0E-08	2.3E-07	1.9E-02	1.7E-01		
	Ground Water Dermal Abs.	8.4E-11	1.7E-10	9.1E-03	1.3E-02		
Ledyard Residents	Fugitive Dust Inhalation	8.7E-08	1.8E-07	7.8E-04	1.2E-03		
Children	Fugitive Dust Inhalation	6.4E-11	1.4E-10	4.4E-06	1.0E-05		

Note: Shaded values indicate levels of risk above what is generally considered de minimus for environmental risk to humans (1.0E-6) for carcinogens and for non-carcinogens shaded values indicate levels of the hazard index ratio (which is the ratio of its exposure dose to its reference dose) in excess of "1" which is used as a benchmark with regard to the potential for chronic, generally sublethal effects.

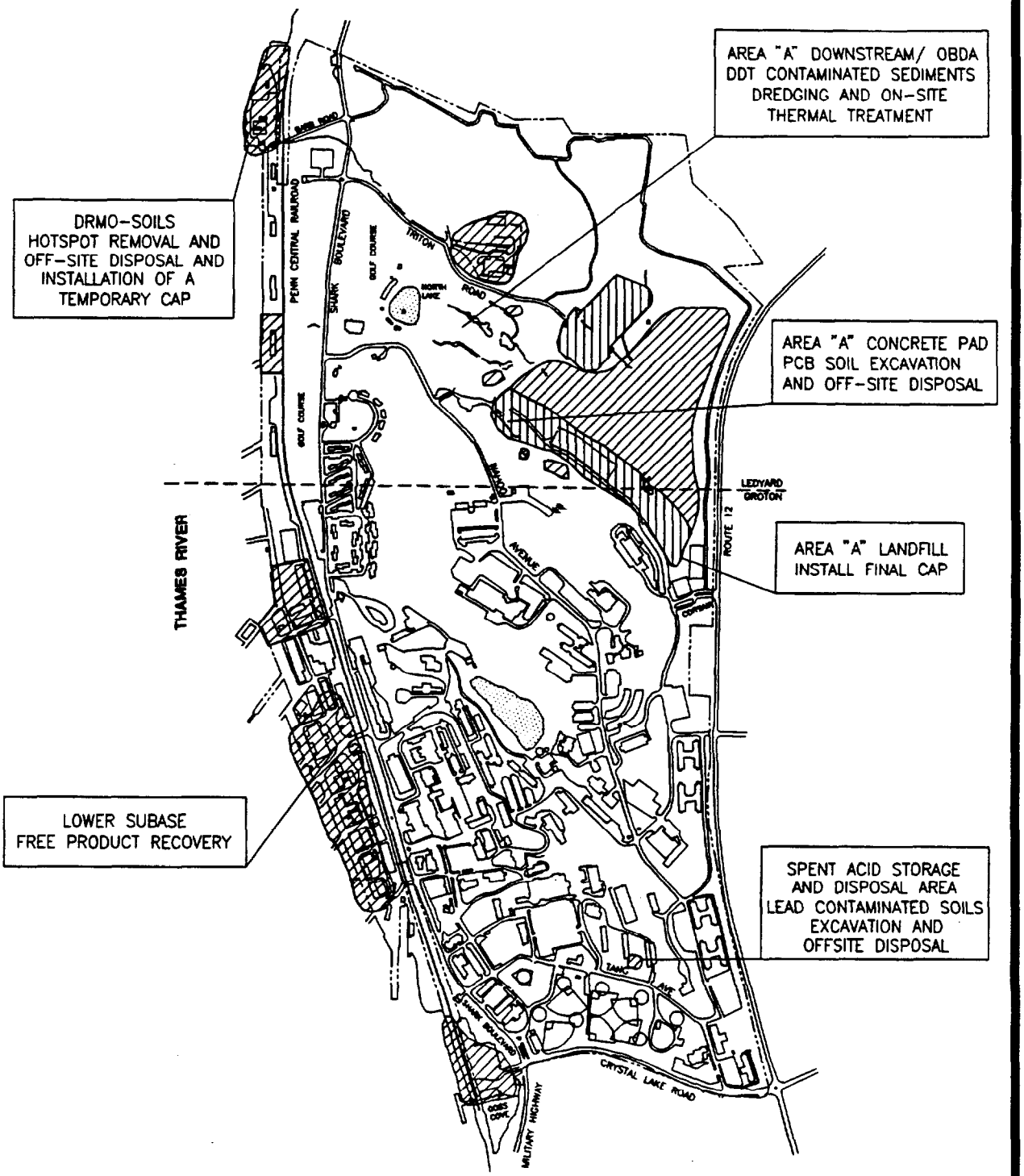
GENERAL RESPONSE ACTIONS

TABLE 2-17
GENERAL RESPONSE ACTIONS

REMEDIAL ACTION OBJECTIVE	AREA OR VOLUME	GENERAL RESPONSE ACTIONS	TECHNOLOGY TYPES
		AREA A/OBDA	
Reduce infiltration through landfill and prevent erosion of landfill surface soils.	7 acres	Containment	Horizontal Barriers, Stormwater Control
Reduce exposure of workers to PCBs in surface soils.	100 cubic yards	Limited Action	Access Restrictions
		Containment	Horizontal Barriers
		Removal	Excavation
		Treatment (*In situ* & Aboveground)	Biological, Physical/Chemical, Thermal
		Disposal (Onsite & Offsite)	Landfill, Reuse
Reduce exposure of children and biota to DDTR in sediments and prevent transport of sediments.	7,900 cubic yards	Limited Action	Access Restrictions
		Containment	Horizontal Barriers, Surface Water Control
		Removal	Excavation, Dredging
		Treatment (*In situ* & Aboveground)	Biological, Physical/Chemical, Thermal
		Disposal (Onsite & Offsite)	Landfill, Reuse
Control and treat ground water with constituent concentration that exceeds ARARs.	28,000,000 gallons	Containment	Ground Water Controls, Horizontal Barriers, Vertical Barriers
		Removal	Subsurface Drains, Pumping
		Treatment (*In situ* & Aboveground)	Biological, Physical/Chemical, Thermal
		Disposal (Onsite & Offsite)	Discharge to POTW, Discharge to Surface Water, Discharge to Ground Water, Transportation to TSDF
		DRMO	
Reduce exposure of workers to PCBs, CPAH, and lead in soils and prevent erosion.	1,000 cubic yards	Limited Action	Access Restrictions
		Containment	Horizontal Barriers, Surface Water Control
		Removal	Excavation
		Treatment (*In situ* & Aboveground)	Biological, Physical/Chemical, Thermal
		Disposal (Onsite & Offsite)	Landfill, Reuse
Reduce leachate generation from solvent contaminated soils.	500 cubic yards	Limited Action	Access Restrictions
		Containment	Horizontal Barriers, Surface Water Control
		Removal	Excavation
		Treatment (*In situ* & Aboveground)	Biological, Physical/Chemical, Thermal
		Disposal (Onsite & Offsite)	Landfill, Reuse

TABLE 2-17 (continued)
GENERAL RESPONSE ACTIONS

REMEDIAL ACTION OBJECTIVE	AREA OR VOLUME	GENERAL RESPONSE ACTIONS	TECHNOLOGY TYPES
SPENT ACID STORAGE AND DISPOSAL AREA			
Reduce exposure of workers to lead in soils.	Unknown	Limited Action	Access Restrictions
		Containment	Horizontal Barriers, Surface Water Control
		Removal	Excavation
		Treatment (*In situ* & Aboveground)	Physical, Chemical, Thermal
		Disposal (Onsite & Offsite)	Landfill, Reuse
LOWER SUBASE			
Remove and treat or dispose of any recoverable subsurface free product.	Unknown	Treatment (*In situ* & Aboveground)	Subsurface Drains, Pumping
		Disposal (Onsite & Offsite)	Biological, Physical/Chemical, Thermal, Reuse



INSTALLATION RESTORATION STUDY

NAVAL SUBMARINE BASE - NEW LONDON

GROTON, CT

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

INTERIM REMEDIAL MEASURES

ATLANTIC ENVIRONMENTAL SERVICES, INC.

AREA A
CONCRETE PAD AND LANDFILL CAP

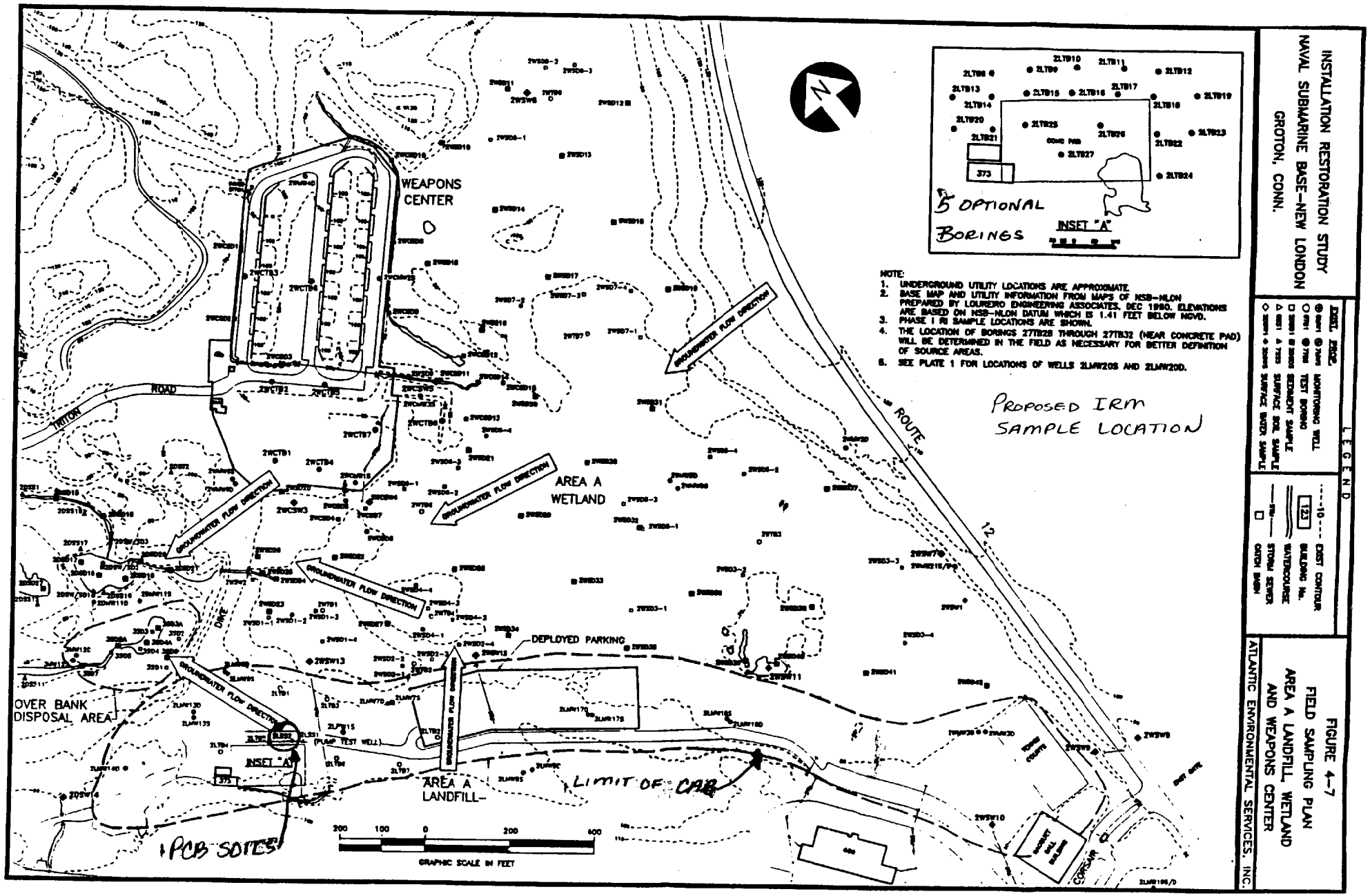

INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE-NEW LONDON
GROTON, CONN.
FIGURE 4-7
FIELD SAMPLING PLAN
AREA A LANDFILL, WETLAND
AND WEAPONS CENTER
ATLANTIC ENVIRONMENTAL SERVICES, INC.
LEGEND
MONITORING WELL
TEST BORING
SEDIMENT SAMPLE
SURFACE SOIL SAMPLE
SURFACE WATER SAMPLE
CONT CONTOUR
BUILDING No.
WATERCOURSE
STORM SEWER
CATCH BASIN
WEAPONS CENTER
TRITON ROAD
ROUTE 12
AREA A WETLAND
GROUNDWATER FLOW DIRECTION
DEPLOYED PARKING
OVER BANK DISPOSAL AREA
INSET "A"
(PUMP TEST WELL)
AREA A LANDFILL
LIMIT OF CAB
PCB SITES
5 OPTIONAL BORINGS
PROPOSED IRM SAMPLE LOCATION
CONCRETE PAD
373
NOTE:
1. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE.
2. BASE MAP AND UTILITY INFORMATION FROM MAPS OF NSB-NLON PREPARED BY LOUREIRO ENGINEERING ASSOCIATES, DEC 1990. ELEVATIONS ARE BASED ON NSB-NLON DATUM WHICH IS 1.41 FEET BELOW NGVD.
3. PHASE I RI SAMPLE LOCATIONS ARE SHOWN.
4. THE LOCATION OF BORINGS 27TB28 THROUGH 27TB32 (NEAR CONCRETE PAD) WILL BE DETERMINED IN THE FIELD AS NECESSARY FOR BETTER DEFINITION OF SOURCE AREAS.
5. SEE PLATE 1 FOR LOCATIONS OF WELLS 2LMW20S AND 2LMW20D.
200 100 0 200 400
GRAPHIC SCALE IN FEET

