

CONFIRMATION STUDY REPORT
ON
HAZARDOUS WASTE SITES
AT
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, R.I.
VOLUME I

MAY 15, 1986

Prepared for:

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Att: Larry Quinn, Code 114

Re: Confirmation Study Report on
Hazardous Waste Sites
at Naval Education and Training Center
Newport, RI.
A/E Contract No. N62472-83-C-1154

Gentlemen:

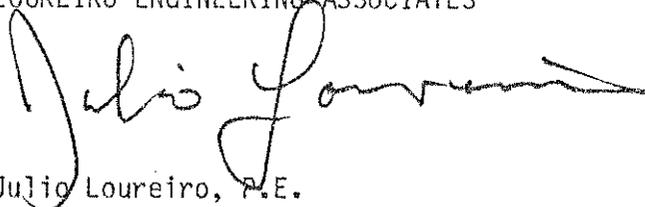
We are transmitting herewith our "Confirmation Study Report on Hazardous Waste Sites at Naval Education and Training Center - Newport, R.I." dated May 15, 1986. The report presents all the data obtained in both the verification and characterization step sampling and analyses programs on six sites. The report also presents recommendations for additional studies and/or remedial action measures as appropriate.

It has been a pleasure working with representatives of the Navy on this project.

Please feel free to call if you have any questions.

Very truly yours,

LOUREIRO ENGINEERING ASSOCIATES



Julio Loureiro, P.E.
President

JL:kd

Encl.

TABLE OF CONTENTS
VOLUME I

	<u>PAGE</u>
LETTER OF TRANSMITTAL	
TABLE OF CONTENTS	i
LIST OF TABLES	iv
LIST OF FIGURES	vi
LIST OF APPENDICES	vii
<u>EXECUTIVE SUMMARY</u>	ES-1
<u>A. INTRODUCTION</u>	A-1
1. Scope and Purpose	A-1
2. Initial Assessment Study (IAS)	A-3
<u>B. COLLECTION OF SAMPLES - VERIFICATION STEP</u>	B-1
1. General	B-1
2. Sediment Sampling Methods	B-1
3. Mussel Sampling Methods	B-2
4. Soil Sampling Methods	B-2
5. Leachate Sampling Methods	B-2
6. Surface Water Sampling Methods	B-3
7. Ground Water Sampling Methods	B-3
8. Sample Containers and Field Preservation	B-4
9. Sample Identification and Custody	B-5
10. Control Samples - Verification Step	B-9
<u>C. COLLECTION OF SAMPLES - CHARACTERIZATION STEP</u>	C-1
1. General	C-1
2. Sediment Sampling Methods	C-1
3. Mussel Sampling Methods	C-1
4. Soil Sampling Methods	C-1
5. Tank Sampling Methods	C-2
6. Groundwater Sampling Methods	C-2
7. Sample Containers and Field Preservation	C-4
8. Sample Identification and Custody	C-6
9. Control Samples - Characterization Step	C-6
<u>D. LABORATORY ANALYSIS</u>	D-1
1. Basic Analytical References	D-1
2. Priority Pollutant Analyses	D-1
3. Metals Analyses	D-2
4. Polychlorinated Biphenyls Analyses	D-4
5. Miscellaneous Analyses	D-6
6. Quality Control/Quality Assurance	D-6
7. Results of Analytical Tests on Site Specific Samples Collected	D-8
8. Results of Analytical Tests on Control Samples Collected	D-8

TABLE OF CONTENTS (Continued)

	<u>PAGE</u>
<u>E. MONITORING WELL INSTALLATION</u>	E-1
1. General	E-1
2. Drilling and Soil Sampling Methods	E-1
3. Well Installation	E-2
4. Groundwater Sampling	E-2
<u>F. FINDINGS AT SITE NO. 01 McALLISTER POINT LANDFILL</u>	F-1
1. History of Waste Disposal	F-1
2. Existing Site Conditions	F-2
3. Hydrogeological Data	F-2
4. McAllister Point Landfill Samples - Verification Step	F-5
5. Analytical Data on Samples Collected - Verification Step	F-7
6. Evaluation of Available Data - Verification Step	F-7
7. Location of Suspected Contaminant Sources - Verification Step	F-11
8. McAllister Point Landfill Samples Collected - Characterization Step	F-14
9. Analytical Data on Samples Collected - Characterization Step	F-14
10. Evaluation of Available Data - Characterization Step	F-20
11. Location of Contaminant Sources and Actual/Potential Migration	F-23
12. Toxicity Data and Standards/Criteria for Contaminants Found	F-24
13. Recommendations	F-30
<u>G. FINDINGS AT SITE NO. 02 MELVILLE NORTH LANDFILL</u>	G-1
1. History of Waste Disposal	G-1
2. Existing Site Conditions	G-1
3. Hydrogeological Data	G-2
4. Melville North Landfill Samples Collected - Verification Step	G-2
5. Analytical Data on Samples Collected - Verification Step	G-4
6. Evaluation of Available Data - Verification Step	G-4
7. Location of Suspected Contaminant Sources - Verification Step	G-7
8. Melville North Landfill Samples Collected - Characterization Step	G-7
9. Field Observations on Samples Collected - Characterization Step	G-7
10. Evaluation of Available Data - Characterization Step	G-7
11. Location of Contaminant Sources and Actual/Potential Migration	G-10
12. Toxicity Data and Standards/Criteria for Contaminants Found	G-10
13. Recommendations and Cost Estimate	G-13
<u>H. FINDINGS AT SITE NO. 07 TANK FARM ONE</u>	H-1
1. History of Waste Disposal	H-1
2. Existing Site Conditions	H-1
3. Hydrogeological Data	H-2
4. Tank Farm One Samples - Verification Step	H-6
5. Analytical Data on Samples Collected - Verification Step	H-8
6. Evaluation of Available Data - Verification Step	H-8
7. Location of Suspected Contaminant Sources - Verification Step	H-8
8. Tank Farm One Samples Collected - Characterization Step	H-10
9. Analytical Data on Samples Collected - Characterization Step	H-13
10. Evaluation of Available Data - Characterization Step	H-13
11. Recommendations	H-17

TABLE OF CONTENTS (Continued)

	<u>PAGE</u>
<u>I. FINDINGS AT SITE NO. 12 TANK FARM FOUR</u>	I-1
1. History of Waste Disposal	I-1
2. Existing Site Conditions	I-1
3. Hydrogeological Data	I-2
4. Tank Farm Four Samples - Verification Step	I-5
5. Analytical Data on Samples Collected - Verification Step	I-7
6. Evaluation of Available Data - Verification Step	I-7
7. Location of Suspected Contaminant Sources - Verification Step	I-7
8. Tank Farm Four Samples Collected - Characterization Step	I-7
9. Analytical Data on Samples Collected - Characterization Step	I-9
10. Evaluation of Available Data - Characterization Step	I-9
11. Location of Contaminant Sources and Actual/Potential Migration	I-11
12. Toxicity Data and Standards/Criteria for Contaminants Found	I-11
13. Recommendations	I-14
<u>J. FINDINGS AT SITE NO. 14 GOULD ISLAND DISPOSAL AREA</u>	J-1
1. History of Waste Disposal	J-1
2. Existing Site Conditions	J-1
3. Hydrogeological Data	J-2
4. Gould Island Disposal Area Samples - Verification Step.	J-2
5. Analytical Data on Samples Collected - Verification Step	J-4
6. Evaluation of Available Data - Verification Step	J-4
7. Location of Suspected Contaminant Sources - Verification Step	J-6
8. Samples Collected - Characterization Step	J-6
9. Analytical Data on Samples Collected - Characterization Step	J-8
10. Evaluation of Available Data - Characterization Step	J-8
11. Location of Contaminant Sources and Actual/Potential Migration	J-11
12. Toxicity Data and Standards/Criteria for Contaminants Found	J-12
13. Recommendations	J-16
<u>K. FINDINGS AT SITE NO. 17 GOUND ISLAND ELECTROPLATING SHOP</u>	K-1
1. History of Waste Disposal	K-1
2. Existing Site Conditions	K-1
3. Gould Island Electroplating Shop Samples - Verification Step	K-2
4. Analytical Data on Samples Collected - Verification Step	K-2
5. Evaluation of Available Data - Verification Step	K-4
6. Gould Island Electroplating Shop Samples Collected - Characterization Step.	K-4
7. Analytical Data on Samples Collected - Characterization Step	K-4
8. Evaluation of Available Data - Characterization Step	K-4
9. Recommendations	K-4

VOLUME II

1. Executed Laboratory Services Request Sheets for All Samples - Verification Step.
2. Executed Custody Sheets for All Samples - Verification Step.
3. Executed Laboratory Services Request Sheets for All Samples - Characterization Step.
4. Executed Custody Sheets for All Samples - Characterization Step.

LIST OF TABLES

<u>No.</u>	<u>Title</u>	<u>Page</u>
1	Sampling Sites and Control Stations	A-2
2	Sample Containers and Field Preservation - Verification	B-6
3	Codes Used in Sample Identification - Verification	B-8
4	Control Samples Collected - Verification Step	B-10
5	Sample Containers and Field Preservation - Characterization	C-5
6	Codes Used in Sample Identification - Characterization	C-7
7	Control Samples Collected - Characterization Step	C-7
8	Monitoring Wells - Site No. 01 - McAllister Point Landfill	F-3
9	Observed Water Levels in Monitoring Wells - Site No. 01 McAllister Point Landfill	F-4
10	Samples Collected - Verification Step Site No. 01 - McAllister Point Landfill	F-6
11	Summary of Sediment and Mussel Sample Analytical Data Site No. 01 - McAllister Point Landfill (Nov., 1983)	F-8
12	Analytical Data on Soils and Leachate Site No. 01 - McAllister Point Landfill (Nov., 1983)	F-9
13	Summary of PCB, Metals, Cyanide and Phenol Priority Pollutant Analytical Data on Soils and Leachate Site No. 01 - McAllister Point Landfill (Nov., 1983)	F-10
14	Samples Collected - Characterization Step Site No. 01 - McAllister Point Landfill	F-12
15	Summary of Sediment Sample Analytical Data - Site No. 01 - McAllister Point Landfill (Sept., 1984)	F-15
16	Summary of Mussel Sample Analytical Data - Site No. 01 - McAllister Point Landfill (Sept., 1984)	F-16

LIST OF TABLES (Cont.)

<u>No.</u>	<u>Title</u>	<u>Page</u>
17	Summary of Routine Groundwater Sample Analytical Data - Site No. 01 - McAllister Point Landfill (Nov., 1984 to Jan., 1985)	F-17
18	Summary of Organics, Pesticides and PCBV Priority Pollutant Analytical Data on Groundwater - Site No. 01 - McAllister Point Landfill (Jan. 1985)	F-18
19	Summary of Metals, Cyanide and Phenol Priority Pollutant Analytical Data on Groundwater Site No. 01 - McAllister Point Landfill (Jan., 1985)	F-19
20	Samples Collected - Verification Step Site No. 02 - Melville North Landfill	G-3
21	Summary of Sediment and Mussel Sample Analytical Data Site No. 02 - Melville North Landfill (Nov., 1983)	G-5
22	Summary of Soil Sample Analytical Data Site No. 02 - Melville North Landfill (Nov., 1983)	G-6
23	Samples Collected - Characterization Step Site No. 02 - Melville North Landfill	G-8
24	Summary of Field Observations on Soil Excavations Site No. 02 - Melville North Landfill (Sept., 1985)	G-9
25	Monitoring Wells - Site No. 07 - Tank Farm One	H-4
26	Observed Water Levels in Monitoring Wells - Site No. 07 Tank Farm One	H-5
27	Samples Collected - Verification Step Site No. 07 - Tank Farm One	H-7
28	Summary of Soil Sample Analytical Data Site No. 07 - Tank Farm One (Nov., 1983)	H-9
29	Summary of Groundwater Sample Analytical Data Site No. 07 - Tank Farm One (Nov., 1983)	H-9
30	Samples Collected - Characterization Step Site No. 07 - Tank Farm One	H-11
31	Summary of Gas Chromatographic Scans of Samples of Soil, Groundwater, and Oil-Water Separator Effluent Site No. 07 - Tank Farm One (Sept., 1984 to Jan., 1985)	H-14

LIST OF TABLES (Cont.)

<u>No.</u>	<u>Title</u>	<u>Page</u>
32	Summary of PBHC and BTX Analytical Data on Samples of Groundwater and Oil-Water Separator Effluent Site No. 07 - Tank Farm One (Nov., 1984 to Jan., 1985)	H-15
33	Monitoring Wells - Site No. 12 - Tank Farm Four	I-3
34	Observed Water Levels in Monitoring Wells - Site No. 12 Tank Farm Four	I-4
35	Samples Collected - Verification Step Site No. 12 - Tank Farm Four	I-6
36	Summary of Surface Water, Soil and Sediment Sample Analytical Data Site No. 12 - Tank Farm Four (Nov., 1983)	I-6
37	Samples Collected - Characterization Step Site No. 12 - Tank Farm Four	I-8
38	Summary of Analytical Data on Samples of Groundwater - Site No. 12 - Tank Farm Four (Nov., 1984 to Jan., 1985)	I-10
39	Summary of Analytical Data on Samples of Bottom Water From Inactive Oil Storage Tanks - Site No. 12 - Tank Farm Four (Sept., 1984)	I-10
40	Samples Collected - Verification Step Site No. 14 - Gould Island Disposal Area	J-3
41	Summary of Sediment and Mussel Sample Analytical Data Site No. 14 - Gould Island Disposal Area (Dec., 1983)	J-5
42	Samples Collected - Characterization Step Site No. 14 - Gould Island Disposal Area	J-7
43	Summary of Sediment Sample Analytical Data - Site No. 14 - Gould Island Disposal Area	J-9
44	Summary of Mussel Sample Analytical Data - Site No. 14 - Gould Island Disposal Area (Sept., 1984)	J-10
45	Samples Collected - Verification Step Site No. 17 - Gould Island Electroplating Shop	K-3
46	Summary of Sediment and Mussel Sample Analytical Data Site No. 17 - Gould Island Electroplating Shop (Dec., 1983)	K-3
47	Samples Collected - Characterization Step Site No. 17 - Gould Island Electroplating Shop	K-5
48	Summary of Mussel Sample Analytical Data - Site No. 17 - Gould Island Electroplating Shop (Sept., 1984)	K-5

LIST OF FIGURES

<u>No.</u>	<u>Title</u>	<u>Following Page</u>
1	Vicinity Plan	A-1
2	Sites Investigated and Control Sampling Stations	A-1
3	Verification Sampling Points - Site No. 01 McAllister Point Landfill	F-5
4	Characterization Sampling Points - Site No. 01 McAllister Point Landfill	F-14
5	Verification Sampling Points - Site No. 02 - Melville North Landfill	G-2
6	Characterization Sampling Points - Site No. 02 - Melville North Landfill	G-7
7	Soil Sampling Locations - Site No. 02 - Melville North Landfill	G-7
8	Verification Sampling Points - Site No. 07 - Tank Farm One	H-6
9	Verification Sampling Points - Site No. 07 - Tank Farm One - Oil Water Separator	H-6
10	Characterization Sampling Points - Site No. 07 - Tank Farm One	H-10
11	Characterization Sampling Points - Site No. 07 - Tank Farm One - Oil Water Separator	H-10
12	Verification Sampling Points - Site No. 12 - Tank Farm Four	I-5
13	Characterization Sampling Points - Site No. 12 - Tank Farm Four	I-7
14	Verification Sampling Points - Site No. 14 - Gould Island Disposal Area	J-2
15	Characterization Sampling Points - Site No. 14 - Gould Island Disposal Area	J-6
16	Verification Sampling Points - Site No. 17 - Gould Island Electroplating Shop	K-2
17	Characterization Sampling Points - Site No. 17 - Gould Island Electroplating Shop	K-4

APPENDICES

Designation

- A YWC Sample Label
- B QA/QC Summary
- C YWC Laboratory Reports
- D Well Drillers Logs and Monitoring Well Details
- E Location Plan - Sampling Stations - Site 01
McAllister Point Landfill
- F Locations Plans - Sampling Stations - Sites 07, 12, 14
Tank Farms One and Four, Gould Island Disposal Area

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CONFIRMATION STUDY

EXECUTIVE SUMMARY

GENERAL

This Confirmation Study is a part of the Navy Assessment and Control of Installation Pollution (NACIP) Program "designed to identify contamination of Navy lands resulting from past operations and to institute corrective measures, as needed". The NACIP program consist of three distinct phases namely 1) initial assessment study (IAS), 2) confirmation study, and 3) corrective measures. The initial assessment study (conducted by others), was completed for the Naval Education and Training Center (NETC) in March, 1983. The IAS identified six sites where sufficient evidence exists to warrant confirmation studies, namely, 1) McAllister Point Landfill, 2) Melville North Landfill, 3) Tank Farm One, 4) Tank Farm Four, 5) Gould Island Disposal Area, and 6) Gould Island Electroplating Shop. The Confirmation Study consisted of an evaluation of previously identified sites to determine whether significant concentrations of toxic or hazardous materials are present and migrating by surface and/or subsurface routes, or whether the potential for migration exists. The Confirmation Study is conducted in two steps: a verification step and a characterization step. The scope of the work performed in the verification step was defined in the initial assessment study and modified slightly in conducting the verification step. The results of work performed in the verification step are fully discussed in a draft report submitted February 28, 1984 and revised May 8, 1984.