TABLE 7-21
AREA A FIELD SAMPLING PLAN

Sample Location	Well Type/ Proposed Depth (ft)	Rationale	Sample Designations	Sample Type			Analysis								
				Soil (No. of Samples)	Sediment (No. of Samples)	Water (No. of Samples)	VOC	SVOC	Inorganics	Pesticides	PCB	TCLP	Dioxin	RAD	Engineering
Monitoring Wells															
24 Existing wells	Existing	Sample all existing wells. Only well 2LMW18S analyzed for PCBs to confirm previous analysis.	Existing			• (24)	• (24)	• (24)	• (24)		• (1)				
2LMW7S 2LMW9D 2LMW13D 2LMW18S 2WMW3D 2WMW4D 2DMW11S 2DMW11D 3MW12S 2MW12D	Bedrock and overburden	Existing wells where radiological parameters exceeded screening levels.	2LGW7S 2LGW9D 2LGW13D 2LGW18S 2WGW3D 2WGW4D 2DGW11S 2DGW11D 3GW12S 2GW12D			• (10)								• (10)	
2LMW19D[1] 2LMW19S 2LMW20D[1] 2LMW20S	Bedrock/100' below bedrock surface Overburden/20±'	Further assessment of the ground water flow directions between the southeast portion of Area A Landfill and homes served by private wells near NSB-NLON east gate; evaluate ground water quality.	2LGW19D 2LGW19S 2LGW20D 2LGW20S			• (4)	• (4)	• (4)	• (4)						
2WMW21S 2WMW21D[1] 2WMW22D[1] 2DMW23D	Bedrock/100' below bedrock surface Overburden/20±'	Further assessments of the ground water flow directions between Area A Wetland and homes serviced by private wells near the east and north NSB-NLON boundaries. Evaluate ground water quality potentially upgradient of affected site areas.	2WGW21S 2WGW21D 2WGW22D 2DGW23D			• (4)	• (4)	• (4)	• (4)						
2WMW5D	Bedrock/20' (minimum penetration of bedrock)	Better define bedrock ground water flow direction within Area A Wetland; evaluate ground water quality.	2WGW5D			• (1)	• (1)	• (1)	• (1)						
2DMW24D 2DMW24S 2DMW25D 2DMW25S 2DMW26D 2DMW26S 2DMW27D 2DMW27S 2DMW28D 2DMW28S 2DMW29S 2DMW30S	Bedrock/20' (minimum penetration of bedrock) Overburden/20±'	Further evaluate extent of ground water contamination downgradient of Area A Landfill; further evaluate ground water quality/hydrology near North Lake.	2DGW24D 2DGW24S 2DGW25D 2DGW25S 2DGW26D 2DGW26S 2DGW27D 2DGW27S 2DGW28D 2DGW28S 2DGW29S 2DGW30S			• (12)	• (12)	• (12)	• (12)						

TABLE 7-21 (continued)
AREA A FIELD SAMPLING PLAN

Sample Location	Well Type/ Proposed Depth (ft)	Rationale	Sample Designations	Sample Type: Soil (No. of Samples)	Sample Type: Sediment (No. of Samples)	Sample Type: Water (No. of Samples)	Analysis: VOC	SVOC	Inorganics	Pesticides	PCB	TCLP	Dioxin	RAD	Engineering
2WCMW1S 2WCMW2S 2WCMW3S	Overburden/20±'	Define ground water flow directions and hydraulic gradients near Weapons Center; evaluate ground water quality.	2WCGW1S 2WCGW2S 2WCGW3S			• (3)	• (3)	• (3)	• (3)						
2WCMW1S 2WCMW2S 2WCMW3S	Overburden/20±'	Provide chemical data for soils collected from the Weapons Center.	2WCMW1S (depth) 2WCMW2S (depth) 2WCMW3S (depth)	• (3)			• (3)	• (3)	• (3)						• (1)
2LPW1S	Overburden pump test/ base of saturated thickness	Located in an area considered to represent the average hydrogeologic conditions of Area A Landfill.	2LPW1S			• (3)	• (3)	• (3)	• (3)		• (3)				• (3)
			Test Borings												
2LTB8 through 2LTB27	NA/15'	Define lateral and vertical extent and degree of contamination identified around Area A concrete pad. Ten soil samples will be collected for analysis based on GC field screening for PCB and organic vapor analyzer screening for VOCs.	2LTB8 (depth) through 2LTB27 (depth)	• (10)			• (10)	• (10)	• (10)	• (10)	• (10)	• (2)			• (2)
2LTB13 2LTB23	NA/15'	Located in landfill area where dibenzofuran and ash have been detected.	2LTB13 (depth) 2LTB23 (depth)	• (2)									• (2)		
2LTB28 through 2LTB32	NA/15'	Optional borings at Area A concrete pad to be installed to determine the lateral extent of soil contamination (if contamination is detected, during field screening). Three soil samples will be collected for analysis based on GC field screening for PCB and total organic vapor analyzer screening for VOCs.	2LTB28 (depth) through 2LTB32 (depth)	• (3)			• (3)	• (3)	• (3)	• (3)	• (3)				
2WCTB1 2WCTB2 2WCTB3 2WCTB4 2WCTB5 2WCTB6 2WCTB7 2WCTB8	NA/15'	Provide chemical data for soils collected from the Weapons Center area.	2WCTB1 (depth) 2WCTB2 (depth) 2WCTB3 (depth) 2WCTB4 (depth) 2WCTB5 (depth) 2WCTB6 (depth) 2WCTB7 (depth) 2WCTB8 (depth)	• (8)			• (8) 13	• (8) 13	• (8) 13	• (4) 13	• (4) 13	• (1) 2	0		• (3) 2
		Subtotal Soil Samples		13 ~~26~~			~~24~~	~~24~~	~~24~~	~~17~~	~~13~~	~~12~~	~~10~~	0	~~12~~
		Subtotal Ground Water Sampling[2]				51	51	51	51	0	4	0	0	10	3

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TABLE 2-23
AREA A LANDFILL - PCB CONTAMINATED SOILS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
		LIMITED ACTION	
No Action	No Action	Evaluation required by CERCLA.	•
Access Restriction	Deed Restriction/ Fencing	Effective at preventing direct contact at minimal cost.	•
		CONTAINMENT	
Horizontal Barrier	Caps	This process option can meet remedial action objectives and is easily implemented; however it is not a permanent remedy.	•
Surface Water Control	Site Grading and Stormwater Management	Can improve effectiveness of other process options such as capping and by itself can prevent downstream migration of sediments.	•
		REMOVAL	
Excavation	Backhoe	Common method easily implemented and readily available.	•
Dredging	Mechanical	Dredging techniques are only applicable to sediments.	
	Hydraulic	Dredging techniques are only applicable to sediments.	
		IN SITU TREATMENT	
Biological	Aerobic	Not effective in degrading PCBs.	
Physical/ Chemical	Soil Venting	Process is not effective at removing PCBs due to their low volatility.	
	Stabilization	These processes have been proven to be effective at stabilizing PCBs but not the risk posed by direct contact.	•
Thermal	Vitrification	Pilot scale tests have been successfully completed on PCB wastes. Mobilization costs are substantial and few vendors are available.	
		ABOVEGROUND TREATMENT	
Biological	Landfarming	Not proven to be effective at degrading PCBs.	
	Composting	Not proven to be effective at degrading PCBs.	
	Bioslurry	Not proven to be effective at degrading PCBs.	
Physical/ Chemical	Steam Stripping	Not effective in removing PCBs from soil due to PCB's low volatility and solubility.	
	Air Stripping	Not effective in removing PCBs from sediments due to PCB's low volatility.	
	Dechlorination	High destruction of PCBs possible. Biphenyl end-product not believed to be bioaccumulative or toxic. Potential handling problems exist and few commercial vendors are available.	
	Oxidation	High reagent costs. Only laboratory scale treatments of PCBs have been successfully completed.	
	Dewatering	Effective method for dewatering sediments. Commercial units readily available. Not applicable to soils.	

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TABLE 2-23 (continued)
AREA A LANDFILL - PCB CONTAMINATED SOILS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
Physical/ Chemical (con't)	Soil Washing	For PCBs, this is a volume reduction alternative. No field scale operations have been performed in the United States. PCBs have only been treated at a laboratory scale. The amount of volume reduction is inversely proportional to the silt-clay content of the contaminated soil.	
	Solvent Extraction	High PCB removal on pilot scale basis has been demonstrated. Solvent residuals remain in soil.	•
	Stabilization	Has been proven effective at stabilizing PCBs but not in reducing risk due to direct contact.	•
Onsite Thermal	Incineration	Field scale operations for a variety of substances including DDTR have been performed. Dewatering would be required as a pretreatment step. The rotary kiln was selected as the representative process option for incinerators.	•
	Pyrolysis	Pyrolysis units are not widely available. Incineration and low temperature thermal desorption will be evaluated as the representative thermal processoption.	
	Low Temperature Thermal Desorption	Field scale operation for a variety of substances including DDTR have been performed. Dewatering would be required as a pretreatment step. Potentially, the process option is more cost-effective and produces fewer air emissions than an incinerator.	•
Offsite Thermal	Incineration	Highly effective and expensive. Availability may be limited. Dewatering would be required as a pretreatment step.	•
	Pyrolysis	Pyrolysis units are not widely available. Incineration and low temperature thermal desorption will be evaluated as the representative thermal process option.	
	Low Temperature Thermal Desorption	No permitted facilities permitted to manage DDTR have been located; therefore, this option will not be retained.	
DISPOSAL			
Onsite Landfill	Solid Waste Disposal Area	Not retained as secure chemical landfill. Retained as representative process option. High liability as facilities may be leaking contaminants to ground water. Due to relatively small quantities involved, offsite disposal is more cost-effective; therefore, onsite disposal will not be further evaluated.	
	RCRA Chemical Landfill	This is essentially a containment option. It is effective in meeting remedial action objectives; however, it is not a permanent remedy. Due to the relatively small quantities involved, offsite disposal is more cost-effective; therefore, onsite disposal will not be further evaluated.	
Onsite Reuse	Use in Asphalt Batch Plant (aggregate)	This is essentially a stabilization process. By itself, is not a permanent remedy or capable of preventing future direct contact.	
	Backfill After Treatment	After treatment, this is an easy-to-implement disposal alternative. Its effectiveness is based on the treatment performed.	•

TABLE 2-23 (continued)
AREA A LANDFILL - PCB CONTAMINATED SOILS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
Offsite Landfill	Solid Waste Disposal Area	Secure chemical landfill retained as representative process option. High liability as facilities may be leaking contaminants to ground water.	
	RCRA Chemical Landfill	This is essentially a containment option. It is effective in meeting remedial action objectives; however, it is not a permanent remedy.	•
Offsite Reuse	Use in Asphalt Batch Plant (aggregate)	This is essentially a stabilization process. By itself, is not a permanent remedy or capable of preventing future direct contact. No facilities permitted to manage PCBs have been located.	
	Cement Manufacturing	This is essentially an incineration option providing an effective permanent remedy. No facilities permitted to manage PCBs have been located.	