The characterization step was conducted on all six sites and the results are fully discussed in a draft report submitted March 13, 1985 and revised July 26, 1985. This executive summary presents a brief overview of the findings and recommendations of the entire confirmation study.

OVERVIEW OF SITE SPECIFIC FINDINGS

McAllister Point Landfill. This landfill received all of the wastes generated at the Newport Naval Complex from 1955 through the mid-1970's and is known to contain at least 200 gallons of PCB contaminated oil. Also in the landfill are spent acids, wastes paints, solvents, and waste oils. In the verification step, samples of soil leachate, near-shore sediments, and mussels were collected for analysis. Control samples were collected at two stations in Narragansett Bay for comparison. Sediment and mussel samples were analyzed for PCB's and the following metals; chromium, cadmium, lead, arsenic, mercury, selenium, silver, copper, barium, nickel, beryllium, antimony, and tin. Soils and leachate samples were analyzed for priority pollutants.

The results of the verification step sampling and analysis indicate that metals are accumulating in sediments and mussels near the McAllister Point Landfill based on comparison to data from the control stations. Elevated levels of lead, copper, nickel, and chromium were detected in the sediments (up to 150, 145, and 2 times that in the controls, respectively). Elevated copper concentrations were also found in the mussels (up to seven times that in the controls).

The priority pollutant examinations of the leachate samples indicated all priority pollutants to be below detection limits except for certain metals (cadmium and chromium), cyanides and phenols. Low concentrations of ethylbenzene and toluene were found in one leachate sample.

The priority pollutant examination of the composite soil sample indicated no significantly high values. Except for chromium, copper, lead, nickel and zinc, all priority pollutants in soils were below detection limits.

The sediment samples seemed to indicate that certain metals are accumulating in the vicinity of Station Nos. 12 and 13 near the south end of the landfill. The pollutants are not being concentrated by the mussels to the same extent, although the copper concentrations in the mussels were substantially higher near the south end of the landfill than at other stations further north or at the control stations. There is no significant accumulation of metals in the soil cover.

The verification step data seem to indicate that the landfill has caused or is continuing to cause metal deposition near Station Nos. 12 and 13. To determine the extent of the contamination and the migration pathways, additional sampling and analysis were carried out in the characterization step, including sediment, mussel and groundwater sampling and analysis. All samples were analyzed for lead, copper, chromium, and nickel. Groundwater samples were also analyzed for priority pollutants, pH and chlorides.

In general, the off-shore sediments sampled in the characterization step were found to be less contaminated than the near-shore sediments. Elevated levels of lead, copper, and nickel were found in sediments close to shore but the chromium concentrations at these stations were only slightly above the control sample concentrations. Lead and copper are being assimilated by mussels at rates up to 5 times that of the controls.

Four sets of samples were collected from the three monitoring wells, one upgradient and two downgradient of or in the fill. Samples from the two wells located in the landfill showed concentrations of lead and copper significantly higher than in the upgradient well.

The following summarizes recommendations for Site 01 - McAllister Point Landfill:

Hazardous wastes are known to have been deposited in the McAllister

Point Landfill and there is evidence that contaminants (principally lead and copper) have migrated out of the landfill and into the environment (mussels and sediments). The groundwater sampling data suggest that the migration pathway of the contaminants is via the groundwater but the concentrations of these metals do not seem high enough to point to the underlying groundwater as a continuing major source of environmental contamination. No evidence was found to indicate that the overlying soils or the visible leachate discharges were sources of environmental contamination. This means that no migration pathway was defined by the study to account for the environmental contamination found.

However, the proximity of the contaminated mussels and sediments to the landfill strongly points to the landfill as the source of the contamination. Surface runoff and visible leachate discharges flow into the Bay and the groundwater hydraulic gradients indicate that the groundwater is moving into the Bay along with any subsurface leachate which may be generated. The extent of the sediment and mussel contamination was not defined at the southern end of the fill, but it was established that the contaminants are confined to near-shore locations.

On the basis of the existing limited knowledge on mobilization of contaminants from sediments, there is no justification for an action such as removal of contaminated sediments to a disposal area. The elevated levels of metals in mussels are an obvious concern and the data should be reported to the State of Rhode Island. Any action with respect to the taking of mussels for food from the area would be at the discretion of the State of Rhode Island.

Additional studies are recommended to determine if the landfill is continuing to contribute contaminants into the Bay and if so, the

pathway(s) by which this is occurring. The extent of the contamination along the shoreline also needs further study. The format of these studies should be governed by the requirements of 40 CFR 300.68 which covers Remedial Investigation/Feasibility Study (RI/FS) activities for a hazardous waste site. These investigations would include more extensive monitoring well installations, sampling of groundwater, soil and surface water, and sediment and mussel sampling periodically to determine if the contaminant levels are changing. In addition, feasibility studies would be conducted to develop and analyze remedial alternatives.

To determine an order of magnitude cost for a remedial measure, a cost estimate was made for a clay cap (3 feet thick), burial of the scattered metallic debris along the shoreline and rip-rap of the seaward face to minimize erosion. The estimated cost for this work is \$1,100,000 exclusive of well installation, sampling and analysis. As mentioned above, an RI/FS program should be instituted before proceeding with any remedial measures.

A site monitoring program would continue for a five-year period to determine groundwater quality and to determine if sediment and mussel contaminants are increasing or decreasing.

Melville North Landfill. This site was used as a landfill from World War II to 1955. Wastes disposed of in this landfill included mostly domestic type refuse and some spent acids, waste paints, solvents, waste oils (diesel, fuel and lube), and PCB's.

In the verification step, samples of soil, near-shore sediments, and mussels were collected for analysis. The soil samples were analyzed for PCB's, chromium, cadmium, lead, arsenic, mercury, selenium, silver, copper, barium, nickel, beryllium, antimony, and tin.

The analytical data on samples collected indicate that there is no

significant accumulation of metals or PCBs in sediment or mussels collected at the three marine sampling points in comparison to data from control stations. The composite soil sample indicated the presence of some lead and very high concentrations of petroleum based hydrocarbons (PBHC). No PCBs were detected.

Visual soil examinations were conducted in the characterization step in order to determine the extent of the PBHC contaminated soil. None of the test holes showed any significant travel of oil laterally away from the piles. Some of the holes showed accumulations of waste bituminous paving material. These investigations indicate that the oily material has not migrated laterally away from the surface piles of the soil. Some downward migration may have occurred under the piles, but there was no indication of this at holes adjacent to the piles.

The following summarizes the remedial actions recommended for Site 02 - Melville North Landfill:

- Remove the oily soil piles to the limits shown on Figure No. 5 and dispose of the material as oil spill clean-up materials.
- Fill the disturbed area with clean soil, grade to drain and provide loam to promote growth of grass.

The estimated cost for this work is \$80,000.

Tank Farm One. This site includes six underground tanks each with a capacity of 60,000 barrels. Five of these tanks are now used for the storage of oils including aviation fuel. One tank is no longer used. In the past, these tanks were periodically cleaned to remove the sludge material which, over time, settles on the bottoms of the tanks. This practice occurred from World War II until the 1970's.

When the tanks were cleaned, the sludge material was placed in a pit

which was approximately 20 feet long, 10 feet wide, and 4 feet deep. These disposal pits were simply dug in the general vicinity of the tank being cleaned. The sludge was placed in the pits and allowed to weather for a few weeks. The pits were then covered over and marked with signs warning of tetraethyllead. These pits are spread throughout the tank farm, but through the years, most of the signs marking the disposal areas have disappeared. Only two markers remain at this time and samples were collected at those two locations.

Both groundwater and soil samples were collected in the verification step. The groundwater samples were analyzed for petroleum based hydrocarbons (PBHC), lead, and BTX (benzene, toluene, xylene). The soil samples were analyzed for lead and oil and grease.

The analytical data on all samples collected indicated the presence of oil or gasoline contaminants in the soil and groundwater at Tank Farm One. This judgment was based on the magnitude of the oil and grease concentrations in soil samples and the BTX concentrations in groundwater samples. Although some lead was found in the soil samples, the concentrations were relatively low and no lead was found in groundwater. The concentrations of BTX and petroleum based hydrocarbons in the groundwater samples were high; BTX contamination indicates pollutants from light oils such as gasoline.

The analytical data confirm the presence of oil and grease in deposits at the suspected locations of previous tank sediment burial pits. The analysis of groundwater samples confirmed that BTX contaminants are present in the groundwaters at one or more of the buried storage tanks.

As a result, groundwater monitoring wells were installed at two locations to enable collection of groundwater samples at three stations.

Soil samples were collected at three stations in the characterization phase. The groundwater samples were analyzed for PBHC and BTX, and the soil samples and some groundwater samples were analyzed for oil identification using high resolution gas chromatography to match the characteristics of oils found in the soil with oils found in the groundwater samples.

The results indicate that the petroleum products found in the soils from the old burial locations are weathered materials similar to No. 6 or Bunker C fuel oil. The petroleum products found in all other samples were significantly different and were indicative of weathered gasoline. No evidence was found to indicate that oil from previous disposal practices is entering the groundwater.

There are some petroleum-based hydrocarbons and BTX present in the groundwater underdrainage system and the oil-water separator is generally performing well in limiting these discharges to the Bay. No BTX was found in either groundwater monitoring well. Further investigation is needed to determine whether or not the existing tanks are leaking. However, it can be stated that the weathered gasoline found in the groundwater samples could have come from aviation fuel leaks from the existing tanks but confirmation of this can only be resolved by sampling of tank contents for comparison.

The results of the studies indicate that some light petroleum products have entered the groundwater but not from previous waste disposal practices. Consequently, the site does not require further study, investigation, or remedial action under the NACIP program.

Tank Farm Four. This site has 12 concrete underground tanks, each with a capacity of 60,000 barrels. These tanks were used by the Navy to store No. 5 and No. 6 fuel oils. The latest use of some of the tanks was under lease to a private contractor but the types of oils stored are not known. The use

of these tanks was discontinued several years ago, when they were emptied (but not cleaned) and refilled with water. When the tanks were in use, the bottom sludge was periodically removed and disposed of by burning; however, there was some suspicion that the cleanings were disposed of on the ground in the general vicinity of the tank being cleaned. There are no indications on the site as to specifically where these deposits, if any, were made.

Sediment, surface water, and soil samples were collected for analysis at this site in the verification step. The surface water and sediment samples were analyzed for lead and PBHC and the soil samples were composited into a single sample which was analyzed for lead and oil and grease.

The analytical data indicated that one or more of the soil samples was high in lead and/or oil and grease and that some petroleum based hydrocarbons may be escaping via surface runoff. The sources of these contaminants could be either of the following:

- Undefined locations of burial or dumping areas for tank bottom sediments.
- Leakage from tanks numbered 37 to 48 which were emptied but not cleaned when taken out of service.

In order to determine whether or not contaminants in the soils and/or abandoned tanks are migrating off-site, two groundwater monitoring wells were drilled in the characterization phase. Additionally, the water phase of six of the twelve tanks was sampled and analyzed so that a determination can be made as to the fate of this liquid. All samples collected were analyzed for lead and PBHC.

The analytical data indicate that there is some petroleum-based hydrocarbon contamination in the groundwater. No significant concentrations of lead were found. Since the direction of groundwater movement is toward Norman's Brook and the Bay, no water supplies could be affected by this

contamination and any impact on beneficial uses of the groundwater or the Bay would be practically non-detectable.

The pollutants found in the bottom water of the oil storage tanks are such that the waters could, after pretreatment, be discharged to a sanitary sewer during oil removal operations if necessary.

The following summarizes the recommendations for Site 12 - Tank Farm Four:

There is no evidence to indicate that hazardous wastes are now or were in the past stored in the tanks, or that any hazardous wastes were buried on the site. These conclusions are based on the definitions of hazardous wastes in EPA 40 CFR 261. Any remedial action will most likely be based on (1) the State of Rhode Island Hazardous Waste Rules and Regulations, (which cover a wider range of materials), or on (2) the State of Rhode Island Regulations for Underground Storage Facilities Used for Petroleum Products and Hazardous Materials.

Further investigations are needed to include additional record searches, additional sampling and complete inventory of the contents of all tanks to (1) determine if the tanks do fall under the State regulations, (2) determine the quantities of oil and water to be reclaimed and/or disposed of, (3) define a remedial action program to empty the tanks, clean the tanks and inspect the tanks for defects, and (4) establish the extent of groundwater contamination if the tank inspection indicates that leaks may have occurred.

These studies should be coordinated with the Rhode Island DEM to insure proper compliance with State regulations because some of the provisions are not possible to comply with for Tank Farm Four.

Therefore, the Rhode Island DEM should be asked to accept an

alternative program affording equal environmental protection with respect to Tank Farm Four, if permanent closure is required under the regulations.

Such an alternative program might include, for example:

- Removal of contents and cleaning of tanks
- Inspection of tanks for leak or defects
- If evidence of possible leakage is found, install groundwater monitoring wells and conduct a groundwater sampling and analysis program to evaluate groundwater contamination
- Destruction of tanks or securing of tanks in a safe condition at the option of the Navy

Temporary closure of underground tanks is also allowed under the Rhode Island regulations. If the Navy should elect to maintain the tanks for possible future use as a tank farm, then temporary closure should be requested and special terms negotiated with the State of Rhode Island to include consideration of the unique nature of the facility as a defense installation, with terms similar to that suggested for permanent closure.

To determine an order of magnitude cost for a remedial measure, a cost estimate was made for demolition of the tanks.

The tanks would be emptied and cleaned and the roofs of the tanks demolished by collapsing them into the bottom of the tank. Several holes would be made in the bottom of each tank and all piping removed. The tanks would then be filled with bank run gravel or on-site material, if available.

A groundwater monitoring program would be conducted to determine if groundwater contamination exists and, if so, what remedial measures are needed.

The estimated cost for this work is \$2,600,000 exclusive of well installation, sampling and analysis.

Gould Island Disposal Area. This site was used throughout the World War II period and received all the wastes generated on the island. Some wastes were incinerated on the site and the ash was dumped on the site along with other wastes. The deposits were made on a steep slope facing Narragansett Bay on the west side of the island. The site was last used about 30 years ago. In addition to the normal types of industrial refuse, there was considerable waste production from electroplating and degreasing operations on the island during World War II. Wastes from these operations would have gone to this site unless they were discharged directly into Narragansett Bay. These wastes would have included muriatic acid, chromic acid, copper cyanide, sodium cyanide, sodium hydroxide, nickel sulfate, and Anodex cleaner.

In the verification step, samples of near-shore sediments and mussels were collected for analysis. All samples were analyzed for PCB, chromium, cadmium, lead, arsenic, mercury, selenium, silver, copper, barium, nickel, beryllium, antimony, and tin.

The analytical data on samples collected indicated that metals are accumulating in sediments and mussels near the Gould Island Disposal area. This judgment is based on comparison of the verification step sampling and analytical data with the control station data. Elevated levels of lead, copper, chromium, and nickel were detected in the sediments. No PCB contamination was found in any of the sediment samples.

Slightly elevated copper concentrations were found in mussels by comparison to the controls. These do not appear to be significantly high, however. No other metals were found in the mussel samples. The PCB levels in mussels were lower than those found in the controls.

Additional sediment and mussel sampling and analysis was conducted in the characterization step. All of the samples were analyzed for lead,

copper, chromium, and nickel.

In general, the off-shore sediments sampled in the characterization step were found to be less contaminated than the near-shore sediments. Elevated levels of lead and copper were found in sediments close to shore. The chromium and nickel concentrations at these stations were only slightly above the control sample concentrations. Lead and copper are being assimilated by mussels at rates higher than the controls.

The following summarizes recommendations for Site 14 - Gould Island Disposal Area:

Hazardous wastes are known to have been deposited in the Gould Island Disposal Area and there is evidence that contaminants (principally lead and copper) have migrated out of the landfill and into the environment (mussels and sediments)).

No groundwater level observations were made nor were any monitoring wells installed because of logistical problems. Consequently, no data are available to indicate whether or not the underlying groundwater is a continuing major source of environmental contamination. No soil samples were collected and there was no visible evidence of leachate discharges. This means that no migration pathway was defined by the study to account for the environmental contamination found.

However, the proximity of the contaminated mussels and sediments to the landfill strongly points to the landfill as the source of the contamination. Surface runoff discharges into the Bay and the steep surface topography indicates that the groundwater is moving into the Bay along with any subsurface leachate which may be generated. The extent of the sediment and mussel contamination was not defined at the northern and southern ends of the fill, but it was established that the contaminants are confined to near-shore locations.

On the basis of the existing limited knowledge on mobilization of contaminants from sediments, there is no justification for an action such as removal of contaminated sediments to a disposal area. The elevated levels of metals in mussels are an obvious concern and the data should be reported to the State of Rhode Island. Any action with respect to the taking of mussels for food from the area would be at the discretion of the State of Rhode Island.

Additional studies are recommended to determine if the landfill is continuing to contribute contaminants into the Bay and if so, the pathway(s) by which this is occurring. The extent of the contamination along the shoreline also needs further study. The format of these studies should be governed by the requirements of 40 CFR 300.68 which covers Remedial Investigation/Feasibility Study (RI/FS) activities for a hazardous waste site. These investigations would include monitoring well installations, sampling of groundwater, soil and surface water, and sediment and mussel sampling periodically to determine if the contaminant levels are changing. In addition, feasibility studies would be conducted to develop and analyze remedial alternatives.

To determine an order of magnitude cost for a remedial measure, a cost estimate was made for a clay cap (3 feet thick), burial of the scattered metallic debris along the shoreline, and rip-rap of the seaward face to minimize erosion. The estimated cost for this work is \$650,000 exclusive of well installation, sampling and analysis. As mentioned above an RI/FS program should be instituted before proceeding with any remedial measures.

A site monitoring program would continue for a five-year period to determine groundwater quality and to determine if sediment and mussel contaminants are increasing or decreasing.

Gould Island Electroplating Shop. Extensive electroplating and degreasing operations occurred on Gould Island (Building 32) during World War II. These operations existed only during the war. The wastes generated included muriatic acid, chromic acid, copper cyanide, sodium cyanide, sodium hydroxide, nickel sulfate, Anodex cleaner, and degreasing solvents. The method of disposal could not be verified. However, rinse water was most likely discharged into the bay while concentrated spent plating solutions were probably bled slowly into the wastewater stream. Plating sludges, on the other hand, were probably disposed of in the landfill.

Both sediment and mussel samples were collected at this site during the verification step. The samples were analyzed for cyanide (sediment only), chromium, cadmium, lead, mercury, silver, copper, and nickel.

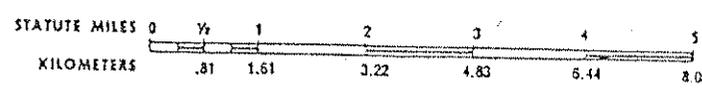
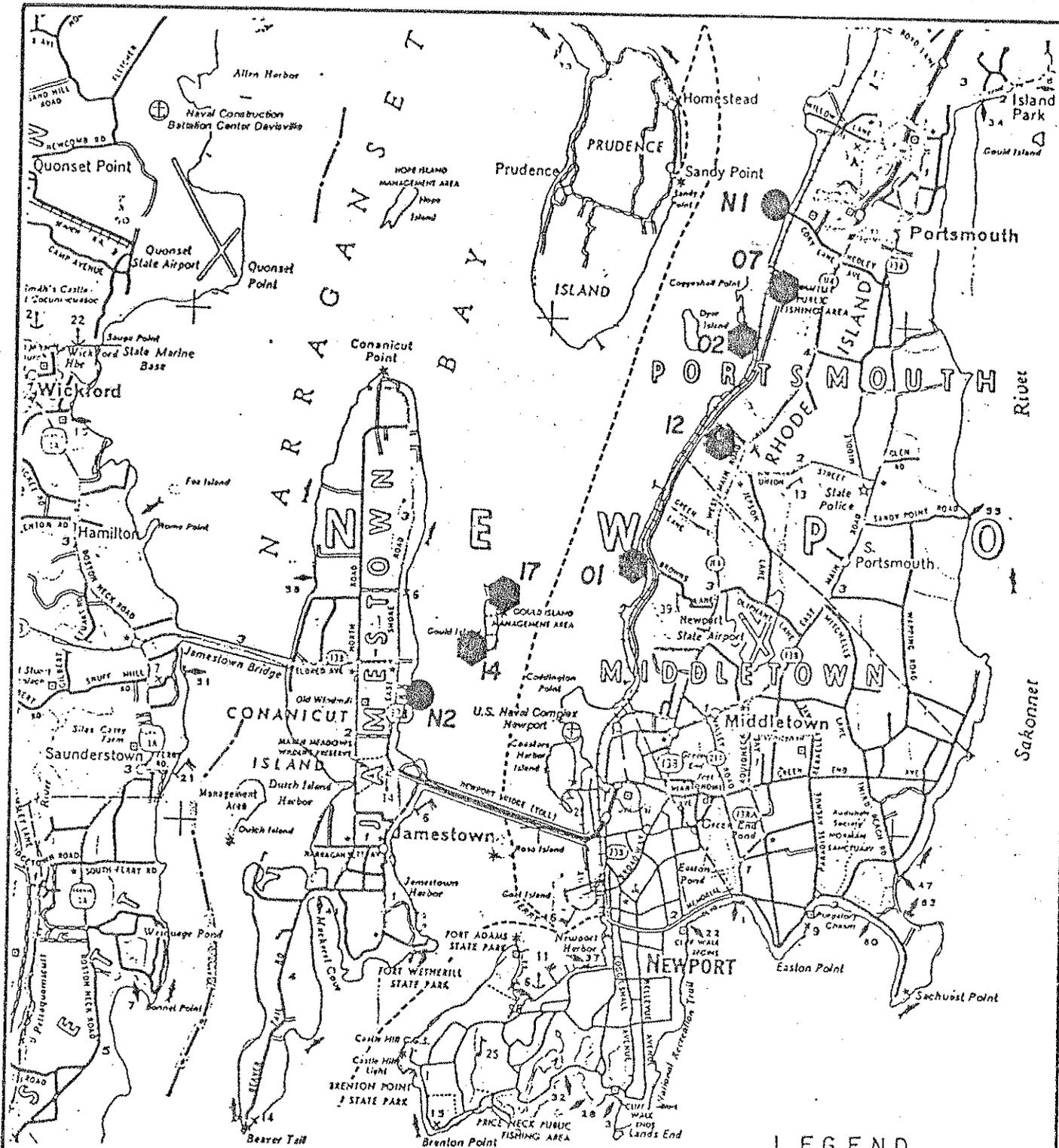
The analytical data on samples collected indicated that slightly elevated concentrations of cyanide and copper are present in sediments and an elevated concentration of copper is present in mussels collected from the vicinity of one of the discharge pipes at the Gould Island Electroplating Shop.

Additional mussel sampling and analysis was conducted during the characterization step. The sample was analyzed for chromium, copper, lead, and nickel.

The analytical data on samples collected indicate that metals in mussels are comparable to the controls.

No further studies or remedial actions are needed at this site because the levels of contaminants found are not significantly high.

CONTROL SAMPLING POINTS

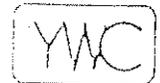


GRAPHIC SCALE

- LEGEND**
-  12 SITE LOCATION & NUMBER
 -  NI CONTROL STATION & NUMBER

CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

SITES INVESTIGATED
& CONTROL SAMPLING STATIONS



York Wastewater Consultants, Inc.
Stamford, Connecticut

LEA LOUREIRO ENGINEERING ASSOCIATES

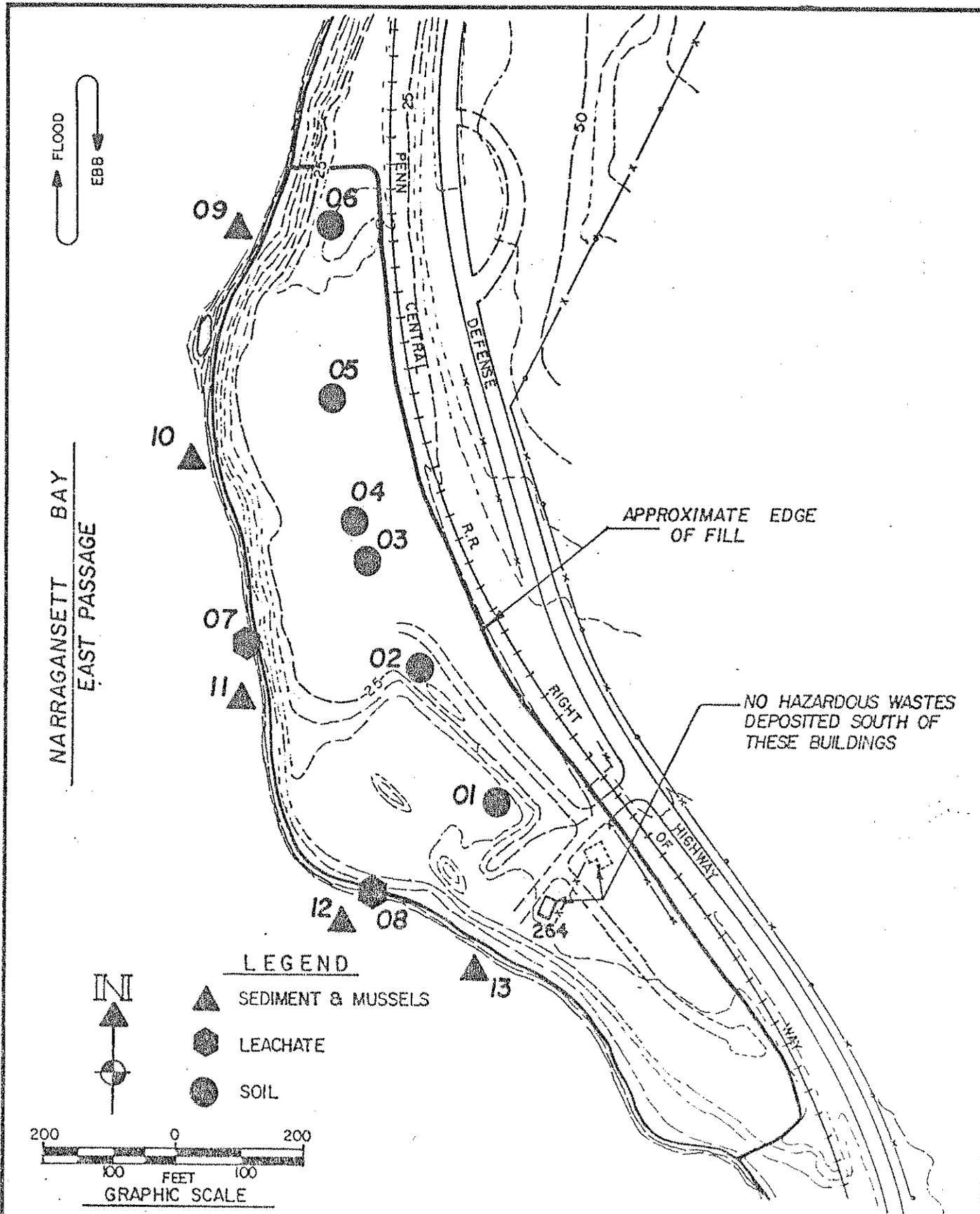
a professional corporation
CONSULTING ENGINEERS

AVON, CT.

MAR. 13, 1985

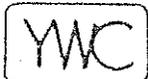
FIG. NO. 2

VERIFICATION SAMPLING POINTS



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

McALLISTER POINT LANDFILL
SITE NO 01
VERIFICATION SAMPLING POINTS



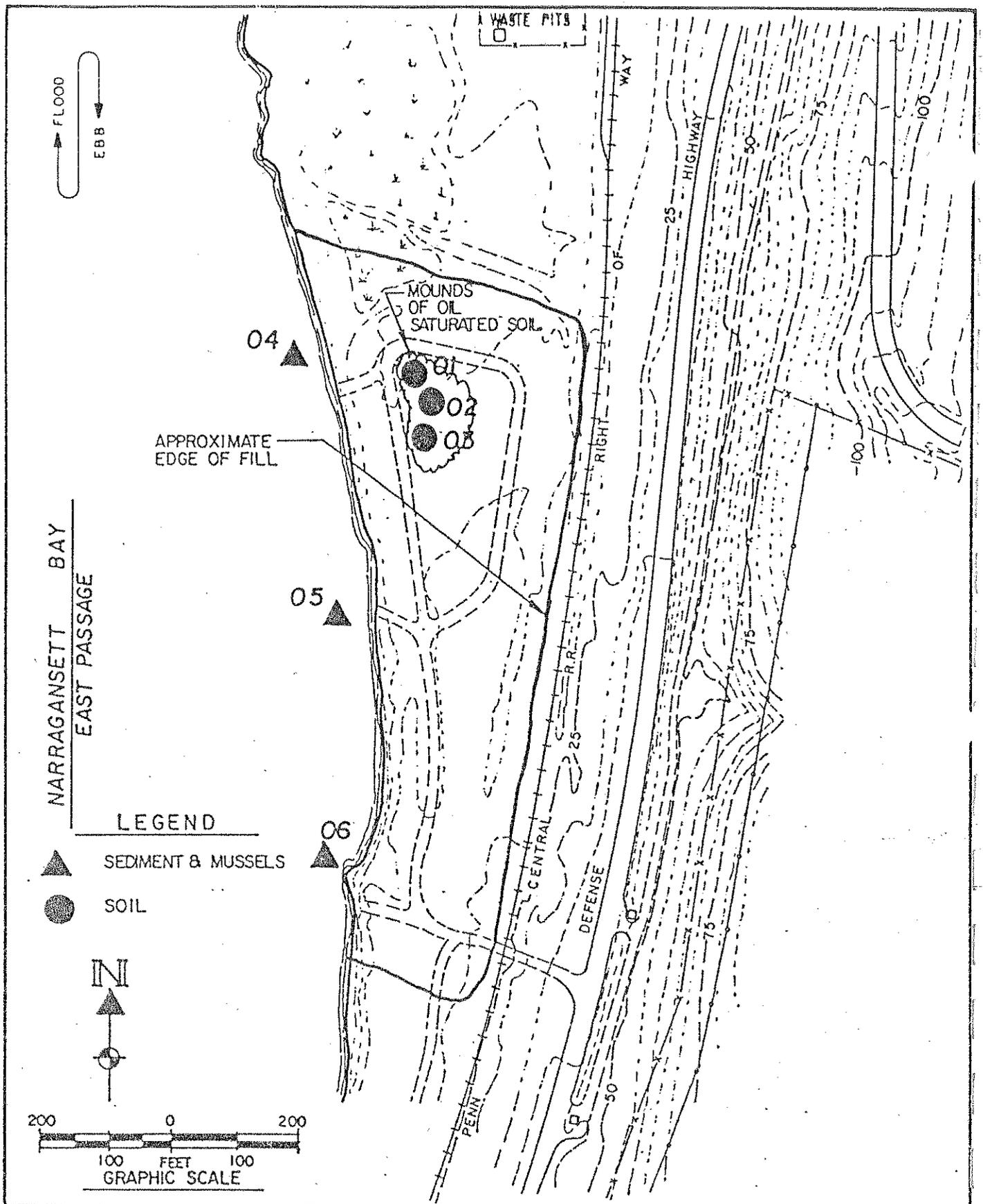
York Wastewater Consultants, Inc.
Stamford, Connecticut



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a professional corporation
CONSULTING ENGINEERS
AVON, CT.