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TABLE 3-2
AREA A LANDFILL - PCB CONTAMINATED SOILS
DEVELOPMENT OF ALTERNATIVES

RETAINED PROCESS OPTIONS	ALTERNATIVES									
	LIMITED ACTION		CONTAINMENT	OFFSITE ALTERNATIVES[3]		ONSITE ALTERNATIVES				
SOIL/SEDIMENT	No Action	Access Restriction	Surface Cap	Incineration	RCRA Landfill	In situ Stabilization	Aboveground Stabilization	Incineration[1]	Low Temperature Thermal Desorption[1]	Solvent Extraction[1]
	2L-1	2L-2	2L-3	2L-4	2L-5	2L-6	2L-7	2L-8	2L-9	2L-10
No Action	•									
Access Restriction		•	•							
Horizontal Barrier - Cap			•							
Site Grading & Stormwater Management			•							
Excavation - Backhoe				•	•		•	•	•	•
In situ Stabilization						•				
Solvent Extraction										•
Stabilization							•			
Onsite Incineration								•		
Offsite Incineration				•					•[2]	•[2]
Onsite Low Temp Thermal Desorption									•	
Onsite Backfill							•	•	•	•
Offsite RCRA Chemical Landfill					•					

1. Feasibility of these alternatives contingent upon specified alternative being selected for remediation of DDTR contaminated sediments in Area A Downstream.
2. The condensed/extracted PCB and spent carbon will be transported offsite for incineration if an afterburner is not used.
3. Offsite Low Temperature Thermal Desorption or offsite reuse (asphalt or cement) will be reconsidered if a permitted offsite facility is located.

18-Mar-93 PCBALT2.WK3

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TABLE 3-3
AREA A/OBDA - GROUND WATER
DEVELOPMENT OF ALTERNATIVES

RETAINED PROCESS OPTIONS	ALTERNATIVES											
	Limited Action		Containment	Containment, Onsite Pump-and-Treat, Offsite Disposal								
Water	No Action	Limited Action	Capping	GW-1 POTW	GW-1 Biologically POTW	GW-1 GAC POTW	GW-1 Air Stripping POTW	GW-1 Chem. Prec. POTW	GW-1 Ion Exchange POTW	GW-1 Slurry Wall, Treatment POTW	GW-1 Thames River	GW-2
	2/3-1	2/3-2	2/3-3	2/3-4	2/3-5	2/3-6	2/3-7	2/3-8	2/3-9	2/3-10 thru 2/3-14	2/3-15 thru 2/3-25	2/5-26 thru 2/3-47
No Action	•										These alternatives are the same as alternatives 2/3-4 thru 2/3-14, with the only difference being the method of disposal.	These alternatives are the same as 2/3-4 thru 2/3-25 except for the addition of four recovery wells installed in the Area A Downstream.
Access Restrictions		•	•	•	•	•	•	•	•	•		
Horizontal Barrier - Cap			•	•	•	•	•	•	•	•		
Slurry Wall (RPO)										•		
Extraction Wells				•	•	•	•	•	•	•		
Fixed Bed Biological (RPO)					•					These alternatives are the same as 2/3-5 thru 2/3-9, except for the addition of a slurry wall.		
Air Stripping												
Carbon Adsorption						•	•					
Dewatering					•	•	•	•				
Filtration (Granular Media)					•	•	•	•	•			
Precipitation/Flocculation/ Sedimentation					•	•	•	•				
Ion Exchange (Resin Adsorption)									•			
Neutralization					•	•	•	•				
UV Oxidation								•				
Discharge to POTW				•	•	•	•	•	•	•		
Discharge to Thames River											•	

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AREA A - DOWNSTREAM/OBDA

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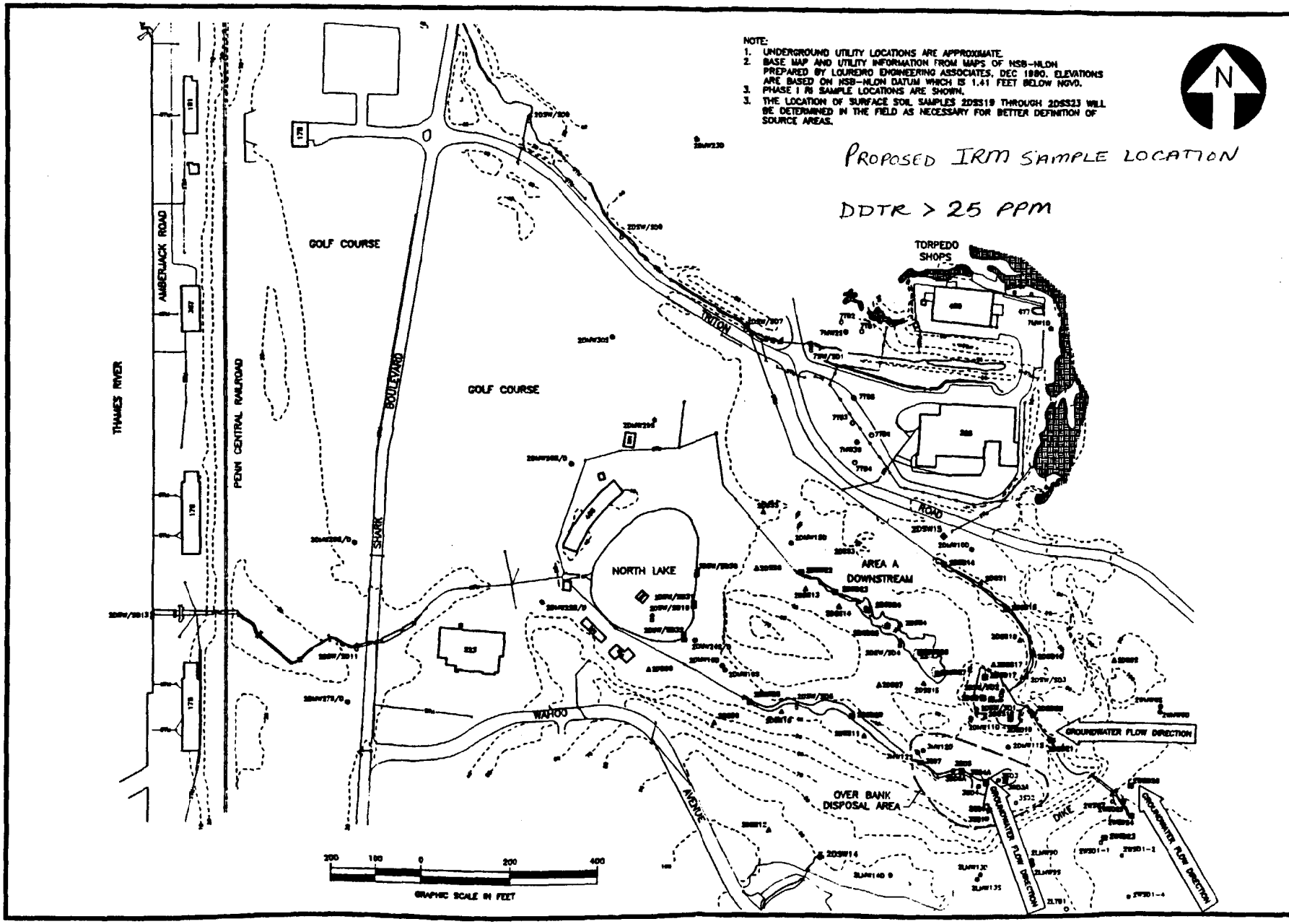

INSTALLATION RESTORATION STUDY
NAVAL SUBMARINE BASE-NEW LONDON
GROTON, CONN.

LEGEND

EXIST. PROP.
MONITORING WELL
TEST BORING
SEDIMENT SAMPLE
SURFACE SOIL SAMPLE
SURFACE WATER SAMPLE

EXIST CONTOUR
BUILDING No.
WATERCOURSE
STORM SEWER
CATCH BASIN

FIGURE 4-8
FIELD SAMPLING PLAN
AREA A DOWNSTREAM/OBDA

ATLANTIC ENVIRONMENTAL SERVICES, INC.

TABLE 7-21 (continued)
AREA A FIELD SAMPLING PLAN

Sample Location	Well Type/ Proposed Depth (ft)	Rationale	Sample Designations	Sample Type: Soil (No. of Samples)	Sample Type: Sediment (No. of Samples)	Sample Type: Water (No. of Samples)	Analysis: VOC	Analysis: SVOC	Analysis: Inorganics	Analysis: Pesticides	Analysis: PCB	Analysis: TCLP	Analysis: Dioxin	Analysis: RAD	Analysis: Engineering
Sediment Sampling															
2WSD10 through 2WSD42 2WSD23 2WSD26	0-1' Below sediment surface TO	Provide additional pesticide analytical data in Area A wetland to confirm that elevated levels of pesticides are not present. Ten soil samples will be collected for analysis based on GC field screening for pesticides.	2WSD10 (0-1') through 2WSD42 (0-1')		• ~~(10)~~ (4)					• ~~(10)~~ (4)		• ~~(1)~~ (0)			• ~~(1)~~ (0)
2DSD14 through 2DSD29 3SD3A 3SD4A 3SD5A 3SD7	0' to base of sediments	Define lateral and vertical extent and degree of pesticides in Area A downstream pond sediments. Ten soil samples will be collected for analysis based on GC field screening for pesticides.	2DSD14 (depth) through 2DSD29 (depth) 3SD3A 3SD4A 3SD5A 3SD7		• (10)					• (10)		• (1)			• (5)
2DSD30	0-1'	At ground water seep into North Lake.	2DSD30		• (1)		• (1)	• (1)	• (1)	• (1)	• (1)				
2DSD31	0-1'	At ground water seep into North Lake.	2DSD31		• (1)		• (1)	• (1)	• (1)	• (1)	• (1)				
2DSD32	0-1'	At ground water seep into North Lake.	2DSD32		• (1)		• (1)	• (1)	• (1)	• (1)	• (1)				
2WCSD1 through 2WCSD15	0-1'	Provide chemical data for sediments collected from areas of surface water flow from the Weapons Center; samples for VOC, PCB, and pesticide analysis selected at culvert outlets and upgradient locations within Weapons Center.	2WCSD1 through 2WCSD15		• (15)		• (6)	• (15)	• (15)	• (6)	• (6)	• (1)			• (2)
2WCSD11	0-1'	Located in area where dibenzofurans have been detected.	2WCSD11		• (1)								• (1)		
3SD6	0' to base of sediments	Located in area where dibenzofurans have been detected.	3SD6 (depth)		• (1)					• (1)					
		Subtotal Sediment Sampling			~~16~~		~~9~~	~~18~~	~~18~~	~~20~~	~~5~~	~~2~~	~~2~~	~~8~~	~~8~~
Surface Soil Sampling					14		0	0	0	14	0	1	0	0	5
2DSS1 through 2DSS18	0-6" below grade	Provide chemical data for surficial soil samples from Area A downstream watercourse. Four surface soil samples will be collected for analysis based on GC field screening for pesticides.	2DSS1 (0-6") through 2DSS18 (0-6")	• (5)						• (5)					

TABLE 7-21 (continued)
AREA A FIELD SAMPLING PLAN

Sample Location	Well Type/ Proposed Depth (ft)	Rationale	Sample Designations	Sample Type			Analysis								
				Soil (No. of Samples)	Sediment (No. of Samples)	Water (No. of Samples)	VOC	SVOC	Inor-ganics	Pesti-cides	PCB	TCLP	Dioxin	RAD	Engi-neering
2DSS19 through 2DSS23	0-6" below grade	Optional sample locations to be installed (if required) to determine the lateral extent of soil contamination. If additional contamination is detected during field screening; two surface soil samples will be collected for analysis based on GC field screening for pesticides.	2DSS19 (0-6") through 2DSS23 (0-6")	● (2)						● (2)					
			Subtotal Surface Soil	7			0	0	0	7	0	0	0	0	0
Surface Water															
2WSW1	Existing	Upgradient adjacent to wetland.	2WSW1			● (1)	● (1)		● (1)	● (1)					
2WSW2	Existing	At wetland outlet.	2WSW2			● (1)	● (1)	● (1)	● (1)	● (1)	● (1)				
2WCSW3		Upgradient of wetland at stormwater under drain outlet from Weapons Center.	2WCSW3			● (1)	● (1)	● (1)	● (1)		● (1)				
2WCSW4		Upgradient of wetland at outlet from Weapons Center storm drain.	2WCSW4			● (1)	● (1)	● (1)	● (1)		● (1)				
2WCSW5		Upgradient of wetland at outlet from Weapons Center storm drain.	2WCSW5			● (1)	● (1)	● (1)	● (1)		● (1)				
2WSW6		Northeast section of wetland.	2WSW6			● (1)	● (1)		● (1)	● (1)					
2WSW7		Upgradient of wetlands in small drainage swale from Route 12.	2WSW7			● (1)	● (1)		● (1)	● (1)					
2WSW8 2WSW9		Upgradient of wetland at stormwater outlets from "urban areas".	2WSW8 2WSW9			● (2)	● (2)		● (2)	● (2)					
2WSW11		From pond in Area A wetland.	2WSW11			● (1)	● (1)		● (1)	● (1)					
2WSW10 2WSW12		Upgradient of wetland at stormwater outlet.	2WSW10 2WSW12			● (2)	● (2)		● (2)	● (2)					
2WSW13		Upgradient of wetland at stormwater outlet that passes by Rubble Fill at Bunker A-86.	2WSW13			● (1)	● (1)	● (1)	● (1)		● (1)				
4SW1		Upgradient of Rubble Fill at Bunker A-86 (tabulated under Rubble Fill at Bunker A-86).	4SW1												
2DSW2-5 2DSW7 2DSW9-11	Existing	Surface water sample locations previously sampled during Phase I which were located to measure water quality at various locations in Area A downstream surface waters; 2DSW9 and 2DSW11 analyzed for SVOCs and PCBs.	2DSW2-5 2DSW7 2DSW9-11			● (8)	● (8)	● (2)	● (8)	● (8)	● (2)				