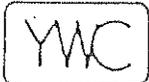
FEB. 28, 1984
REVISED MAY 8, 1984

FIG. NO. 3



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

MELVILLE NORTH LANDFILL
SITE NO 02
VERIFICATION SAMPLING POINTS



York Wastewater Consultants, Inc.
Stamford, Connecticut

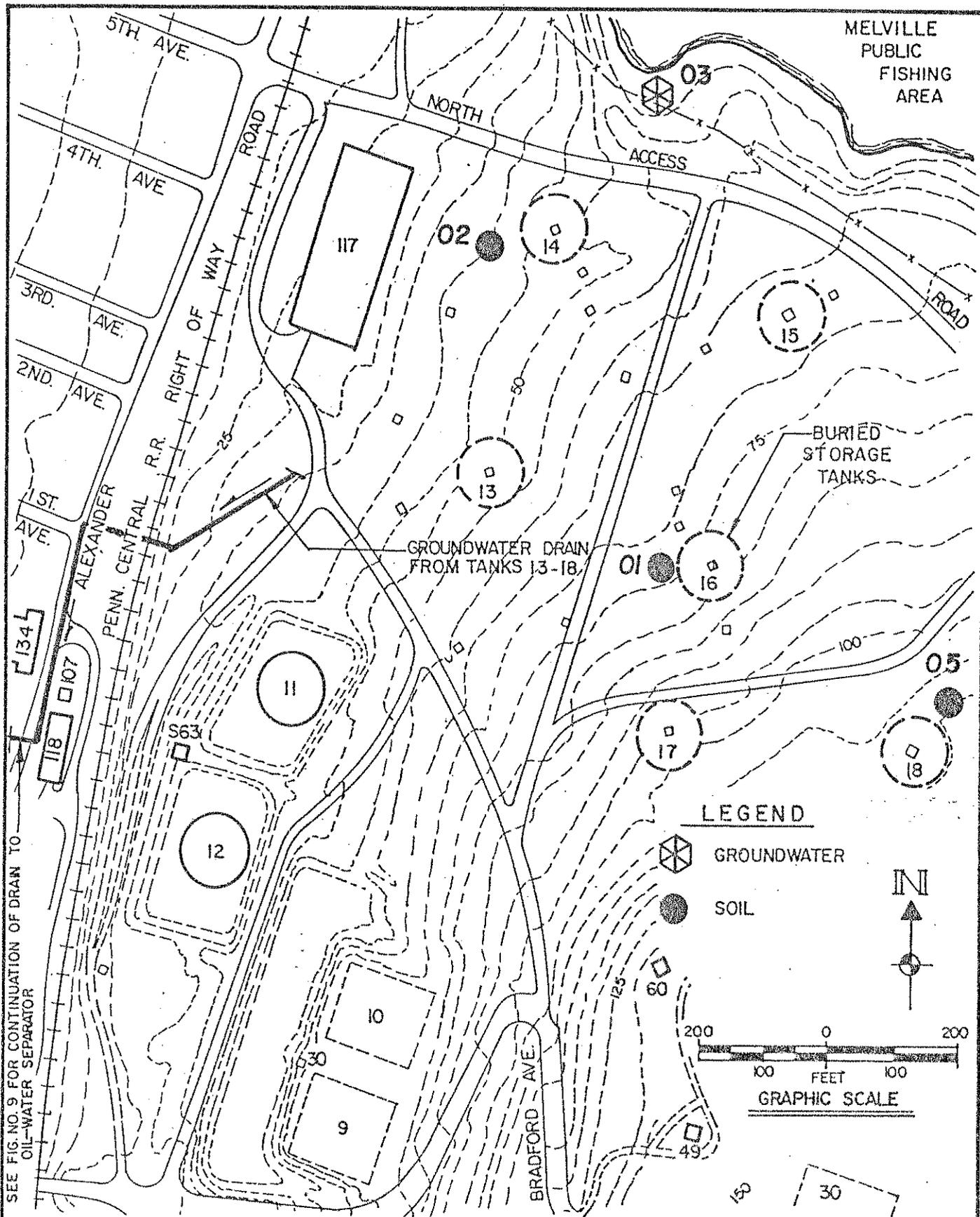


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AVON, CT.

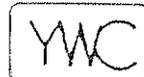
FEB. 28, 1984

FIG. NO. 5



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
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TANK FARM ONE
SITE NO 07
VERIFICATION SAMPLING POINTS



York Wastewater Consultants, Inc.
Hamford, Connecticut

LEA LOUREIRO ENGINEERING ASSOCIATES
a professional corporation

CONSULTING ENGINEERS

AVON, CT.

FEB. 28, 1984

FIG. NO. 8

CHAMBER 163

NOTE: THIS DRAIN COLLECTS GROUNDWATER FROM THE VICINITY OF BURIED TANKS NUMBERED 13 TO 18 (SEE FIG. NO. 8 FOR CONTINUATION)

SLAB TO BLDG 65

6" AC. B.S. BK.

QUARTERS D

OIL-WATER SEPARATOR

NOTE: THESE BYPASS LINES WERE USED DURING SAMPLING AT STATION 04

HOLDING BASIN 04

OIL-WATER SEPARATOR

ROAD

ALEXANDER

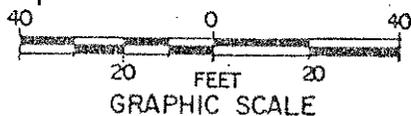
IN



LEGEND

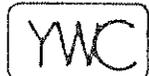


GROUNDWATER



CONFIRMATION STUDY ON HAZARDOUS WASTE SITES NEWPORT NAVAL EDUCATION & TRAINING CENTER

TANK FARM ONE - OIL-WATER SEPARATOR SITE NO 07 VERIFICATION SAMPLING POINTS



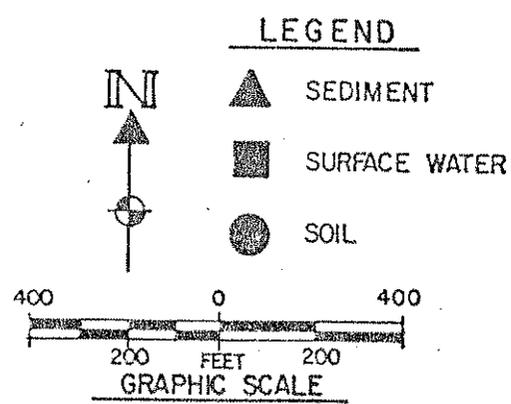
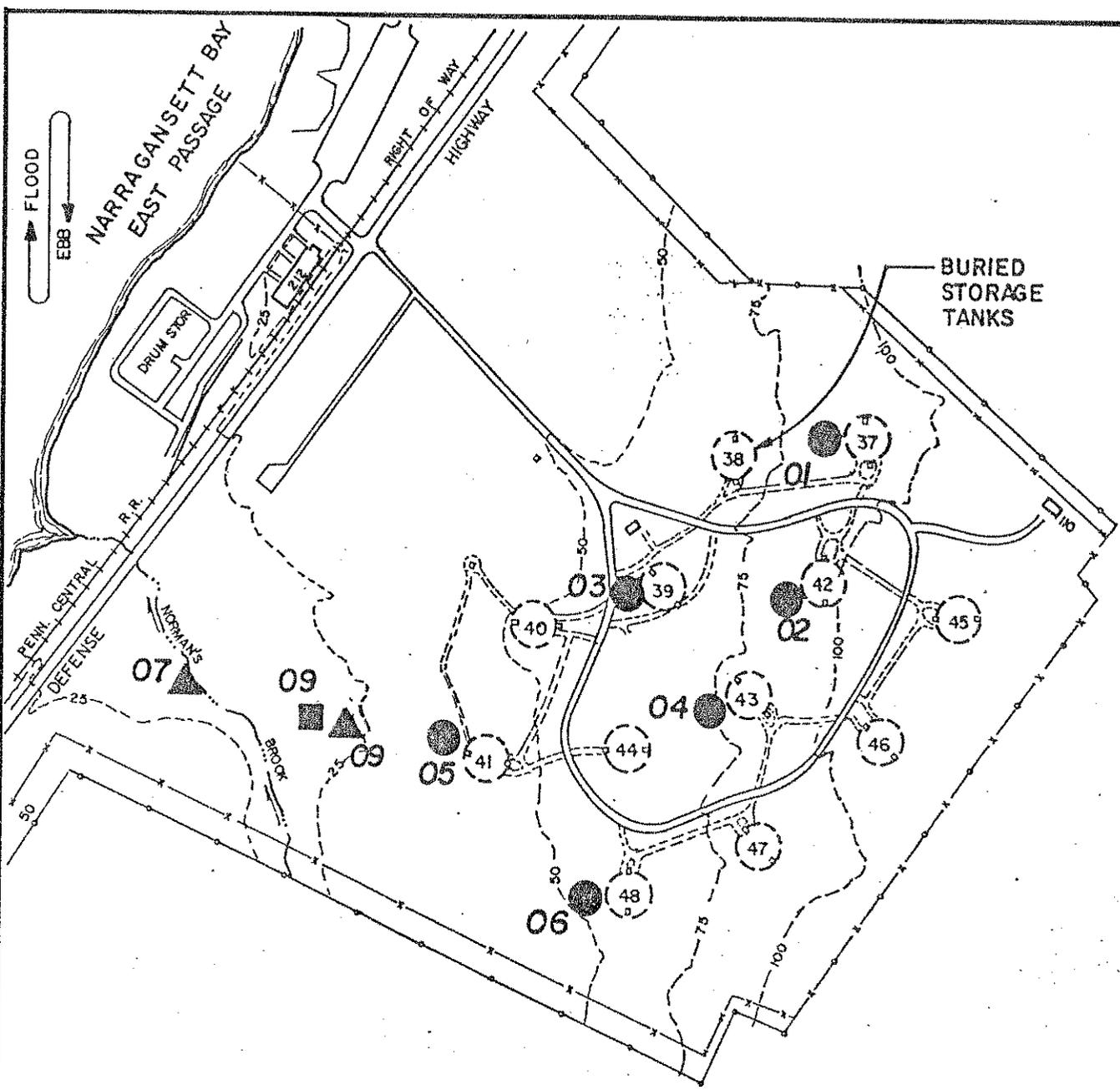
York Wastewater Consultants, Inc. Stamford, Connecticut



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FEB. 28, 1984

FIG. NO. 9



NOTE:
 THE SURFACE WATER AT STATION 09
 WAS ACTUALLY GROUNDWATER SEEPAGE
 IN WET WEATHER.

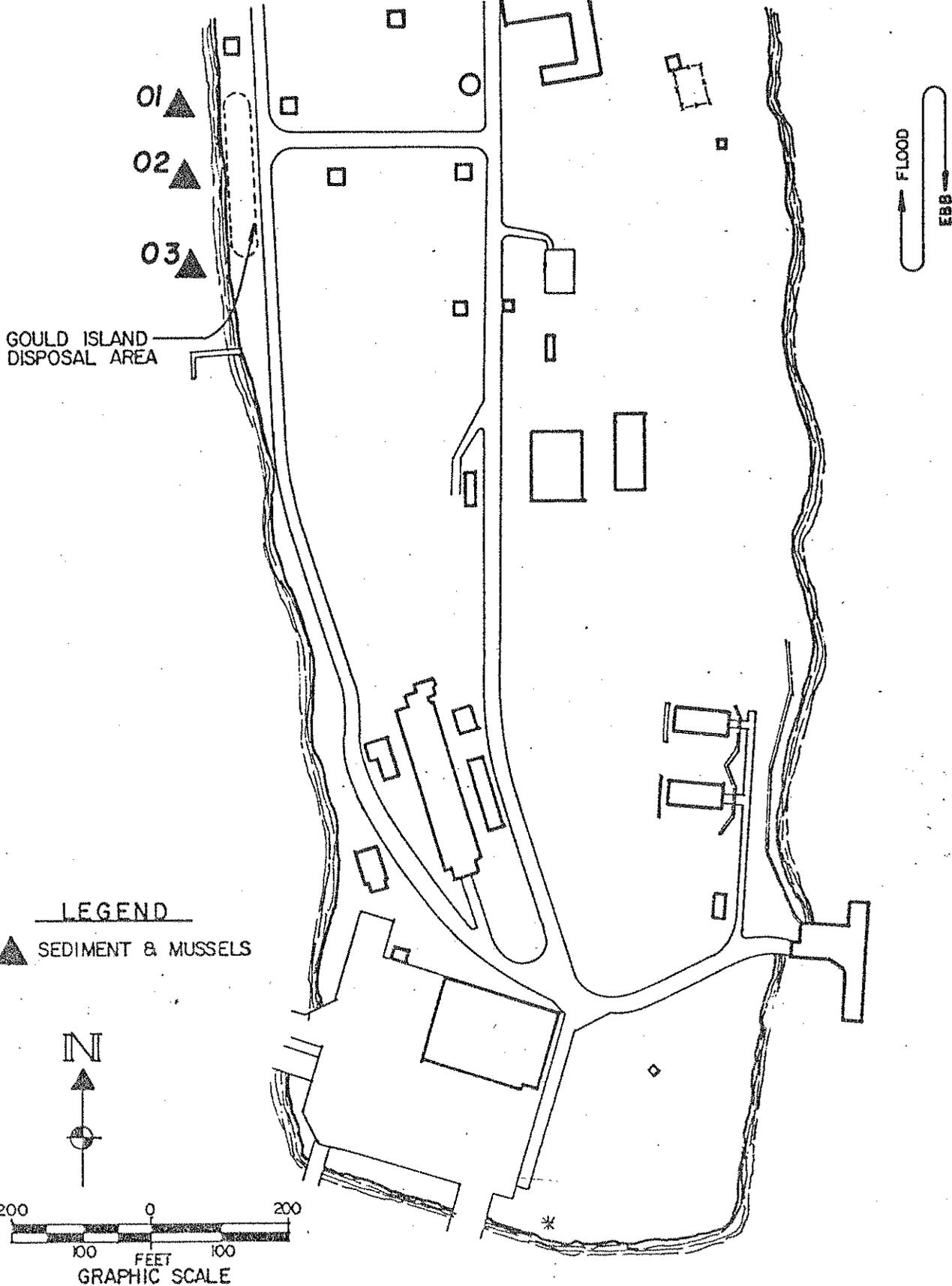
CONFIRMATION STUDY
 ON HAZARDOUS WASTE SITES
 NEWPORT NAVAL EDUCATION &
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TANK FARM FOUR
 SITE NO 12
 VERIFICATION SAMPLING POINTS

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FEB. 28, 1984
 FIG. NO. 12



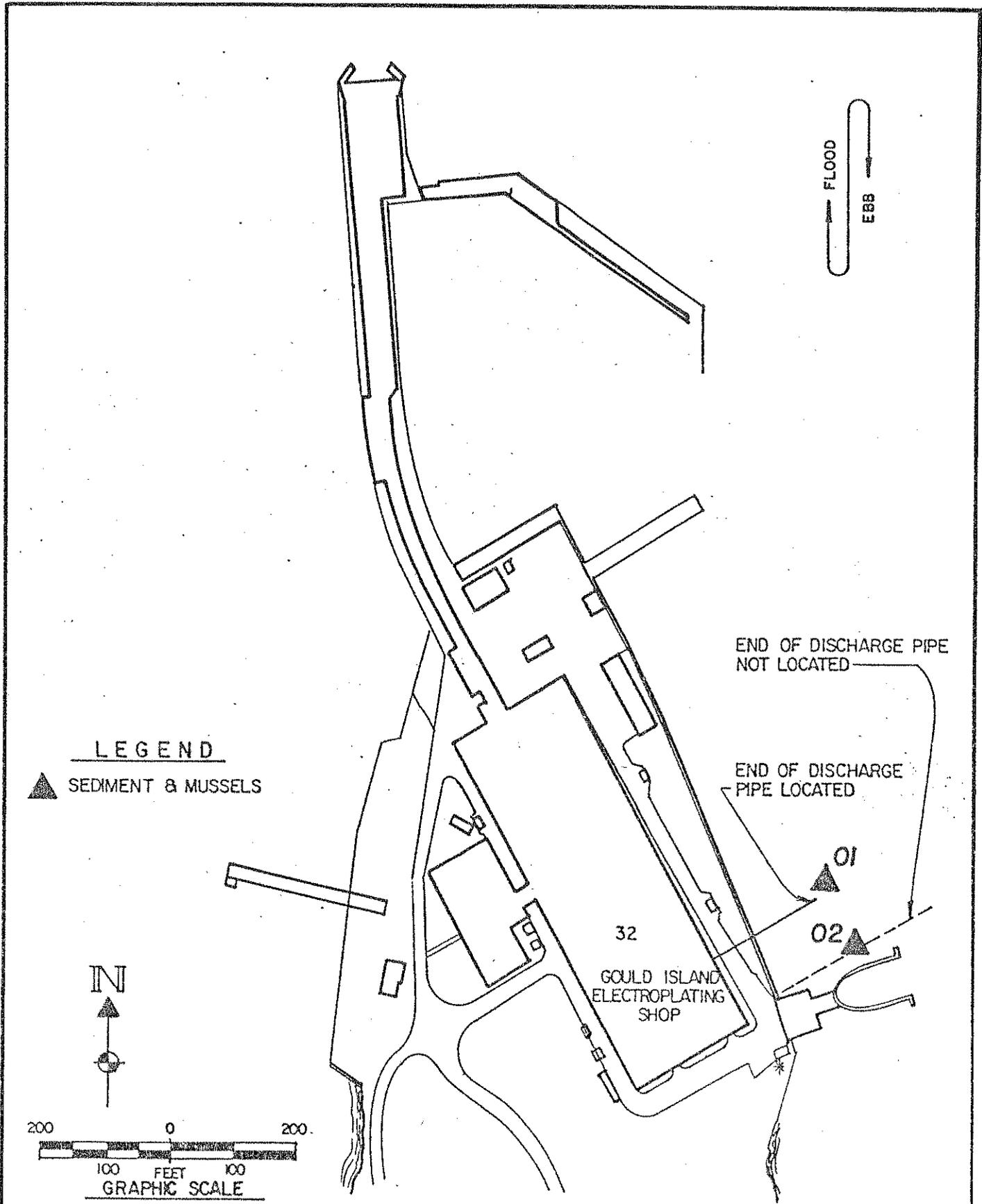
CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

GOULD ISLAND DISPOSAL AREA
SITE NO 14
VERIFICATION SAMPLING POINTS

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FIG. NO. 14



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
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GOULD ISLAND ELECTROPLATING SHOP
SITE NO 17
VERIFICATION SAMPLING POINTS



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Stamford, Connecticut



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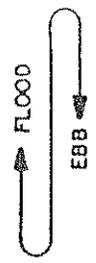
CONSULTING ENGINEERS

AVON, CT.

FEB. 28, 1984

FIG. NO. 16

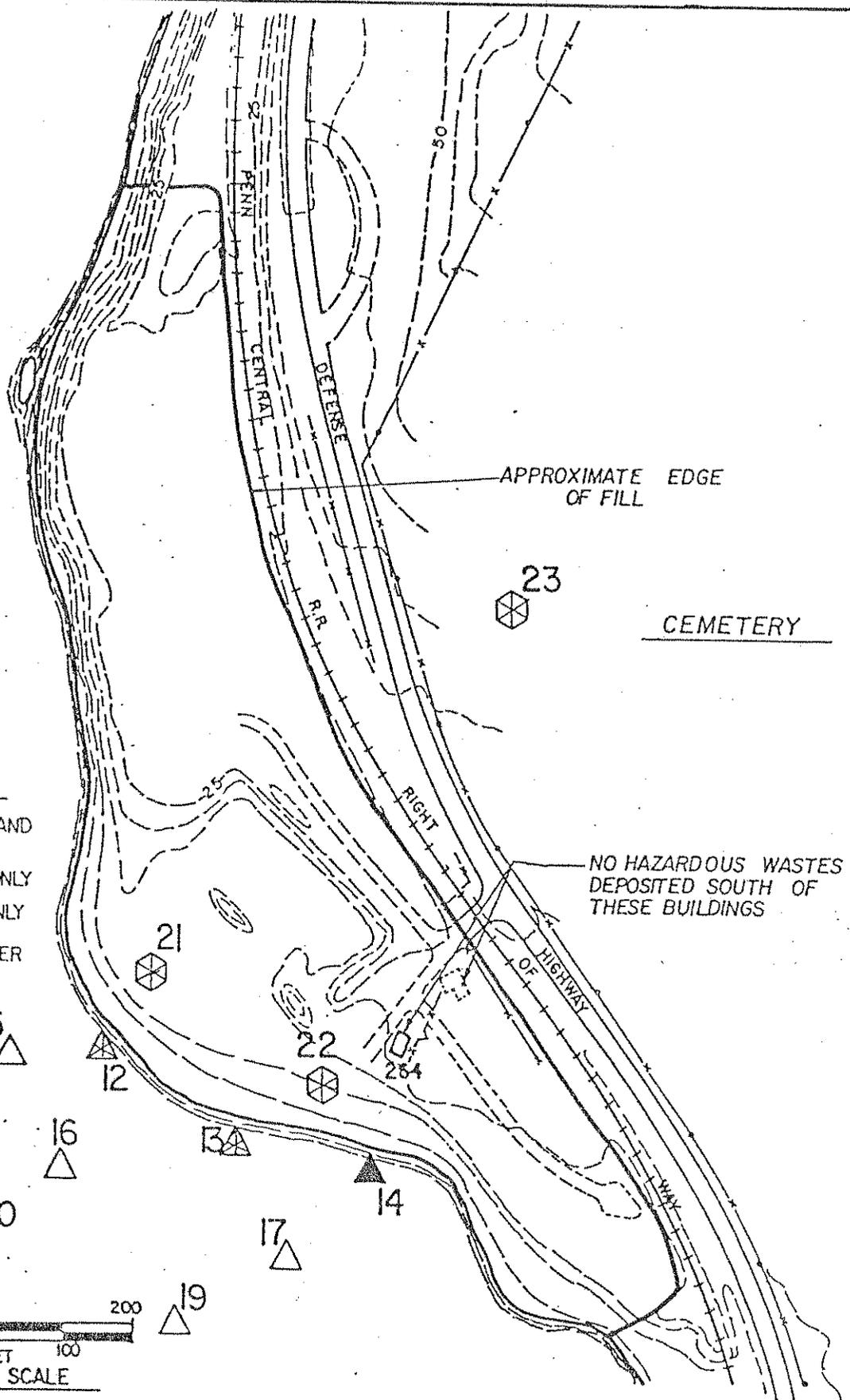
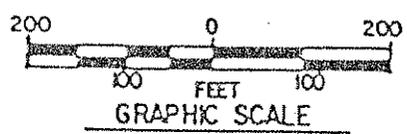
CHARACTERIZATION SAMPLING POINTS



NARRAGANSETT BAY
EAST PASSAGE

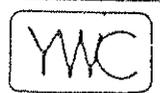
LEGEND

- ▲ SEDIMENT AND MUSSELS
- △ SEDIMENT ONLY
- ⊠ MUSSELS ONLY
- ⊞ GROUNDWATER



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

McALLISTER POINT LANDFILL
SITE NO 01
CHARACTERIZATION SAMPLING POINTS



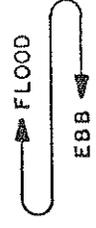
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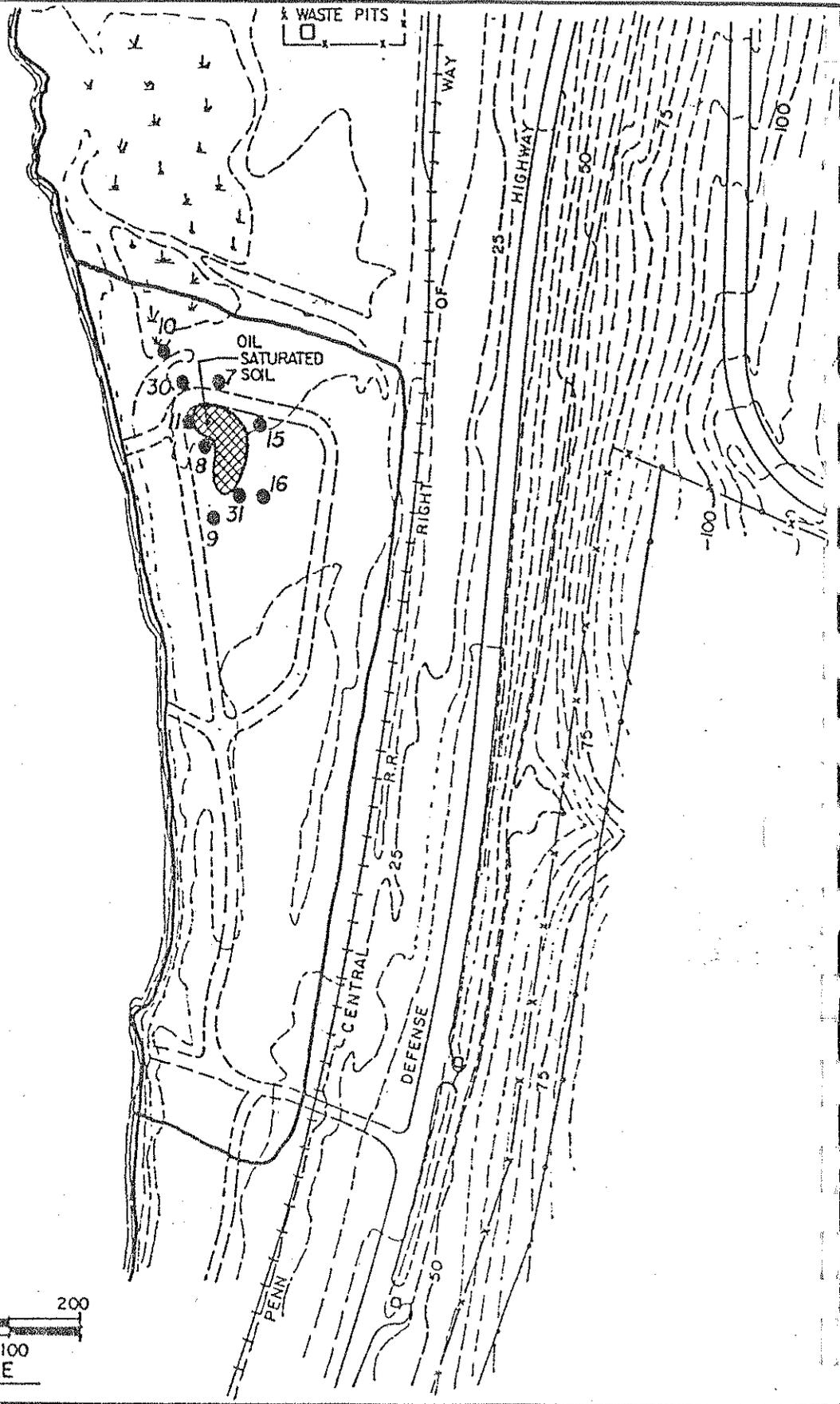
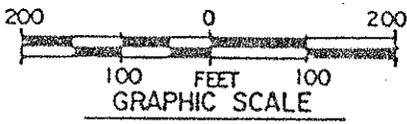
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FIG. NO. 4

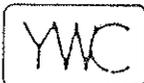


NARRAGANSETT BAY
EAST PASSAGE



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

MELVILLE NORTH LANDFILL
SITE NO 02
CHARACTERIZATION SAMPLING POINTS



York Wastewater Consultants, Inc.
Stamford, Connecticut

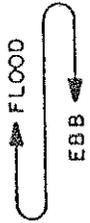


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AVON, CT.

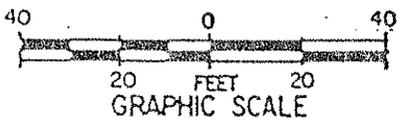
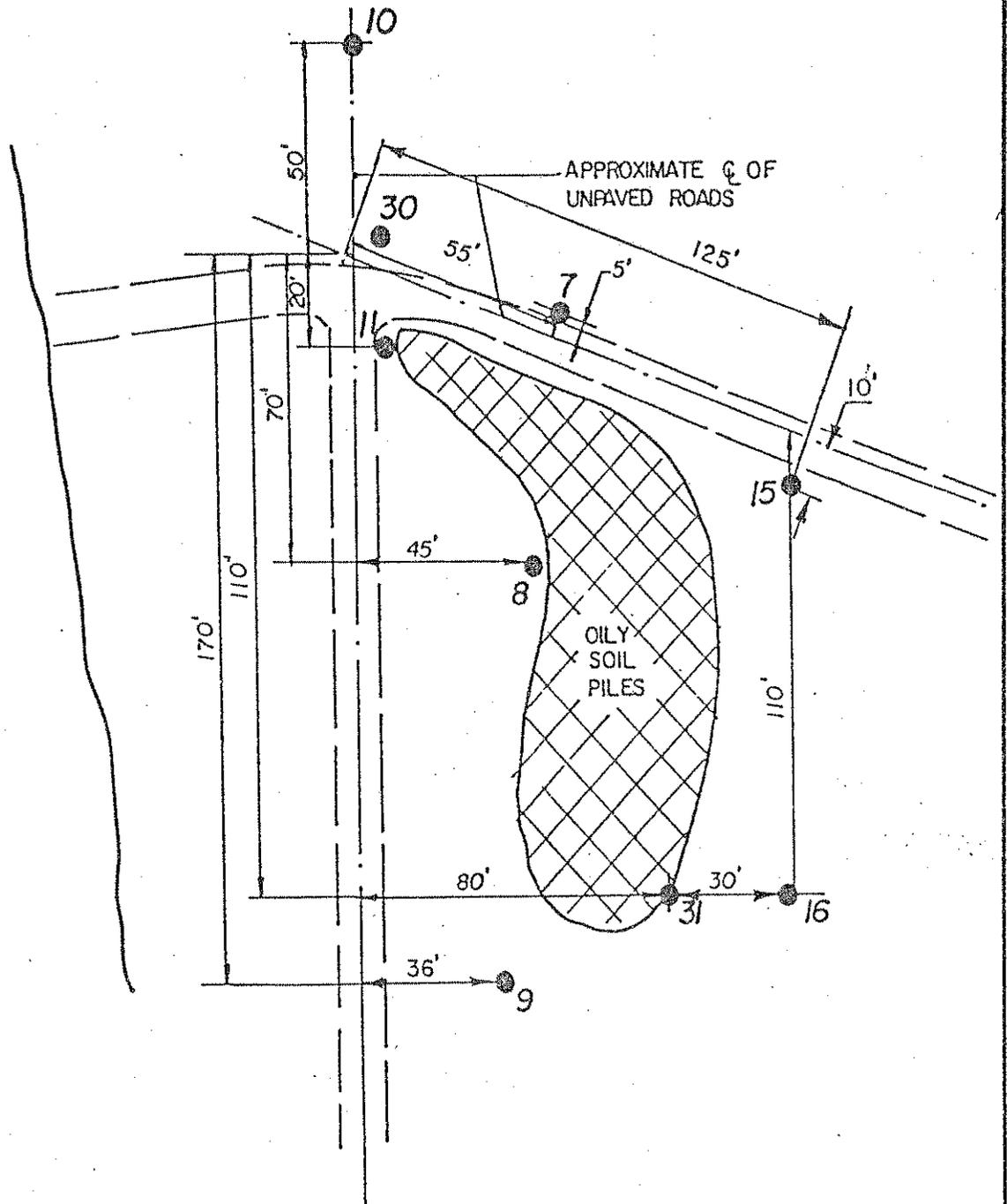
MAR. 13, 1985

FIG. NO. 6

OILY SOIL PILES = 6000 S.F. @ 3 FEET
AVE. DEPTH = 670 C.Y.