TABLE 7-21 (continued)
AREA A FIELD SAMPLING PLAN

Sample Location	Well Type/ Proposed Depth (ft)	Rationale	Sample Designations	Sample Type			Analysis								
				Soil (No. of Samples)	Sediment (No. of Samples)	Water (No. of Samples)	VOC	SVOC	Inorganics	Pesticides	PCB	TCLP	Dioxin	RAD	Engineering
2DSW14		Upgradient of Area A downstream at stormwater outfall.	2DSW14			● (1)	● (1)		● (1)		● (1)				
2DSW15		Upgradient of Area A downstream at outfall from Torpedo Shops.	2DSW15			● (1)	● (1)		● (1)		● (1)				
7SW1	Existing	At downgradient location in Torpedo Shops. (Tabulated under Torpedo Shops).	7SW1												
2DSW30-32		At ground water seep into North Lake.	2DSW30-32			● (3)	● (1)	● (1)	● (1)	● (1)	● (1)				
		Subtotal Surface Water				28	26	8	26	22	8	0	0	0	0
		Total Solids		76			33	42	42	53	26	6	4	0	16
		Total Water[3]				130	128	110	128	22	16	0	0	20	3

PROPOSED

56 Primary test borings (including well borings)
5 Supplemental test borings
28 Wells
- 11 Deep bedrock wells
- 17 Shallow overburden wells

Notes:
[1] 100 feet penetration of bedrock to be representative of offsite residential well construction.
[2] Total includes one sampling round.
[3] Total includes two sampling rounds.

TABLE 7-21 (continued)
AREA A FIELD SAMPLING PLAN

ECOLOGICAL SAMPLING						
Sample Type	Location	Sample Quantity				Analysis
		Tissue	Soil	Sediment	Bioassays	
Area A - Qualitative Survey						
Qualitative soil invertebrate survey	Wetland, Downstream, OBDA					Qualitative
Fish	Downstream ponds	●[1] (3)				Qualitative/Pesticides
Area A - Quantitative Survey						
Native earthworms and soils	Downstream	● (5)	● (5)[3]			Pesticides
In situ earthworm bioassays in soils/wetland sediment	Wetland, Downstream, OBDA				● (15-20)	—
Introduced earthworms from bioassays and soils/wetland sediment	Wetland, Downstream, OBDA	● (5)	● (5)[3]			Pesticides
Earthworm bioassays in pond sediment	Downstream watercourses			● (6)[3]	● (9)[2]	Pesticides (sediment only)
Introduced earthworms from bioassays	Downstream watercourses	● (3)[2]				Pesticides
Frogs	Downstream ponds and streams	● (9)				Pesticides
Benthic Invertebrates and reference location	Downstream ponds and streams	● (18)		● (18)[3]		Quantitative benthic analysis, reference area sediments for pesticides

Notes:

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[1] If larger fish are found, separate analysis will be conducted for tissue and liver for a total of six analyses.
[2] Includes three reference locations.
[3] Analysis included in Area A field sampling plan.

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TABLE 2-27
AREA A DOWNSTREAM - DDTR CONTAMINATED SEDIMENTS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
		LIMITED ACTION	
No Action	No Action	Evaluation required by CERCLA.	•
Access Restriction	Deed Restriction/ Fencing	Effective at preventing direct contact at minimal cost.	•
		CONTAINMENT	
Horizontal Barrier	Caps	This process option can meet remedial action objectives and is easily implemented; however it is not a permanent remedy.	•
Surface Water Control	Site Grading and Stormwater Management	Can improve effectiveness of other process options such as capping and by itself can prevent downstream migration of sediments.	•
		REMOVAL	
Excavation	Backhoe	Common method easily implemented. Areas would require dewatering prior to excavation. Removed materials would have high moisture content and free water, and could not be directly fed to many dewatering process options.	•
Dredging	Mechanical	Excavation by backhoe of dewatered areas was retained as representative process option. Without dewatering, mechanical dredging resuspends a significant amount of sediments.	
	Hydraulic	Common method for removing sediments. Sediments could be pumped directly to a dewatering process option, thereby minimizing spills and handling costs.	•
		IN-SITU TREATMENT	
Biological	Aerobic	Not proven to be effective at degrading DDTR.	
Physical/ Chemical	Soil Venting	Not effective at removing DDTR due to DDTRs low vapor pressure.	
	Stabilization	No field scale applications with DDTR. Laboratory scale results indicate that this process may be capable of reducing the leaching of DDTR from sediments and the risk of dermal contact.	•
Thermal	Vitrification	This process is not effective for treatment of permeable saturated soils located below the water table; however it is very effective at destroying organic compounds.	
		ABOVEGROUND TREATMENT	
Biological	Landfarming	Not proven to be effective at degrading DDTR.	
	Composting	Not proven to be effective at degrading DDTR.	
	Bioslurry	Not proven to be effective at degrading DDTR.	
Physical/ Chemical	Steam Stripping	Not effective in removing DDTR from sediments due to DDTR's low volatility and solubility.	
	Air Stripping	Not effective in removing DDTR from sediments due to DDTR's low volatility.	

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TABLE 2-27 (continued)
AREA A LANDFILL - DOWNSTREAM DDTR CONTAMINATED SEDIMENTS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
Physical/ Chemical (con't)	Dechlorination	Degradation products are unknown and may be toxic. Only bench scale treatments have been completed. Process produces large volumes of wastewater and has lengthy reaction times. Solids optimally should contain less than 20% moisture.	
	Oxidation	DDTR contaminated solids have not even been treated at a laboratory scale. Large quantities of expensive oxidizing agents would be necessary.	
	Dewatering	Many successful field scale dewatering processes have been completed. The potential use for this process is as a pretreatment prior to some other process, such as incineration or as a post-treatment.	•
	Soil Washing	For DDTR, this is a volume reduction alternative. No field scale operations have been performed in the United States. Only laboratory scale treatments have been performed. The amount of volume reduction is inversely proportional to the silt-clay content of the contaminated soil. As these sediments contain a large proportion of fine particles, this process will not be retained for further evaluation.	
	Solvent Extraction	This is a containment removal process whose effectiveness is inversely proportional to the percentage of silts and clays in the waste. No field scale demonstrations have been performed. Successful pilot scale treatments have been performed on DDTR.	•
	Stabilization	No field scale applications with DDTR. Laboratory scale results indicate that this process may be capable of reducing the leaching of DDTR from sediments but not the risk of dermal contact.	•
Onsite Thermal	Incineration	Field scale operations for a variety of substances including DDTR have been performed. Dewatering would be required as a pretreatment step. The rotary kiln was selected as the representative process option for incinerators.	•
	Pyrolysis	Pyrolysis units are not widely available. Incineration and low temperature thermal desorption will be evaluated as the representative thermal process option.	
	Low Temperature Thermal Desorption	Field scale operation for a variety of substances including DDTR have been performed. Dewatering would be required as a pretreatment step. Potentially, this process option is more cost-effective and produces fewer air emissions than an incinerator.	•
Offsite Thermal	Incineration	Highly effective and expensive. Availability may be limited. Dewatering would be required as a pretreatment step.	•
	Pyrolysis	Pyrolysis units are not widely available. Incineration and low temperature thermal desorption will be evaluated as the representative thermal process option.	
	Low Temperature Thermal Desorption	No permitted facilities permitted to manage DDTR have been located; therefore, this option will not be retained.	

TABLE 2-27 (continued)
AREA A LANDFILL - DOWNSTREAM DDTR CONTAMINATED SEDIMENTS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
		DISPOSAL	
Onsite Landfill	Solid Waste Disposal Area	Not retained as secure chemical landfill. Retained as representative process option. High liability as facilities may be leaking contaminants to ground water. Due to relatively small quantities involved, offsite disposal is more cost-effective; therefore, onsite disposal will not be further evaluated.	
	RCRA Chemical Landfill	This is essentially a containment option. It is effective in meeting remedial action objectives; however, it is not a permanent remedy. Due to the relatively small quantities involved offsite, disposal is more cost effective; therefore, onsite disposal will not be further evaluated.	
Onsite Reuse	Use in Asphalt Batch Plant (aggregate)	This is essentially a stabilization process. By itself, is not a permanent remedy or capable of preventing future direct contact.	
	Fill After Treatment	After treatment, this is an easy to implement disposal alternative. Its effectiveness is based on the treatment performed.	•
Offsite Landfill	Solid Waste Disposal Area	Secure chemical landfill retained as representative disposal process option. High liability as solid waste disposal areas may be leaking contaminants to ground water.	
	Secure Chemical Landfill	This is essentially a containment option. It is effective in meeting remedial action objectives; however, it is not a permanent remedy.	•
Offsite Reuse	Use in Asphalt Batch Plant (aggregate)	This is essentially a stabilization process. By itself, it is not a permanent remedy or capable of preventing future direct contact. No facilities permitted to manage DDTR have been located.	
	Cement Manufacturing	This is essentially an incineration option providing an effective permanent remedy. No facilities permitted to manage DDTR have been located.	

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TABLE 3-1
AREA A DOWNSTREAM – DDTR CONTAMINATED SEDIMENTS
DEVELOPMENT OF ALTERNATIVES

RETAINED PROCESS OPTIONS	ALTERNATIVES									
	LIMITED ACTION		CONTAINMENT	OFFSITE[2]		ONSITE ALTERNATIVES				
SOIL/SEDIMENT	No Action	Access Restriction	Cap	Incineration	RCRA Landfill	In situ Stabilization	Aboveground Stabilization	Incineration	Low Temperature Thermal Desorption	Solvent Extraction
	2D-1	2D-2	2D-3	2D-4	2D-5	2D-6	2D-7	2D-8	2D-9	2D-10
No Action	●									
Access Restriction		●	●							
Horizontal Barrier – Cap			●							
Site Grading & Stormwater Management		●	●			●[3]				
Excavation – Backhoe										
Dredging – Hydraulic				●	●		●	●	●	●
In situ Stabilization						●				
Dewatering				●	●		●	●	●	●
Solvent Extraction										●
Stabilization							●			
Onsite Incineration								●		
Offsite Incineration				●					●[1]	●[1]
Onsite Low Temp. Thermal Desorption									●	
Onsite Backfill							●	●	●	●
Offsite RCRA Chemical Landfill					●					

1. The condensed/extracted DDT and spent carbon will be transported offsite for incineration if an afterburner is not used.
2. Offsite Low Temperature Thermal Desorption or offsite reuse (asphalt or cement) will be reconsidered if a permitted offsite facility is located.
3. Standing water will be removed and treated onsite.