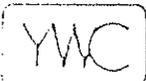


NARRAGANSETT BAY
EAST PASSAGE



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
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MELVILLE NORTH LANDFILL
SITE NO. 02
SOIL SAMPLING LOCATIONS



YMC
YOUNG & MCKEON
CONSULTANTS, INC.
STAMFORD, CONNECTICUT



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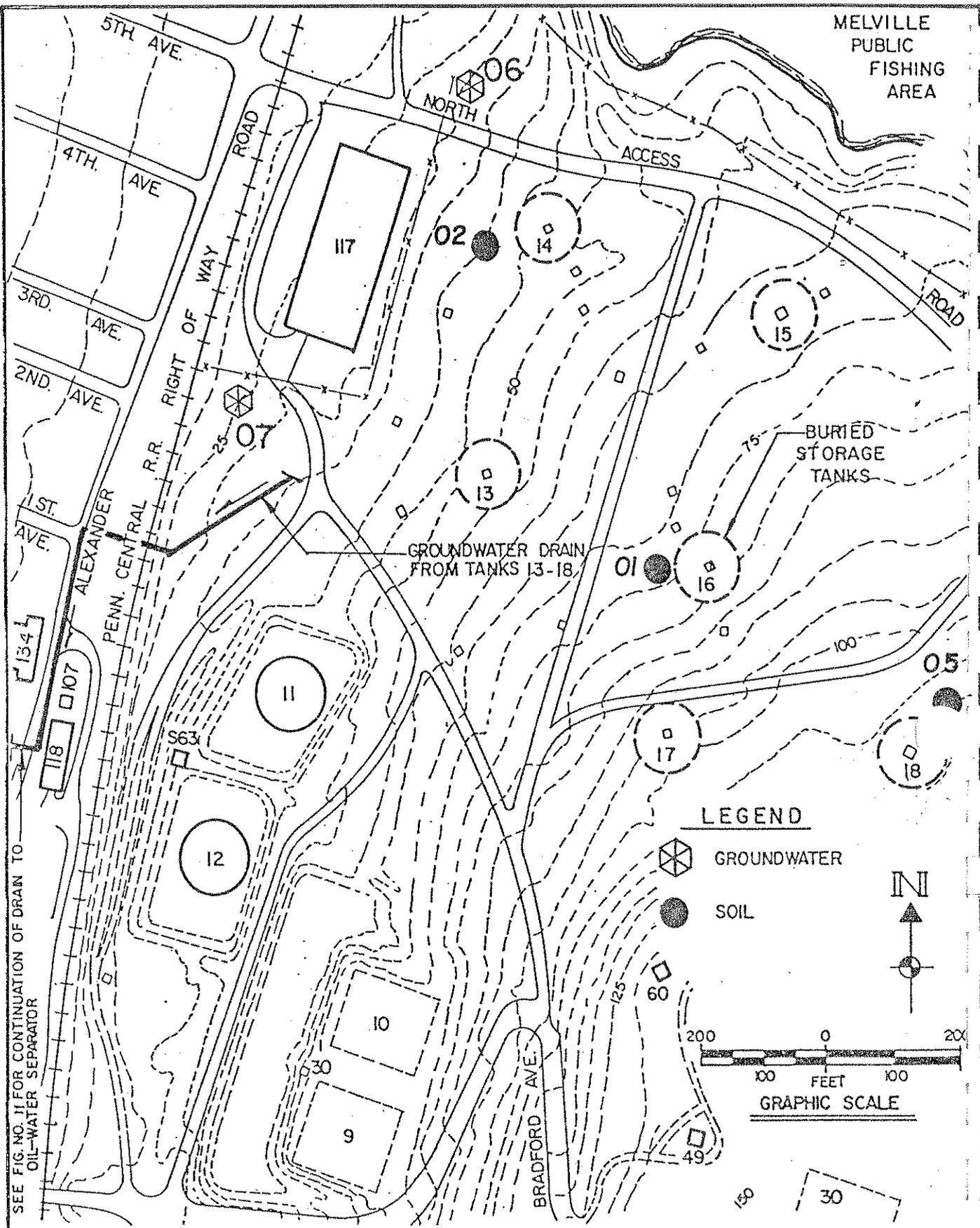
a professional corporation

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FIG. NO. 7

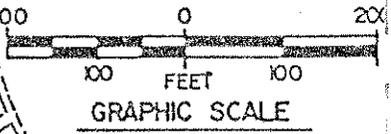


MELVILLE
PUBLIC
FISHING
AREA

SEE FIG. NO. 11 FOR CONTINUATION OF DRAIN TO
OIL-WATER SEPARATOR

LEGEND

-  GROUNDWATER
-  SOIL



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

TANK FARM ONE
SITE NO 07
CHARACTERIZATION SAMPLING POINT



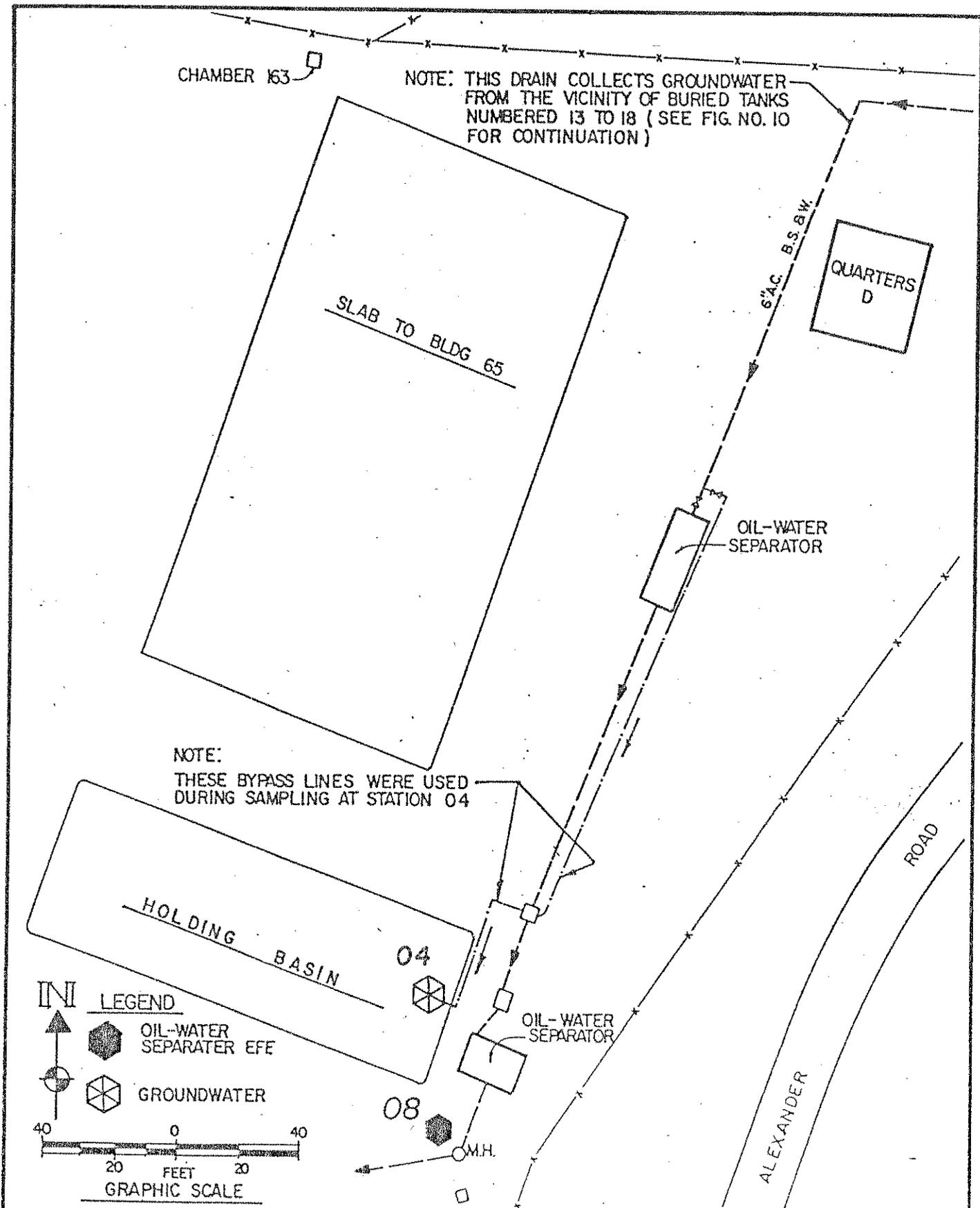
York Wastewater Consultants, Inc.
Stamford, Connecticut



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a professional corporation
CONSULTING ENGINEERS AVON, CT.

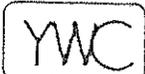
MAR. 13, 1985

FIG. NO. 10



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

TANK FARM ONE - OIL-WATER SEPARATOR
SITE NO 07
CHARACTERIZATION SAMPLING POINTS



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Stamford, Connecticut



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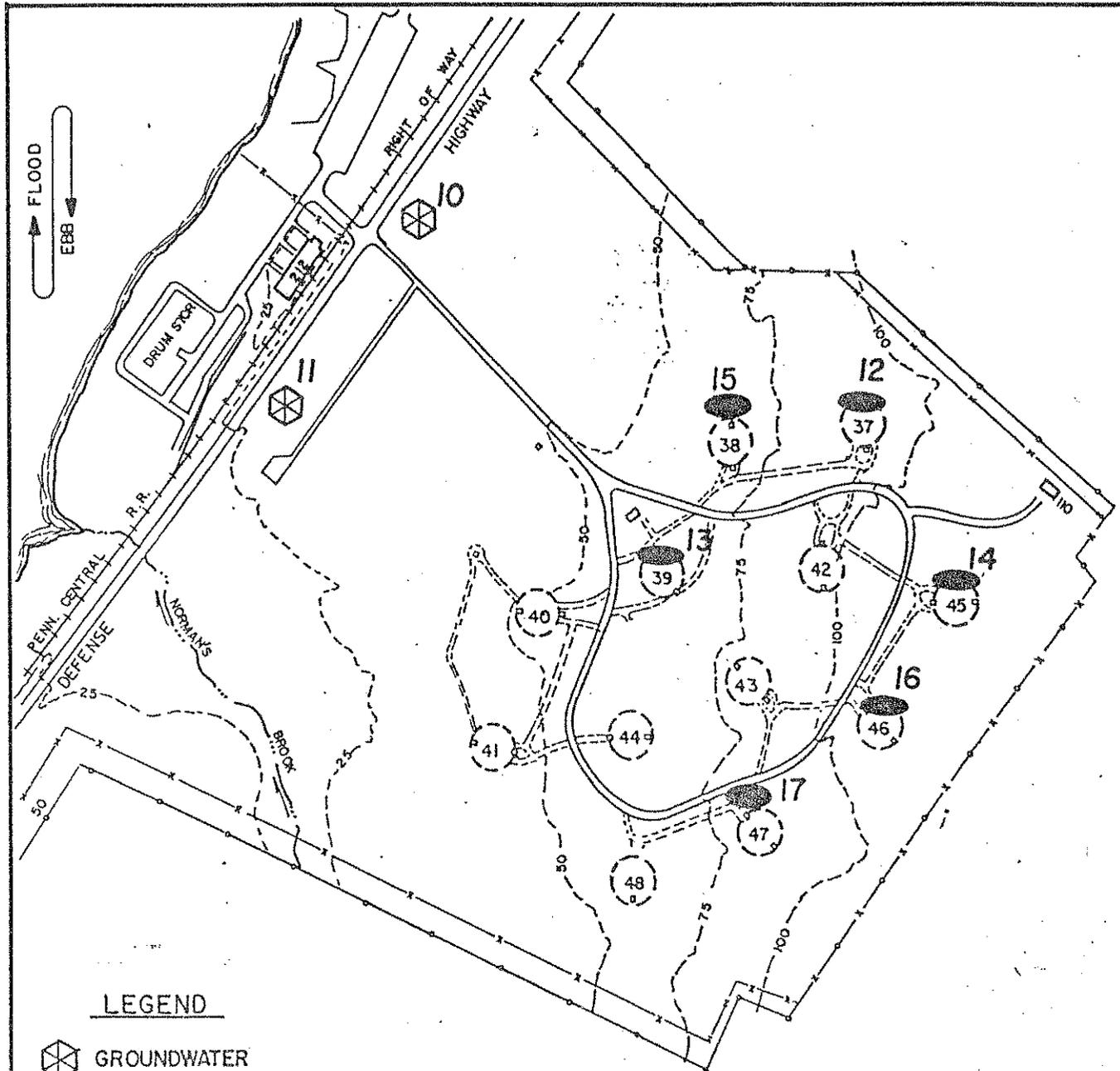
a professional corporation

CONSULTING ENGINEERS

AVON, CT.

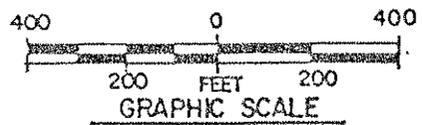
MAR. 13, 1985

FIG. NO. 11



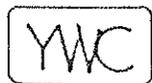
LEGEND

-  GROUNDWATER
-  TANK SAMPLE



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

TANK FARM FOUR
SITE NO 12
CHARACTERIZATION SAMPLING POINTS



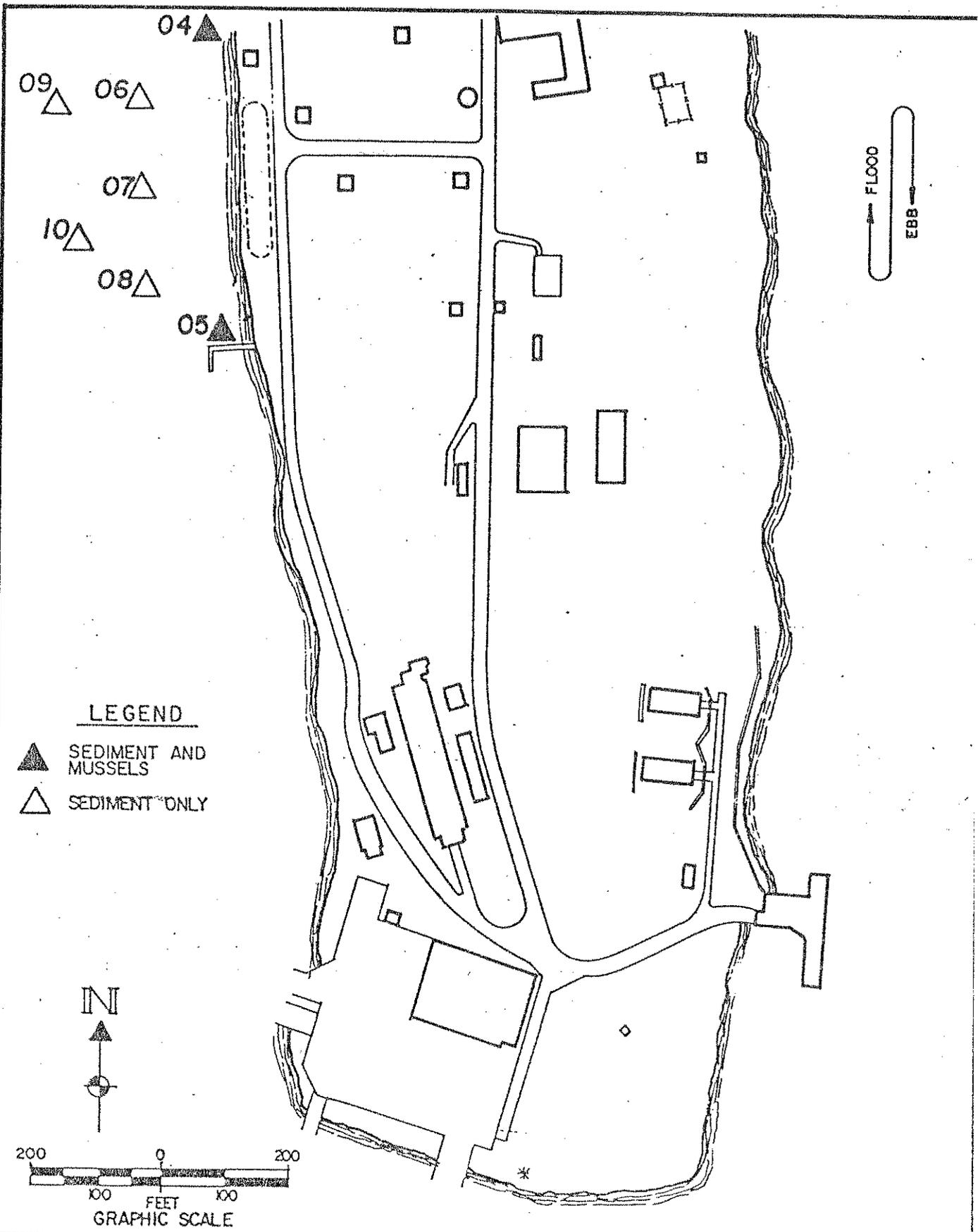
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Stamford, Connecticut



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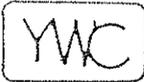
MAR. 13, 1985

FIG. NO. 13



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
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GOULD ISLAND DISPOSAL AREA
SITE NO 14
CHARACTERIZATION SAMPLING POINTS



York Wastewater Consultants, Inc.