18-Mar-93 DDTALT.WK3

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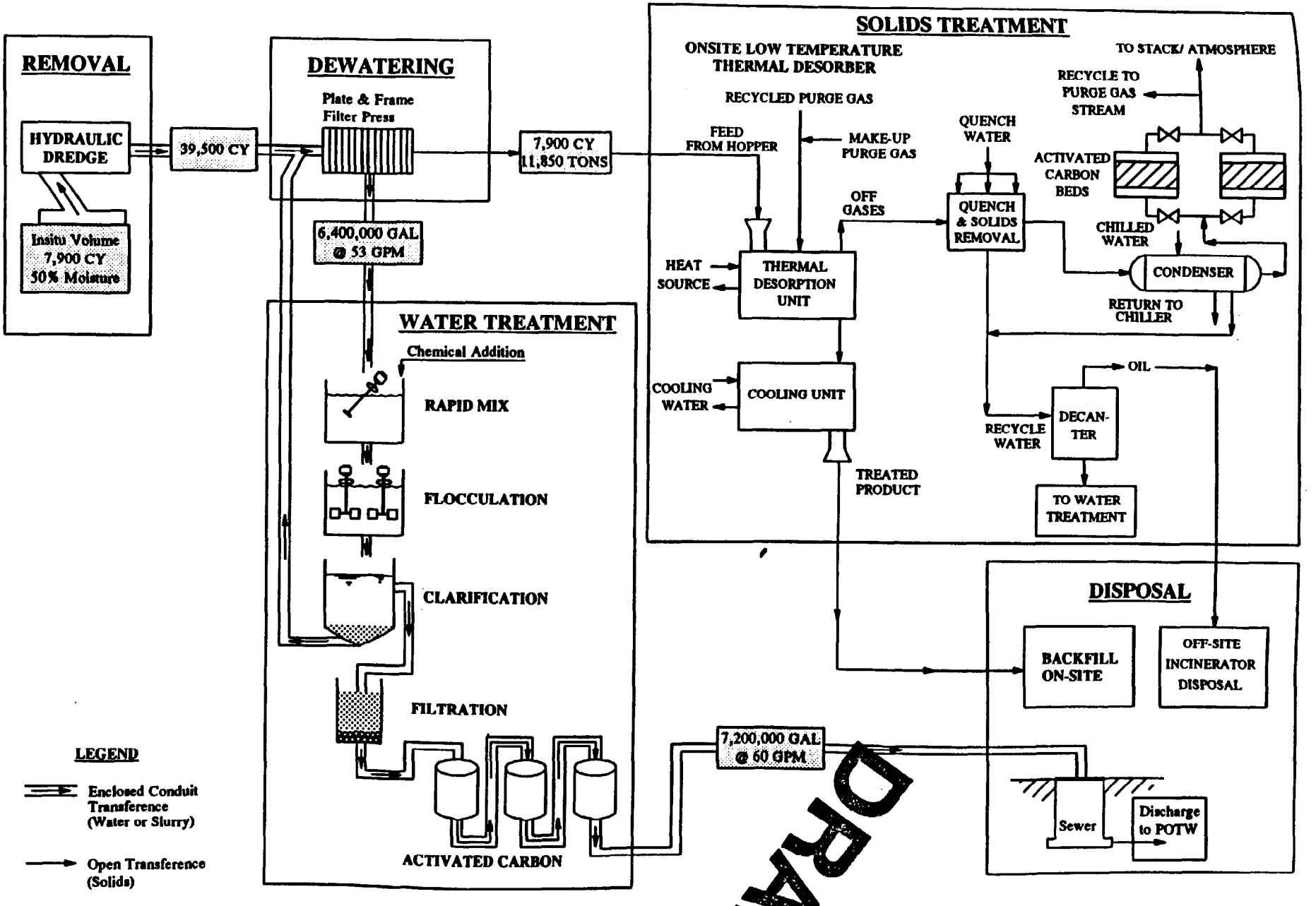

ALTERNATIVE 2D - 9A
LOW TEMPERATURE THERMAL DESORPTION

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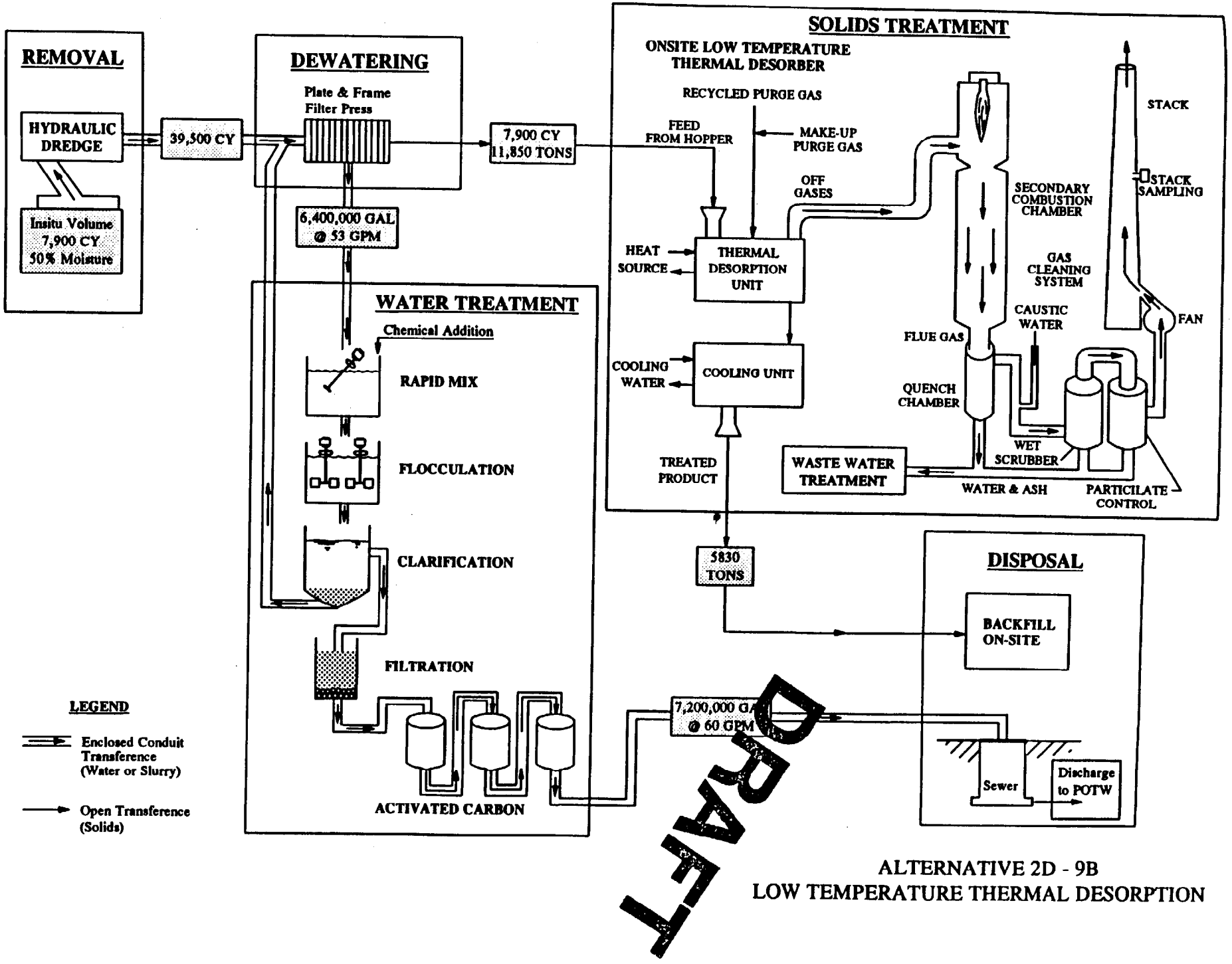
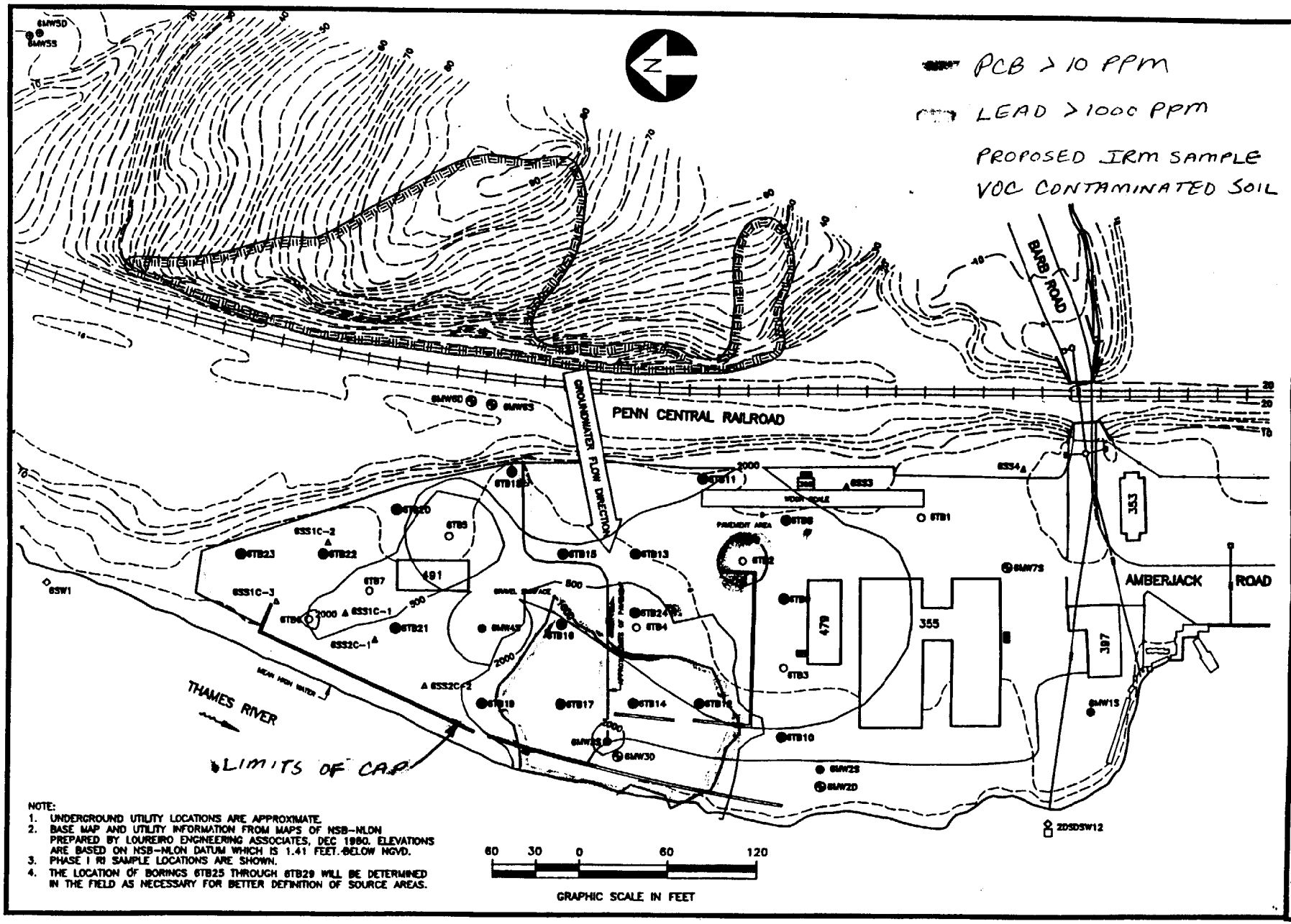


ALTERNATIVE 2D - 9B
LOW TEMPERATURE THERMAL DESORPTION

DRMO - SOILS



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.
3. PHASE I RI SAMPLE LOCATIONS ARE SHOWN.
4. THE LOCATION OF BORINGS 6TB25 THROUGH 6TB29 WILL BE DETERMINED IN THE FIELD AS NECESSARY FOR BETTER DEFINITION OF SOURCE AREAS.

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

LEGEND

FIGURE 7-9
EXTENT OF CONTAMINATION
DRMO

ATLANTIC ENVIRONMENTAL SERVICES, INC.