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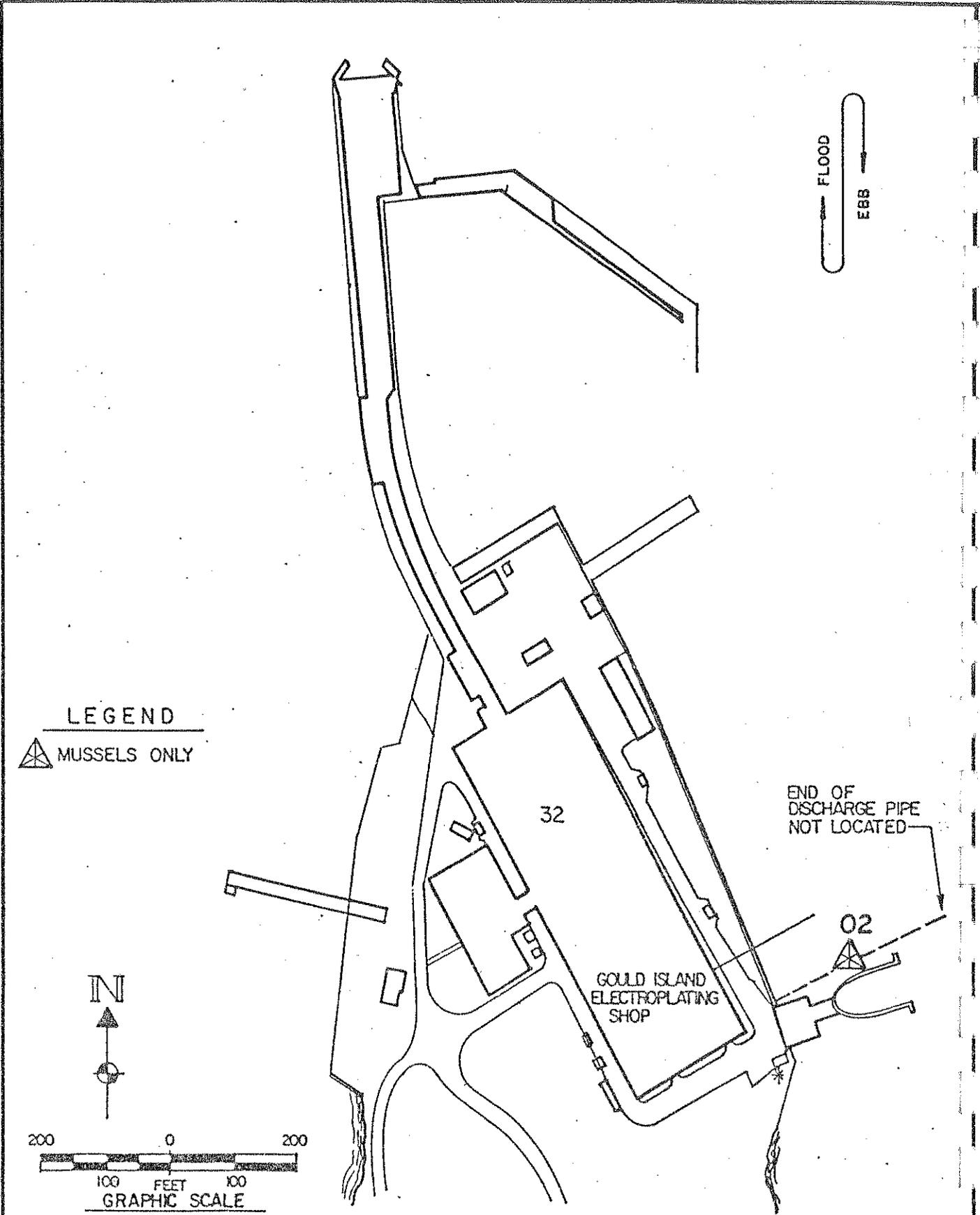
a professional corporation

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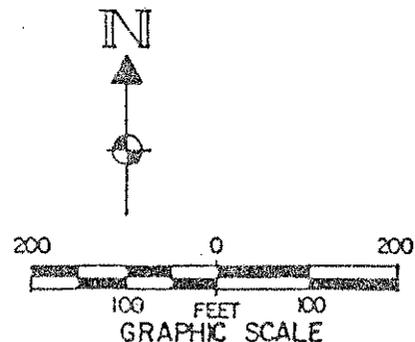
AVON CT

MAR. 13, 1985

FIG. NO. 15



LEGEND
 ▲ MUSSELS ONLY



CONFIRMATION STUDY
 ON HAZARDOUS WASTE SITES
 NEWPORT NAVAL EDUCATION &
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GOULD ISLAND ELECTROPLATING SHOP
 SITE NO 17
 CHARACTERIZATION SAMPLING POINTS

YWC
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 Stamford, Connecticut

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 a professional corporation
 CONSULTING ENGINEERS AVON, CT.

MAR. 13, 1985
 FIG NO. 17

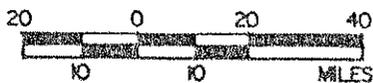
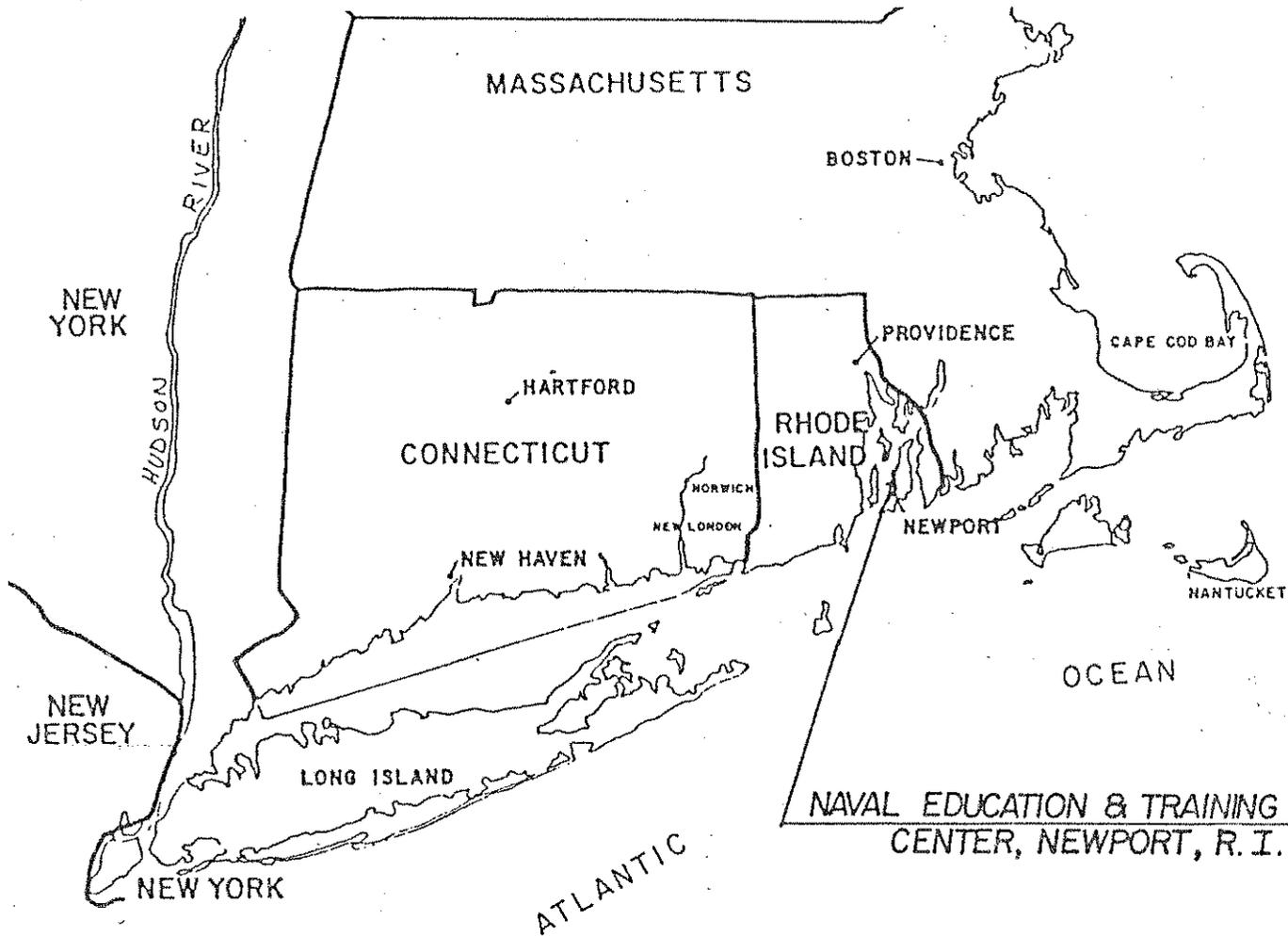
A. INTRODUCTION

1. Scope and Purpose

This report covers the results of the two-step confirmation studies at six sites where hazardous wastes were suspected to be causing adverse effects on the environment due to past waste disposal practices at the Naval Education and Training Center, Newport, Rhode Island (see Vicinity Plan, Figure 1). The purpose of the initial verification step was to locate sources of contamination, determine the presence of specific toxic and hazardous materials and determine generalized site hydrogeology. The purpose of the follow-up characterization step was to develop a quantitative assessment of the contamination identified in the verification step. The six sites investigated are listed in Table 1 and the locations are shown on Figure 2. In addition to the sampling program for the six disposal sites, sampling was conducted at two control sites as listed in Table 1 and shown on Figure 2.

The sites to be evaluated were selected in the Initial Assessment Study (IAS) completed for the Naval Education and Training Center in March, 1983. The IAS was the first phase of the Navy Assessment and Control of Installation Pollution (NACIP) program designed to identify contamination of Navy lands resulting from past operations and to institute corrective measures as needed. The second phase of the NACIP program is the confirmation study; this report covers the results of the entire confirmation study (verification and characterization) and includes recommendations for further studies and/or remedial action as appropriate. Institution of the remedial measures will constitute the third and last phase of the NACIP program.

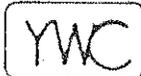
This report presents the details of the sampling and analysis program conducted in the confirmation study. An environmental analysis of the data is presented for each site.



GRAPHIC SCALE

CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

VICINITY PLAN



York Wastewater Consultants, Inc.
Stamford, Connecticut



LOUREIRO ENGINEERING ASSOCIATES

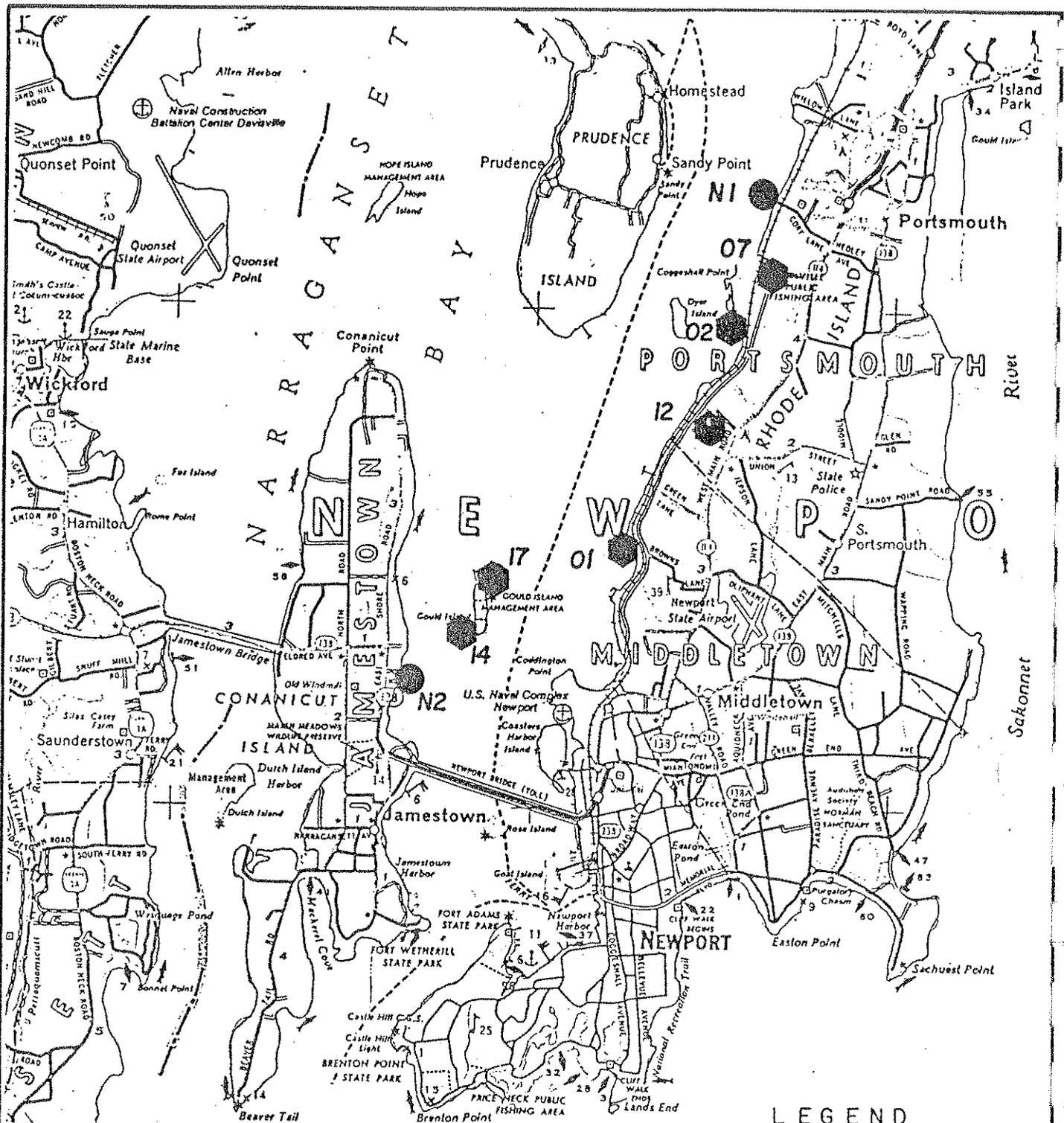
a professional corporation

CONSULTING ENGINEERS

AVON, CT.

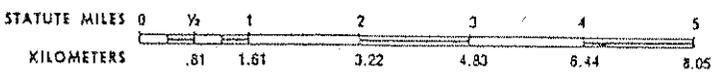
MAR. 13, 1985

FIG. NO. 1



LEGEND

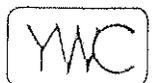
-  12 SITE LOCATION & NUMBER
-  NI CONTROL STATION & NUMBER



GRAPHIC SCALE

CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

SITES INVESTIGATED
& CONTROL SAMPLING STATIONS



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MAR. 13, 1985

FIG. NO. 2

TABLE 1
SAMPLING SITES AND CONTROL STATIONS

<u>Site No.</u>	<u>Site Name</u>	<u>Type of Hazardous Waste Disposal Activity</u>
01	McAllister Point Landfill	Landfilling of NETC wastes for 20 years; PCB-contaminated oils; other waste oils; spent acids, paints and solvents.
02	Melville North Landfill	Similar to McAllister Point Landfill
07	Tank Farm One	Burial of light oil and gasoline tank bottom sediments.
12	Tank Farm Four	Burial of residual fuel oil tank bottom sediments.
14	Gould Island Disposal Area	Burial of electroplating wastes
17	Gould Island Electroplating Shop	Discharge of electroplating wastewaters into Narragansett Bay.
N1	Control Station at end of Corey Lane, Portsmouth, Rhode Island	None suspected or evident near sampling point
N2	Control Station off Rte. 138 north of Newport Bridge, Jamestown, Rhode Island	None suspected or evident near sampling point

The work described herein was carried out under A/E Contract No. N62472-83-C-1154 by Loureiro Engineering Associates of Avon, CT with laboratory analyses and other support being provided by York Wastewater Consultants of Stamford, CT.

2. Initial Assessment Study

The Initial Assessment Study (IAS) performed by Envirodyne Engineers, Inc. at the Naval Education and Training Center covered a total of 18 potentially contaminated sites. Each of the sites was evaluated with regard to contamination characteristics, migration pathways and pollutant receptors. The study concluded that, while none of the sites posted an immediate threat to human health or the environment, the following nine sites warranted a confirmation study: McAllister Point Landfill, Melville North Landfill, Tank Farms One through Five, Gould Island Disposal Area and Gould Island Electroplating Shop. However, the IAS recommended that the confirmation studies be conducted at Tank Farms Two, Three and Five only if contamination is found at Tank Farm Four. As shown in Table 1, the confirmation study included only six of the nine sites.