TABLE 7-24
DRMO FIELD SAMPLING PLAN

Sample Location	Well Type/ Proposed Depth (ft)	Rationale	Sample Designations	Sample Type		Analysis									
				Soil	Water	VOC	SVOC	Inor-ganics	Pesti-cides	PCB	TCLP	Dioxin	RAD	Engi-neering
			Monitoring Wells											
6MW1S	Existing	Existing	6GW1S		•	•	•	•					•	
6MW2S	Existing	Existing	6GW2S		•	•	•	•						
6MW2D[1]	Overburden/50±' (advance boring to determine bedrock contact)	Monitor quality of deep ground water discharging to river; existing shallow soil analytical data available from 6MW2S.	6GW2D		•	•	•	•						
			6MW2D (depth)	•		•	•	•	•	•				
6MW3S	Existing	Existing	6GW3S		•	•	•	•						•
6MW3D[1]	Overburden/50±' (advance boring to determine bedrock contact)	Monitor quality of deep ground water discharging to river; existing shallow soil analytical data available from 6MW3S.	6GW3D		•	•	•	•						
			6MW3D (depth)	•		•	•	•	•	•				•
6MW4S	Existing	Existing	6GW4S		•	•	•	•					•	
6MW5S	Existing	Replaced with 6MW6S												
6MW5D	Existing	Replaced with 6MW6D												
6MW6S	Overburden/20±'	Monitor quality of ground water upgradient of site.	6MW6S (0-10)	•		•	•	•	•	•				
			6GW6S		•	•	•	•						
6MW6D[1]	Overburden/50±' (advance boring to determine bedrock contact)	Monitor quality of deep ground water upgradient of site.	6GW6D		•	•	•	•						
6MW7S	Overburden /20±'	Evaluate ground water quality in the southeast portion of the site; ground water elevation data.	6MW7S (0-10)	•		•	•	•	•	•				
			6GW7S		•	•	•	•						
			Test Borings											
6TB8	NA/Base of fill (15±')	Further define the extent and degree of contamination. Shallow sample from unpaved area.	6TB8 (0-1)	•		•	•	•	•	•				
			6TB8 (1-10)	•		•	•	•	•	•				
6TB9	NA/Base of fill (15±')	Further define the extent and degree of contamination.	6TB9 (0-10)	•		•	•	•	•	•				
6TB10	NA/Base of fill (15±')	Further define the extent and degree of contamination.	6TB10 (0-10)	•		•	•	•	•	•				
6TB11	NA/Base of fill (15±')	Further define the extent and degree of contamination.	6TB11 (0-10)	•		•	•	•	•	•				
6TB12	NA/Base of fill (15±')	Further define the extent and degree of contamination.	6TB12 (0-10)	•		•	•	•	•	•				
6TB13	NA/Base of fill (15±')	Further define the extent and degree of contamination. Shallow samples near area of contamination.	6TB13 (0-1)	•		•	•	•	•	•				
			6TB13 (1-10)	•		•	•	•	•	•				
6TB14	NA/Base of fill (15±')	Further define the extent and degree of contamination.	6TB14 (0-10)	•		•	•	•	•	•				
6TB15	NA/Base of fill (15±')	Further define the extent and degree of contamination.	6TB15 (0-10)	•		•	•	•	•	•				

TABLE 7-24 (continued)
DRMO FIELD SAMPLING PLAN

Sample Location	Well Type/ Proposed Depth (ft)	Rationale	Sample Designations	Sample Type: Soil	Sample Type: Water	Analysis: VOC	SVOC	Inorganics	Pesticides	PCB	TCLP	Dioxin	RAD	Engineering
6TB16	NA/Base of fill (15±')	Further define the extent and degree of contamination. Shallow sample from unpaved area.	6TB16 (0-1)	●		●	●	●	●	●				
			6TB16 (1-10)	●		●	●	●	●	●				●
6TB17	NA/Base of fill (15±')	Further define the extent and degree of contamination.	6TB17 (0-10)	●		●	●	●	●	●				
6TB18	NA/Base of fill (15±')	Further define the extent and degree of contamination. Shallow sample from unpaved area.	6TB18 (0-1)	●		●	●	●	●	●				
			6TB18 (1-10)	●		●	●	●	●	●				
6TB19	NA/Base of fill (15±')	Further define the extent and degree of contamination. Shallow sample from unpaved area.	6TB19 (0-1)	●		●	●	●	●	●				
			6TB19 (1-10)	●		●	●	●	●	●				
6TB20	NA/Base of fill (15±')	Further define the extent and degree of contamination. Shallow sample from unpaved area.	6TB20 (0-1)	●		●	●	●	●	●				
			6TB20 (1-10)	●		●	●	●	●	●	●	●		●
6TB21	NA/Base of fill (15±')	Further define the extent and degree of contamination. Shallow surface soil data available at 6SS2C.	6TB21 (0-10)	●		●	●	●	●	●		●		●
6TB22	NA/Base of fill (15±')	Further define the extent and degree of contamination. Shallow surface soil data available at 6SS1C.	6TB22 (0-10)	●		●	●	●	●	●				●
6TB23	NA/Base of fill (15±')	Further define the extent and degree of contamination. Shallow surface soil data available at 6SS1C.	6TB23 (0-10)	●		●	●	●	●	●				
6TB24	NA/Base of fill (15±')	Further define vertical extent of contamination found at 6TB4.	6TB24 (depth)	●		●	●	●	●	●	●			
6TB25-6TB29	NA/Base of fill (15±')	Optional resolution borings to be installed to determine extent of soil contamination, if required, based upon the field screening results.	6TB25-29 (0-10)	● (5)		● (5) 28	● (5) 28	● (5) 28	● (5) 28	● (5) 28		0		4
			Subtotal Soil 28	~~22~~		~~22~~	~~22~~	~~22~~	~~22~~	~~22~~	2	~~2~~	0	~~2~~
			Subtotal Ground Water[3]		9	9	9	9	0	0	0	0	2	1
			Total Soil	32		32	32	32	32	32	2	2	0	5
			Total Ground Water[3]		18	18	18	18	0	0	0	0	4	1

PROPOSED

22 Primary test borings (including well borings)
5 Supplemental test borings
5 Wells
- 2 - Shallow overburden
- 3 - Deep overburden or bedrock

Notes:

[1] Bedrock well may be installed, see Field Sampling Plan for details.
[2] One round of sampling.
[3] Includes two sampling rounds.

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TABLE 2-25
DRMO - TOTAL LEAD CONTAMINATED SOILS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
		LIMITED ACTION	
No Action	No Action	Evaluation required by CERCLA.	•
Access Restriction	Deed Restriction/ Fencing	Effective at preventing direct contact at minimal cost.	•
		CONTAINMENT	
Horizontal Barrier	Caps	This process option can meet remedial action objectives and is easily implemented; however, it is not a permanent remedy.	•
Surface Water Control	Site Grading and Stormwater Management	Can improve effectiveness of other process options such as capping and by itself can prevent downstream migration of sediments.	•
	Dikes	Permits would be required and would interfere with existing land use. Would not reduce contaminant volume or migration.	
	Floodwall	Permits would be required and would interfere with existing land use. Would not reduce contaminant volume or migration.	
	Cover	Would not reduce contaminant volume or prevent infiltration. A cover would prevent erosion.	
		REMOVAL	
Excavation	Backhoe	Common method easily implemented and readily available.	•
		IN SITU TREATMENT	
Biological	Aerobic	Not effective for metal contamination which can not be degraded biologically.	
Physical/ Chemical	Soil Venting	Not effective for metals because they are not volatile.	
	Stabilization	Field scale treatments of lead contaminated soil have been successfully completed. Leachate concentrations of lead were easily reduced to acceptable standards.	•
Thermal	Vitrification	Several pilot scale operations have been completed. One field scale operation for radioactive waste has been completed. Cannot be used below water table. Vitrified mass should not leach lead above unacceptable concentrations. Capable of treating all contaminants present. Few weeks available.	
		ABOVEGROUND TREATMENT	
Biological	Landfarming	Lead is not biodegradable; therefore, no biological process options will be retained.	
	Composting		
	Bioslurry		
Physical/ Chemical	Steam Stripping	Not effective on non-volatile inorganics.	

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TABLE 2-25 (continued)
DRMO - TOTAL LEAD CONTAMINATED SOILS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
Physical/ Chemical (con't)	Air Stripping	Not effective on non-volatile inorganics.	
	Dechlorination	Only applicable to chlorinated aromatic compounds.	
	Oxidation	Not applicable to inorganic compounds.	
	Dewatering	If excavation below the ground water is necessary, some level of dewatering may be required, depending upon the ultimate disposition of the soil. Otherwise no dewatering of soils is required. This is a proven technology.	
	Soil Washing	No field scale operations in the United States. Potential use as volume reduction technique as contaminants are probably trapped in fine particles. Pilot scale operations for lead have been done. The use of leaching agents for lead or other metals is usually not effective at removing contaminants from the fine particles.	•
	Solvent Extraction	Not effective for materials that are not soluble, such as lead.	
	Stabilization	Proven technology at a field scale for lead contaminated soils. Capable of reducing leachate concentrations to acceptable levels.	•
Onsite Thermal	Incineration	None of the thermal process options are capable of destroying or stabilizing inorganic contaminants.	
	Pyrolysis		
	Low Temperature Thermal Desorption		
Offsite Thermal	Incineration	None of the thermal process options are capable of destroying or stabilizing inorganic contaminants.	
	Pyrolysis		
	Low Temperature Thermal Desorption		
DISPOSAL			
Onsite Landfill	Solid Waste Disposal Area	Secure chemical landfill retained as representative process option. High liability as facilities may be leaking contaminants to ground water. Due to the relatively small quantities involved offsite disposal is more cost-effective; therefore, onsite disposal will not be further evaluated.	
	RCRA Chemical Landfill	This is essentially a containment option. It is effective in meeting remedial action objectives; however, it is not a permanent remedy. Due to the relatively small quantities involved offsite disposal is more cost-effective; therefore, onsite disposal will not be further evaluated.	
Onsite Reuse	Use in Asphalt Batch Plant (aggregate)	This is essentially a stabilization process. By itself, it is not a permanent remedy or capable of preventing future direct contact.	

TABLE 2-25 (continued)
DRMO - TOTAL LEAD CONTAMINATED SOILS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
Onsite Reuse (con't)	Fill After Treatment	After treatment, this is an easy-to-implement disposal alternative. Its effectiveness is based on the treatment performed.	•
Offsite Landfill	Solid Waste Disposal Area	Secure chemical landfill retained as representative process option. High liability as facilities may be leaking to ground water.	
	RCRA Chemical Landfill	This is essentially a containment option. It is effective in meeting remedial action objectives; however, it is not a permanent remedy.	•
Offsite Reuse	Use in Asphalt Batch Plant (aggregate)	This is essentially a stabilization process. By itself, it is not a permanent remedy or capable of preventing future direct contact. No facilities permitted to manage characteristically hazardous levels of lead have been located.	
	Cement Manufacturing (Raw Material)	This is essentially an incineration option and is not an effective treatment for inorganics. No facilities permitted to manage characteristically hazardous levels of lead have been located.	

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TABLE 2-25
DRMO - PCB CONTAMINATED SOILS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
		LIMITED ACTION	
No Action	No Action	Evaluation required by CERCLA.	•
Access Restriction	Deed Restriction/ Fencing	Effective at preventing direct contact at minimal cost.	•
		CONTAINMENT	
Horizontal Barrier	Caps	This process option can meet remedial action objectives and is easily implemented; however, it is not a permanent remedy.	•
Surface Water Control	Site Grading and Stormwater Management	Can improve effectiveness of other process options such as capping and by itself can prevent downstream migration of sediments.	•
		REMOVAL	
Excavation	Backhoe	Common method easily implemented and readily available.	•
Dredging	Mechanical	Dredging techniques are only applicable to sediments.	
	Hydraulic	Dredging techniques are only applicable to sediments.	
		IN SITU TREATMENT	
Biological	Aerobic	Not effective in degrading PCBs.	
Physical/ Chemical	Soil Venting	Process is not effective at removing PCBs due to their low volatility.	
	Stabilization	These processes have been proven to be effective at stabilizing PCBs but not the risk posed by direct contact.	•
Thermal	Vitrification	Pilot scale tests have been successfully completed on PCB wastes. Mobilization costs are substantial and few vendors are available.	
		ABOVEGROUND TREATMENT	
Biological	Landfarming	Not proven to be effective at degrading PCBs	
	Composting	Not proven to be effective at degrading PCBs.	
	Bioslurry	Not proven to be effective at degrading PCBs.	
Physical/ Chemical	Steam Stripping	Not effective in removing PCB from soil due to PCB's low volatility and solubility.	
	Air Stripping	Not effective in removing PCBs from sediments due to PCB's low volatility.	
	Dechlorination	High destruction of PCBs possible. Biphenyl end-product not believed to be bioaccumulative or toxic. Potential handling problems exist and few commercial vendors are available.	
	Oxidation	High reagent costs. Only laboratory scale treatments of PCB have been successfully completed.	
	Dewatering	Effective method for dewatering sediments. Commercial units readily available. Not applicable to soils.	

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TABLE 2-25 (continued)
DRMO - PCB CONTAMINATED SOILS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
Physical/ Chemical (con't)	Soil Washing	For PCBs, this is a volume reduction alternative. No field scale operations have been performed in the United States. PCBs have only been treated at a laboratory scale. The amount of volume reduction is inversely proportional to the silt-clay content of the contaminated soil.	
	Solvent Extraction	High PCB removal on pilot scale basis have been demonstrated. Solvent residuals remain in soil.	•
	Stabilization	Has been proven effective at stabilizing PCBs but not in reducing risk due to direct contact.	•
Onsite Thermal	Incineration	Field scale operations for a variety of substances including DDTR have been performed. Dewatering would be required as a pretreatment step. The rotary kiln was selected as the representative process option for incinerators.	•
	Pyrolysis	Pyrolysis units are not widely available. Incineration and low temperature thermal desorption will be evaluated as the representative thermal process option.	
	Low Temperature Thermal Desorption	Field scale operation for a variety of substances including DDTR have been performed. Dewatering would be required as a pretreatment step. Potentially, the process option is more cost-effective and produces fewer air emissions than an incinerator.	•
Offsite Thermal	Incineration	Highly effective and expensive. Availability may be limited. Dewatering would be required as a pretreatment step.	•
	Pyrolysis	Pyrolysis units are not widely available. Incineration and low temperature thermal desorption will be evaluated as the representative thermal process option.	
	Low Temperature Thermal Desorption	No permitted facilities permitted to manage DDTR have been located; therefore, this option will not be retained.	
DISPOSAL			
Onsite Landfill	Solid Waste Disposal Area	Not retained as secure chemical landfill. Retained as representative process option. High liability as facilities may be leaking contaminants to ground water. Due to relatively small quantities involved, offsite disposal is more cost-effective; therefore, onsite disposal will not be further evaluated.	
	RCRA Chemical Landfill	This is essentially a containment option. It is effective in meeting remedial action objectives; however, it is not a permanent remedy. Due to the relatively small quantities involved offsite disposal is more cost-effective; therefore, onsite disposal will not be further evaluated.	
Onsite Reuse	Use in Asphalt Batch Plant (aggregate)	This is essentially a stabilization process. By itself, is not a permanent remedy or capable of preventing future direct contact.	
	Backfill After Treatment	After treatment, this is an easy-to-implement disposal alternative. Its effectiveness is based on the treatment performed.	•

TABLE 2-25 (continued)
DRMO - PCB CONTAMINATED SOILS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
Offsite Landfill	Solid Waste Disposal Area	Secure chemical landfill retained as representative process option. High liability as facilities may be leaking contaminants to ground water.	
	RCRA Chemical Landfill	This is essentially a containment option. It is effective in meeting remedial action objectives; however, it is not a permanent remedy.	•
Offsite Reuse	Use in Asphalt Batch Plant (aggregate)	This is essentially a stabilization process. By itself, is not a permanent remedy or capable of preventing future direct contact. No facilities permitted to manage PCBs have been located.	
	Cement Manufacturing	This is essentially an incineration option providing an effective permanent remedy. No facilities permitted to manage PCBs have been located.	

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TABLE 2-26
DRMO - VOC CONTAMINATED SOILS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
		LIMITED ACTION	
No Action	No Action	Evaluation required by CERCLA	•
Access Restriction	Deed Restriction/ Fencing	Effective at preventing direct contact at minimal cost.	•
		CONTAINMENT	
Horizontal Barrier	Caps	This process option can meet remedial action objectives and is easily implemented; however, it is not a permanent remedy.	•
Surface Water Control	Site Grading and Stormwater Management	Can improve effectiveness of other process options such as capping and, by itself, can prevent downstream migration of sediments.	•
	Dikes	Permits would be required and would interfere with existing land use. Would not reduce contaminant volume or migration.	
	Floodwall	Permits would be required and would interfere with existing land use. Would not reduce contaminant volume or migration.	
	Cover	Would not reduce contaminant volume. Would not prevent infiltration.	
		REMOVAL	
Excavation	Backhoe	Common method easily implemented and readily available.	•
		IN SITU TREATMENT	
Biological	Aerobic	Has been proven effective; however, it is not as effective as soil venting.	
Physical/ Chemical	Soil Venting	Effectively proven technology for VOC removal. Not effective below the water table. Aboveground air stripping has been selected as the representative physical/chemical process option.	
	Stabilization	Has been used with some success on VOCs. Aboveground stabilization is more cost effective.	•
Thermal	Vitrification	Several pilot scale operations have been completed. Cannot be used below the water table. Capable of treating all contaminants present. High energy requirements.	
		ABOVEGROUND TREATMENT	
Biological	Landfarming	Has been used effectively on VOCs; however, majority of treatment is probably due to volatilization. This option will be retained to the extent that biological treatment will be part of any air stripping operation.	•
	Composting	Potentially effective; however, its effectiveness not as certain as landfarming.	
	Bioslurry	Potentially effective; however, it involves preparation of slurry and is not as proven as landfarming.	

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TABLE 2-26 (continued)
DRMO - VOC CONTAMINATED SOILS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
Physical/ Chemical	Steam Stripping	Potentially effective; however air stripping is as effective at removing VOCs and has been used successfully at several locations.	
	Air Stripping	Selected as representative process option. Proven effective on VOCs.	•
	Dechlorination	Only applicable to aromatic halides. Not proven at field scale.	
	Oxidation		
	Dewatering	If excavation below the ground water table is required, some level of dewatering will probably be required, depending upon the ultimate desorption of the soil. This is a proven technology.	
	Soil Washing	Potentially effective volume reduction technique.	
	Solvent Extraction	Successful pilot scale treatments have been performed on VOCs.	•
	Stabilization	Effective at preventing leaching of VOCs into the ground water, may also minimize risk of dermal contact and dust inhalation. No destruction or removal of contaminants.	•
Onsite Thermal	Incineration	Field scale operations for a variety of substances including DDTR have been performed. Dewatering would be required as a pretreatment step. The rotary kiln was selected as the representative process option for incinerators.	•
	Pyrolysis	Pyrolysis units are not widely available. Incineration and low temperature thermal desorption will be evaluated as the representative process option.	
	Low Temperature Thermal Desorption	Field scale operation for a variety of substances including DDTR have been performed. Dewatering would be required as a pretreatment step. Potentially, this process option is more cost-effective and produces fewer air emissions than an incinerator.	•
Offsite Thermal	Incineration	Highly effective and expensive. Availability may be limited. Dewatering would be required as a pretreatment step.	•
	Pyrolysis	Pyrolysis units are not widely available. Incineration and low temperature thermal desorption will be evaluated as the representative process option.	
	Low Temperature Thermal Desorption	No permitted facilities permitted to manage DDTR have been located; therefore, this option will not be retained.	
DISPOSAL			
Onsite Landfill	Solid Waste Disposal Area	Not retained as secure chemical landfill. Retained as representative process option. High liability as facilities may be leaking contaminants to ground water. Due to relatively small quantities involved, offsite disposal is more cost-effective; therefore, onsite disposal will not be further evaluated.	

TABLE 2-26 (continued)
DRMO - VOC CONTAMINATED SOILS

TECHNOLOGY	PROCESS OPTION	SCREENING COMMENTS	OPTION RETAINED
Onsite Landfill (con'd)	RCRA Chemical Landfill	This is essentially a containment option. It is effective in meeting remedial action objectives; however, it is not a permanent remedy. Due to the relatively small quantities involved, offsite disposal is more cost effective; therefore, onsite disposal will not be further evaluated.	
Onsite Reuse	Use in Asphalt Batch Plant (aggregate)	This is essentially a stabilization process. By itself, it is not a permanent remedy or capable of preventing future direct contact.	
	Fill After Treatment	After treatment, this is an easy-to-implement disposal alternative. Its effectiveness is based on the treatment performed.	•
Offsite Landfill	Solid Waste Disposal Area	Secure chemical landfill retained as representative disposal process option. High liability as solid waste disposal areas may be leaking contaminants to ground water.	
	Secure Chemical Landfill	This is essentially a containment option. It is effective in meeting remedial action objectives; however, it is not a permanent remedy.	•
Offsite Reuse	Use in Asphalt Batch Plant (aggregate)	This is essentially a stabilization process. By itself, it is not a permanent remedy or capable of preventing future direct contact. No facilities permitted to manage hazardous waste solvents have been located.	
	Cement Manufacturing (Raw Material)	This is essentially an incineration option providing an effective permanent remedy. No facilities permitted to manage hazardous waste solvents have been located.	

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TABLE 3–4
DRMO – LEAD CONTAMINATED SOILS
DEVELOPMENT OF ALTERNATIVES

RETAINED PROCESS OPTIONS	ALTERNATIVES						
	LIMITED ACTION		CONTAINMENT	OFFSITE ALTERNATIVE	ONSITE ALTERNATIVES		
SOIL/SEDIMENT	No Action	Access Restriction	Direct Contact Cap	RCRA Landfill	In situ Stabilization	Aboveground Stabilization	Soil Washing
	6LEAD–1	6LEAD–2	6LEAD–3	6LEAD–4	6LEAD–5	6LEAD–6	6LEAD–7
No Action	●						
Access Restriction		●	●				
Horizontal Barrier – Cap			●				
Surface Water Control			●				
Excavation – Backhoe				●		●	●
In situ Stabilization					●		
Soil Washing							●
Stabilization				●[1]		●	●[1]
Onsite Backfill						●	●[2]
Offsite RCRA Chemical Landfill				●			●[2]

1. Optional, depends on TCLP analysis. Offsite stabilization can be performed at the selected offsite RCRA landfill.
2. Fine grained (contaminated) soils separated by the soil washing process will be landfilled, while the larger soil particles will be backfilled.

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TABLE 3-5
DRMO - PCB CONTAMINATED SOILS
DEVELOPMENT OF ALTERNATIVES

RETAINED PROCESS OPTIONS	ALTERNATIVES									
	LIMITED ACTION		CONTAINMENT	OFFSITE ALTERNATIVES[3]		ONSITE ALTERNATIVES				
SOIL/SEDIMENT	No Action	Access Restriction	Direct Contact Cap	Incineration	RCRA Landfill	In situ Stabilization	Aboveground Stabilization	Incineration[1]	Low Temperature Thermal Desorption[1]	Solvent Extraction[1]
	6PCB-1	6PCB-2	6PCB-3	6PCB-4	6PCB-5	6PCB-6	6PCB-7	6PCB-8	6PCB-9	6PCB-10
No Action	●									
Access Restriction		●	●							
Horizontal Barrier - Cap			●							
Site Grading & Stormwater Management			●							
Excavation - Backhoe				●	●		●	●	●	●
In situ Stabilization						●				
Solvent Extraction										●
Stabilization							●			
Onsite Incineration								●		
Offsite Incineration				●					●[2]	●[2]
Onsite Low Temp. Thermal Desorption									●	
Onsite Backfill							●	●	●	●
Offsite RCRA Chemical Landfill					●					

1. Feasibility of these alternatives contingent upon specified alternative being selected for remediation of DDTR contaminated sediments in Area A downstream.
2. The condensed/extracted PCB and spent carbon will be transported offsite for incineration.
3. Offsite Low Temperature Thermal Desorption or offsite reuse (asphalt or cement) will be reconsidered if a permitted offsite facility is located.

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TABLE 3-6
DRMO - VOC CONTAMINATED SOILS
DEVELOPMENT OF ALTERNATIVES

RETAINED PROCESS OPTIONS	ALTERNATIVES										
	LIMITED ACTION		CONTAINMENT	OFFSITE[4]		ONSITE ALTERNATIVES					
SOIL/SEDIMENT	No Action	Access Restriction	Impermeable Cap	Incineration	RCRA Landfill	Aboveground Stabilization	Aboveground Landfarming	Incineration[1]	Low Temperature Thermal Desorption[1]	Air Stripping	Solvent Extraction[1]
	6VOC-1	6VOC-2	6VOC-3	6VOC-4	6VOC-5	6VOC-6	6VOC-7	6VOC-8	6VOC-9	6VOC-10	6VOC-11
No Action	●										
Access Restriction		●	●								
Horizontal Barrier - Cap			●								
Site Grading & Stormwater Management			●								
Excavation - Backhoe				●	●		●	●	●	●	●
In situ Stabilization						●					
Air Stripping (above-ground)					●					●	
Solvent Extraction											●
Stabilization							●	●[2]	●[2]	●[2]	●[2]
Onsite Incineration								●			
Offsite Incineration				●					●[3]		●[3]
Onsite Low Temperature Thermal Desorption									●		
Onsite Backfill							●	●	●	●	●
Offsite RCRA Chemical Landfill					●						

1. Feasibility of this alternative contingent upon specified alternative being selected for remediation of DDTR contaminated sediments in Area A downstream.
2. Stabilization may be required due to high TCLP lead levels.
3. The condensed/extracted VOC's and spent carbon will be transported offsite for incineration.
4. Offsite Low Temperature Thermal Desorption or offsite reuse (asphalt or cement) will be reconsideered if a permitted offsite facility is located.

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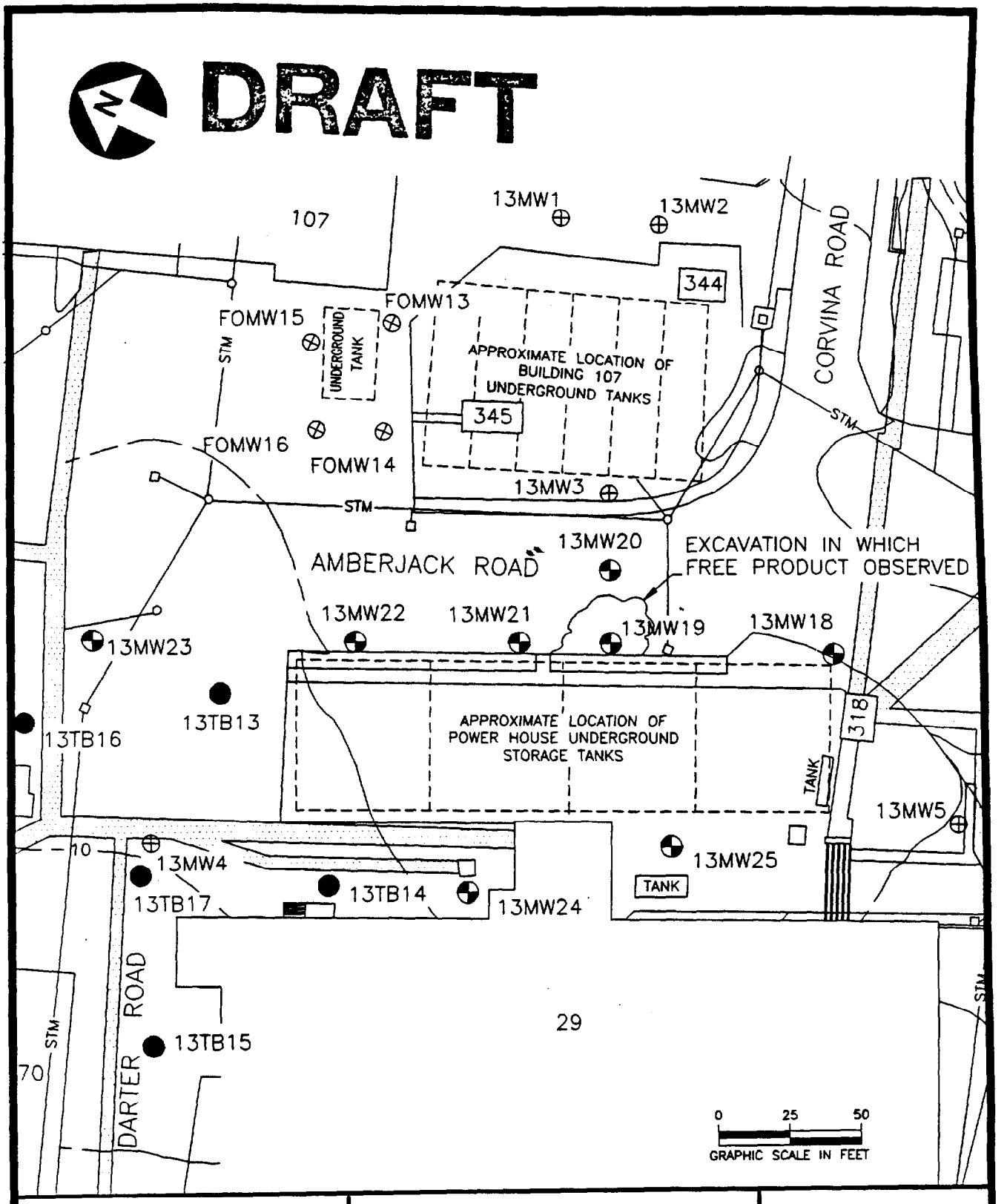
LOWER SUBASE - FREE PRODUCT



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

LEGEND

EXIST.	PROP.	
⊕13MW1	⊕13MW5	MONITORING WELL
○13TB1	●13TB5	TEST BORING

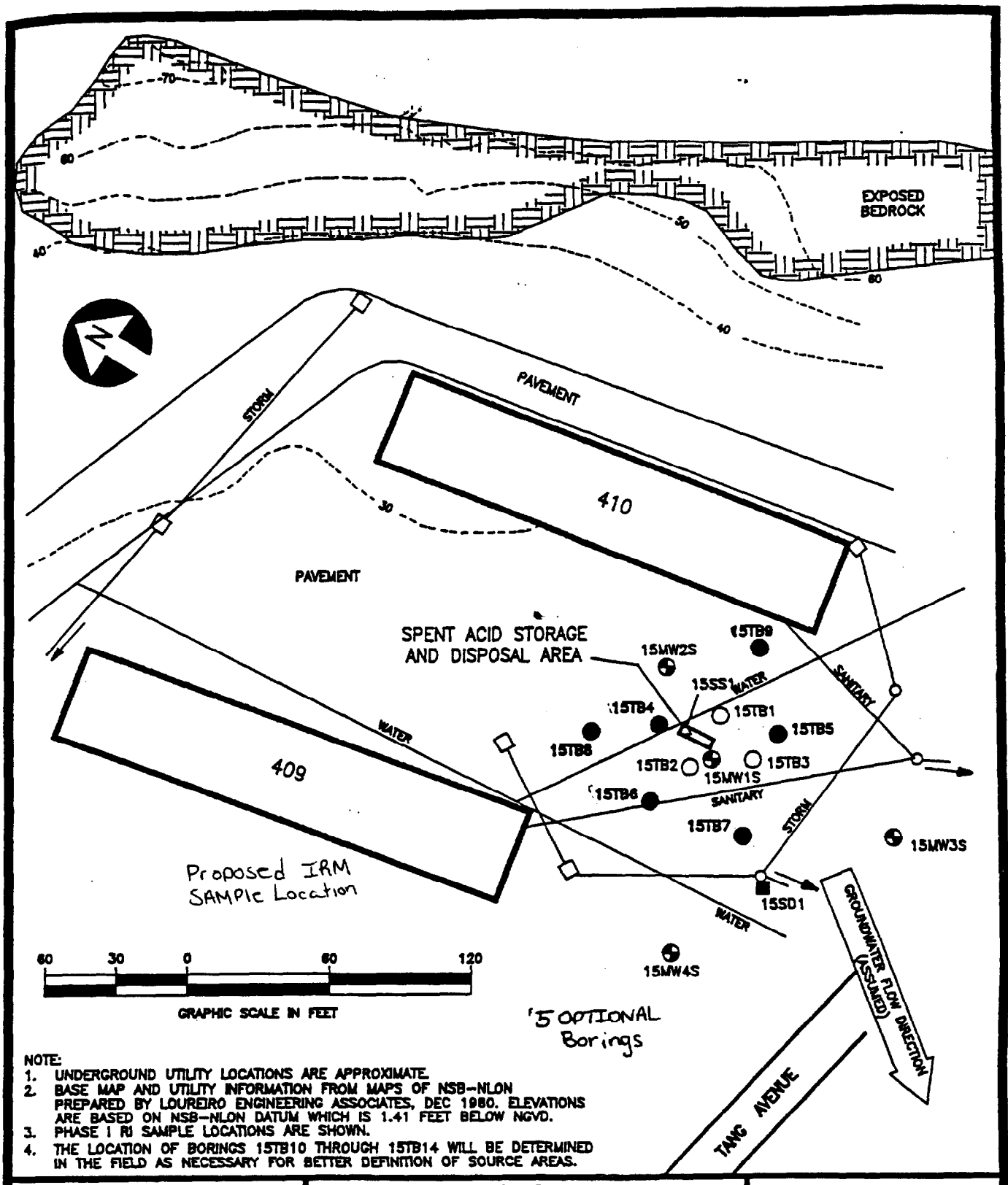
SOURCE: Naval Submarine Base Existing Conditions April 1985 Loureiro Engineering Associates

—10—	EXIST CONTOUR
123	BUILDING No.
≈≈≈	WATERCOURSE
—STM—	STORM SEWER
□	CATCH BASIN

REMEDIAL DESIGN DATA
PROPOSED
INTERIM REMEDIAL MEASURES
LOWER SUBASE

ATLANTIC ENVIRONMENTAL SERVICES, INC.

SPENT ACID STORAGE AND DISPOSAL AREA



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.
3. PHASE I RI SAMPLE LOCATIONS ARE SHOWN.
4. THE LOCATION OF BORINGS 15TB10 THROUGH 15TB14 WILL BE DETERMINED IN THE FIELD AS NECESSARY FOR BETTER DEFINITION OF SOURCE AREAS.

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

LEGEND

EXIST.	PROP.	
⊕ 15MW1	⊕ 15MW1	MONITORING WELL
○ 15TB1	● 15TB1	TEST BORING
□ 15SD1	■ 15SD1	SEDIMENT SAMPLE
△ 15SS1	▲ 15SS1	SURFACE SOIL SAMPLE
◇ 15SW1	◆ 15SW1	SURFACE WATER SAMPLE

---10---	EXIST CONTOUR
123	BUILDING No.
═══	WATERCOURSE
○	MANHOLE
□	CATCH BASIN

FIGURE 4-6
FIELD SAMPLING PLAN
SPENT ACID STORAGE AND DISPOSAL AREA

ATLANTIC ENVIRONMENTAL SERVICES, INC.

TABLE 4-13
SPENT ACID STORAGE AND DISPOSAL AREA FIELD SAMPLING PLAN

Sample Location	Well Type/ Proposed Depth (ft)	Rationale	Sample Designations	Sample Type		Analysis						
				Soil	Water	VOC	SVOC	Inorganics	Pesticides	PCB	TCLP	Engineering
Monitoring Wells												
15MW1S	Overburden/20±' (advance to bedrock)	Provide chemical data for shallow ground water and subsurface soils in source area, immediately downgradient of the former acid storage tank; determine depth to bedrock.	15MW1S (depth)	•		•	•	•	•	•	•	•
			15GW1S		•	•	•	•	•	•		•
15MW2S	Overburden/20±'	Monitor quality of shallow ground water and test for soil contamination upgradient of the former acid storage tank.	15MW2S (depth)	•		•	•	•	•	•		
			15GW2S		•	•	•	•	•	•		
15MW3S	Overburden/20±'	Monitor quality of shallow ground water and subsurface soils downgradient of the former acid storage tank.	15MW3S (depth)	•		•	•	•	•	•		
			15GW3S		•	•	•	•	•	•		
15MW4S	Overburden/20±' (advance to bedrock)	Monitor quality of shallow ground water and subsurface soils downgradient of the former acid storage tank; determine depth to bedrock.	15MW4S (depth)	•		•	•	•	•	•		
			15GW4S		•	•	•	•	•	•		
Test Borings												
15TB4	NA/15±'	Determine stratigraphy/nature of fill immediately north of the former acid storage tank. Further determine nature, extent and degree of soil contamination.	15TB4 (depth)	•		•	•	•	•	•	•	•
15TB5	NA/15±'	Further define extent of subsurface soil contamination (within 35' southeast of former acid tank).	15TB5 (depth)	•		•	•	•	•	•	•	
15TB6	NA/15±'	Further define extent of subsurface soil contamination (within 35' west of former acid tank).	15TB6 (depth)	•		•	•	•	•	•	•	
15TB7	NA/15±'	Further define extent of subsurface soils contamination (within 50' south of former acid tank).	15TB7 (depth)	•		•	•	•	•	•		
15TB8	NA/15±'	Further define extent of subsurface soils contamination (within 50' northwest of former acid tank).	15TB8 (depth)	•		•	•	•	•	•		
15TB9	NA/15±'	Determine nature and extent of subsurface soils contamination within 50' east of former acid tank.	15TB9 (depth)	•		•	•	•	•	•		
15TB10-15TB14	NA/15±'	Optional borings to be installed to determine extent of soil contamination, if required, based on the field screening results.	15TB10 (depth)-15TB14 (depth)	• (5)		• (5)	• (5)	• (5)	• (5)	• (5)	• —	• —
			Subtotal Soils	10	0	10	10	10	10	10	4	2
			Subtotal Water[3]	0	4	4	4	4	4	4	0	1
				11		11	11	11	11	11	4	2

TABLE 4-13 (continued)
SPENT ACID STORAGE AND DISPOSAL AREA FIELD SAMPLING PLAN

Sample Location	Well Type/ Proposed Depth (ft)	Rationale	Sample Designations	Sample Type		Analysis						
				Soil	Water	VOC	SVOC	Inorganics	Pesticides	PCB	TCLP	Engineering
Sediment Sampling												
15SD1	-	Provide chemical data for sediment from downgradient, stormwater location to determine whether site contaminants are being transported offsite by these mechanisms.	15SD1	•		•	•	•	•	•		
			Subtotal Sediments	1	0	1	1	1	1	1	0	0
			Total Soils	16	0	16	16	16	16	16	4[1]	2
			Total Water[2]	0	8	8	8	8	8	8	0	1

PROPOSED

10 Primary test borings (including well borings)
5 Supplemental test borings
4 Wells

Notes:

[1] Four TCLP inorganic analyses will be conducted based on field screening for lead; one of the four will be selected for full TCLP analysis.
[2] Total includes 1 round of sampling only.
[3] Total includes 2 rounds of sampling.