B. COLLECTION OF SAMPLES - VERIFICATION STEP

1. General

The sampling program for the verification step was based on the data presented in the IAS, supplemented by data obtained on a field reconnaissance in October, 1983. The selection of sampling stations and parameters for laboratory analysis was based on hazardous waste constituents which were known or suspected to be present at each site. The types of samples were selected on the basis of environmental importance (e.g., food sources, food chain, ground water), availability of the animals or substrate at or near each site and the possibility that harmful constituents might have an adverse effect. To obtain the highest probability that adverse effects, if occurring, would be detected, sampling stations were located as close as possible to the potential points of contamination.

2. Sediment Sampling Methods

Sediment samples were collected with a hand coring device although in some locations (because of the presence of very coarse sediment materials such as rocks, boulders and stones) it was necessary to sample by scooping the top layer of sediment into a sample container. It was the intent to collect three sediment samples at each designated sediment sampling station - a surface sample, and samples at depths of one and two feet - although only the surface sediment samples were intended for laboratory examination in the verification step. The sediment samples at greater depths were intended for use, if necessary, in the characterization step; these were obtainable only at the three Melville North Landfill sampling stations and at one station at the Gould Island Electroplating Shop site.

The hand coring device consisted of a 1-1/2 inch diameter transparent plastic pipe. The lower end of the pipe was fitted with a coupling having a saw-tooth end to aid in forcing the corer into the sediment. A tight-fitting

rubber stopper was placed in the lower end of the device before lowering the tube onto the surface of the sediment. The stopper was pulled up by a cord at approximately the same rate as the sediment was penetrated. Upon withdrawal from the water, the rubber stopper prevented loss of the core (except with very coarse sediment materials). The core was removed from the tube by first pulling the stopper past a vent hole in the side of the pipe after which the core could be removed into sample containers by gravity with the aid of some agitation.

3. Mussel Sampling Methods

Mussels were collected by hand from the intertidal zone. An effort was made to include only the edible blue mussel (Mytilus edulis) in the sample although a few others may have been collected. The laboratory was instructed to analyze only the edible blue mussel. In most cases, the sample (at least 100 animals, 1-1/2 to 2 inches long) was gathered in an area covering no more than a 50-foot length of shoreline.

4. Soil Sampling Methods

Soil samples were hand excavated by shovel and, where necessary, by use of a pick or crow bar to loosen material. Before each use, the sampling implements were cleaned with hexane and/or inserted several times into the soil near the sampling point. At the desired depth, a soil sample was removed with a shovel and placed on a clean polyethylene sheet from which it was transferred into appropriate sample containers. The waste hexane and the used polyethylene sheets were appropriately discarded after use on each sample.

5. Leachate Sampling Methods

Leachate samples were collected only at the McAllister Point Landfill where liquid was observed discharging from the landfill at two locations at the surface adjacent to Narragansett Bay. No attempts were made to collect subsurface leachate flows in the verification step.

At one location, there was a significant flow out of the face of the landfill following each high tide. This flow was sampled by dipping with a glass container with the mouth pointed upstream and transferring the sample into the appropriate sample containers. The 50-milliliter sample vial for examination for volatile compounds was dipped so that it was filled to overflowing with the mouth pointed upstream, and then capped to exclude air. The container used to dip the sample was appropriately discarded after use on each sample.

At the other observed leachate discharge, liquid was trickling out of numerous places at an exposed face of solid waste deposits. Two places were selected for sampling based on suitability for collecting the small trickle of flow without picking up sediments or other foreign material in the sample. At both places, a small trough was formed of aluminum foil to collect the trickling leachate and to conduct it into a bottle from which the sample was transferred to appropriate sample bottles. The 50-milliliter sample vial for examination for volatile compounds was collected to overflowing at the aluminum trough and capped to exclude air.

6. Surface Water Sampling Methods

One surface water sample was collected at Tank Farm Four. This sample was collected on the south side of the site where, in wet weather, groundwater was seeping out to form a small stream. This flow was sampled by dipping with a glass container with the mouth pointed upstream and transferring the sample into the appropriate sample containers. The container used to dip the sample was appropriately discarded after use.

7. Ground Water Sampling Methods

Ground water samples were collected from two locations at Tank Farm One, one at a 36-inch diameter ground water observation pit near the south bank of Melville Pond and the other from a ground water collection pipe system normally discharging into an oil-water separator (which was bypassed during sampling).

The ground water observation pit was sampled by pumping directly into appropriate sample containers. The pump was an electrically-driven peristaltic pump; power was obtained from a gasoline engine-driven generator. The polypropylene suction tubing was weighted and the end submerged about one foot below the water surface in the pit. The pump was operated about five minutes before collecting the sample. No attempt was made to draw down the water level in the pit prior to sampling.

The ground water collection pipe system was sampled by direct discharge from an open end pipe into appropriate sample containers. The oil-water separator was bypassed for a minimum of 15 minutes into a nearby holding basin where the samples were collected at the discharge pipe at the retaining wall on the east end of the basin.

8. Sample Containers and Field Preservation

Five types of sample containers were used:

- Two-liter glass bottle with Teflon-lined screw cap.
- One-liter wide-mouth glass bottle with Teflon- or aluminum foil-lined screw cap.
- 500-milliliter plastic bottle with Teflon-lined screw cap.
- 50-milliliter glass, Teflon septum-capped vial.
- Zip-loc plastic bag (with sample pre-wrapped in aluminum foil).

All samples were preserved by placing them in coolers chilled with ice. In addition, the following preservation techniques were used for specific analyses on water and leachate samples:

- Metals - Add 1-2 milliliters of concentrated nitric acid (pH < 2)
- BTX - Add 1-2 milliliters of concentrated hydrochloric acid (pH < 2)
- Cyanide - Add 1-2 milliliters of 50% sodium hydroxide (pH > 12)
- Phenols - Add 1-2 milliliters of phosphoric acid (pH < 4) and 1+ gram copper sulfate crystals

The 50-milliliter vials for volatile organic and BTX testing were slowly filled to overflowing and capped to exclude air in water and leachate samples; for soil samples, the vials were filled as much as practical and then tightly capped.

Table 2 shows a summary of the sample containers and field preservation techniques for the various types of samples collected.

9. Sample Identification and Custody

Each sample container was labeled as soon as possible after collection (and after addition of preservatives, if required) with a pre-numbered peel off gummed label furnished by the laboratory. A copy of a typical label is shown in Appendix A. Each label was composed of three parts, each part having the same pre-printed laboratory sample number to facilitate cross references to Chain-of-Custody sheets and Laboratory Services Request/Custody sheets. The three-section label served the functions of (1) maintaining a seal by affixing the large portion of the label to both the container lid and body of the container; (2) maintaining chain-of-custody records by affixing the smallest portion of the label to the Chain-of-Custody sheet; and (3) minimizing numerical transcription errors by affixing the lower part of the label to the Laboratory Services Request/Custody sheet.

The large main section of each label was filled out to provide the following information:

- Job number and client
- Date of sample collection
- Check box to indicate that sample is to be saved
- Sample identification number

The lower part of the label was also filled out with the sample identification number identical to that entered on the main section of the label. The three parts of the label were then placed on the sample container,

TABLE 2
SAMPLE CONTAINERS AND FIELD PRESERVATION - VERIFICATION

Sample Type	Container Used		Minimum Sample Quantity	Parameters to be Analyzed**	Preservation Techniques
	Description	Suffix Used in Sample Ident.*			
Sediment	Glass bottle, wide-mouth, one-liter	-	250 grams	PCB, VOC Metals	Cool, 4°C
Mussels	Pre-wrapped in aluminum foil and placed in plastic bag	-	100 mussels	Metals, PCB	Cool, 4°C
Soil	Vial, 50-milliliter	A	20 grams	VOC	Cool, 4°C
	Glass bottle, wide-mouth one-liter	B	100 grams	Other Priority Pollutants	Cool, 4°C
Leachate	Vial, 50-milliliter	A	50 milliliters	VOC	Cool, 4°C
	Glass bottle, two-liter	B	2 liters	Acid & B/N Extract	Cool, 4°C
	Plastic bottle 500-milliliter	C	500 milliliters	Metals	HNO ₃ to pH < 2
	Plastic bottle 500-milliliter	D	500 milliliters	Cyanide	NaOH to pH > 12, Cool, 4°C
	Glass bottle, wide-mouth, one-liter	E	500 milliliters	Phenols	1 Gram CuSO ₄ H ₃ PO ₄ to pH < 4, Cool, 4°C
Surface Water	Glass bottle, wide-mouth, two-liter	A	2 liters	Pet.-Based H.C.	Cool, 4°C
	Plastic bottle, 500-milliliter	B	500 milliliters	Lead	HNO ₃ to pH < 2
Ground Water	Vial, 50-milliliter	A	50 milliliters	BTX	HCl to pH 1-2
	Glass bottle, wide-mouth two-liter	B	2 liters	Pet.-Based H.C.	Cool, 4°C
	Plastic bottle, 500-milliliter	C	500 milliliters	Lead	HNO ₃ to pH < 2

*See Table 3

**All samples were not analyzed for the indicated parameters.

on the Sample Custody sheet and on the Laboratory Services Request/Custody sheet. The executed Sample Custody and Laboratory Services Request/Custody sheets are bound separately in Volume II for the samples collected.

The sample identification entered on the labels consisted of three parts separated by dashes; e.g. 01-09-MS. The first two digits were the site number at which the sample was collected (see Table 1 for site numbers; control stations were assigned numbers N1 and N2). The next two digits were the station number at the site (see Sections F to K). The letters in the last part of the sample identification designated the type of sample (see Table 3 for a complete list of codes). The above example represents a sample of mussels collected at Station 09 at Site No. 01, the McAllister Point Landfill.

To maintain control over the sample from its origination in the field sampling program through receipt and analysis in the laboratory, a chain-of-custody program was instituted for convenience in handling and legal considerations.

At the sampling site, the person who collected the sample placed it in the appropriate container and transferred the sample to the project manager who was responsible for (or delegating responsibility for) addition of proper preservatives to the samples. The project manager then completed all the necessary labeling and preparation of Sample Custody and Laboratory Services Request/Custody sheets. The Sample Custody sheet was signed by the person collecting the sample and by the project manager.

The samples were then turned over to the custody of an on-site representative of the laboratory who also signed the Custody Sheet and became responsible for continuing preservation, storage and transportation of the samples to the laboratory. Samples were kept on ice in coolers in a vehicle kept locked when not attended.

TABLE 3
CODES USED IN SAMPLE IDENTIFICATION - VERIFICATION

<u>Code</u>	<u>Sample Types</u>
GWD	Groundwater collected after a period of dry weather (suffixes A, B and C represent bottles for different types of analyses; see Table 2)
GWW	Groundwater collected after a period of wet weather (suffixes A, B and C represent bottles for different types of analyses; see Table 2)
LD	Leachate from landfill collected after a period of dry weather (suffixes A to E represent bottles for different types of analyses; see Table 2)
LW	Leachate from landfill collected after a period of wet weather (suffixes A to E represent bottles for different types of analyses; see Table 2)
MS	Mussels (<u>Mytilus edulis</u>)
SD	Sediment core (suffix A indicates 0 to 4" depth; B indicates center of core and C bottom of core except at Gould Island Electroplating site suffix B indicates 6" to 12" depth - the depths along the core included in the sample are shown in inches in () following the sample type where appropriate in tables in Sections F to K).
SL	Soil (suffixes A and B represent bottles for different types of analyses; see Table 2)
SWW	Surface water collected after a period of wet weather (suffixes A and B represent bottles for different types of analyses; see Table 2)

At the laboratory, the samples and Custody Sheets were transferred to the incoming sample log-in room and the person receiving the sample signed the Custody Sheets. The samples were then logged in by the Sample Custodian.

Each analyst who worked on a sample signed the corresponding Laboratory Request/Custody Sheet and maintained responsibility for the sample until the next analyst worked on the sample. This procedure was monitored by the Sample Custodian. Upon completion of the analyses, completed results, analyst's initials, date of analysis, notebook and page numbers were recorded on Results of Analyses Sheets which were then attached to the Laboratory Services Request/Custody Sheet and given to the Sample Custodian for review. After review of the data, the results were organized on a computer and archived.

The samples were stored (or preserved if not already preserved) as dictated by sample type, which was the responsibility of the Sample Custodian. While samples were "work-in-progress" they were stored on the Sample Holding Shelves or the freezer or refrigerator (as required). This was noted on the Laboratory Services Request/Custody sheet for expeditious sample location by the next analyst. Completed samples were placed on the thirty day holding shelves and then transferred to the sample storage trailer for holding for an indefinite period.

10. Control Samples - Verification Step

The control samples collected in the verification step (Station Nos. N1 and N2) are listed in Table 4. The locations of the sampling points are shown in Figure No. 2. The principal purpose of the control sampling program in the verification step was to obtain data on the marine environment at and near the shoreline of areas not affected by any of the six sites.

The philosophy used in selecting the control stations was that they should offer similar abiotic factors and should not be close to any known point sources

TABLE 4
CONTROL SAMPLES COLLECTED - VERIFICATION STEP

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>TIME</u>	<u>ANALYSIS FOR</u>
			11-30-83	
8765	N1	Sediment (0-4)*	9:30 A.M.	Cyanide,PCB,Metals**
8766	N1	Mussels	9:30	PCB, Metals
8775	N2	Mussels	11:10	PCB, Metals
8776	N2	Sediment (0-4)	11:20	Cyanide, PCB, Metals

*Numbers in () are depths of sediment samples below top of sediment.

**Metals = Cr, Cd, Pb, As, Hg, Se, Ag, Cu, Ba, Ni, Be, Sb, Sn.

of pollution, but should be close enough to the six sites (but outside the direct influence of the sites) under investigation so that biota and sediments collected at the control stations will have been exposed to similar estuarine conditions as those collected close to the six sites. The differences in analytical results between control samples and site specific samples will give a general indication of the environmental impact of the six sites. It is obvious that all samples, including controls, will be subject to Bay pollution loads. By locating the site specific sample stations very close to the respective sites, the highest probability of detecting the potential pollutants from that site was achieved. By locating the control stations near the six sites, a comparison can be made between the site specific samples and the control samples with similar exposure to Bay pollutants but without direct influence of the six sites. If the control stations were located outside the Bay, or in very different abiotic environments, such comparisons would not be meaningful because important abiotic factors would not be consistent and the level of pollutants detected could not be evaluated against other similar areas of the Bay.

The control samples were collected at two sites in East Passage of Narragansett Bay - N1 north of Site 02 and N2 south of Site 14. The shoreline conditions were very similar to those at most of the site specific stations, the only exception being the Melville North Landfill where softer sediments were found. The sediments were stony at both control stations, particularly at station N1.

The results of analyses on control samples are shown in Appendix C and in appropriate tables in Sections F to K where site-specific findings are discussed.

C. COLLECTION OF SAMPLES - CHARACTERIZATION STEP

1. General

The sampling program for the characterization step was based on the data collected in the verification step. The selection of sampling stations and parameters for laboratory analysis were based on the need to quantitatively determine the extent of contamination and the types of contaminants found in the verification step.

2. Sediment Sampling Methods

Sediment samples were collected from the top four to six inches of the bottom deposits. Scuba divers were employed to collect the samples. Because of the presence of very coarse sediment materials such as rocks, boulders, and stones, the samples were collected by scooping into plastic scoops and then transferring the sediment into the sample containers.

3. Mussel Sampling Methods

Mussels were collected by hand from the intertidal zone. An effort was made to include only the edible blue mussel (Mytilus edulis) in the sample although a few others may have been collected. The laboratory was instructed to analyze only the edible blue mussel. In most cases, the sample (at least 100 animals, 1-1/2 to 2 inches long) was gathered in an area covering no more than a 50-foot length of shoreline.

4. Soil Sampling Methods

Soil samples were hand excavated by shovel and, where necessary, by use of a pick or crow bar to loosen material. Before each use, the sampling implements were inserted several times into the soil near the sampling point. At the desired depth, a soil sample was removed with a shovel and placed on a clean polyethylene sheet from which it was transferred into appropriate sample containers. Polyethylene sheets were appropriately discarded after use on each sample.

5. Tank Sampling Methods

Water samples were collected from inactive oil storage tanks by use of a depth sampler. Samples were collected at the bottom of the tank. The sampler was lowered into the tank through a sampling port in the top of the tank. The bottom port of the sampler was held closed during descent by a weighted plug which was forced away from its seat upon contact with the bottom of the tank. The inlet port of the sampler automatically closed upon lifting the sampler. The contents of the sampler were transferred to sample containers. The sampler was cleaned with potable water between sampling stations.

6. Groundwater Sampling Methods

Groundwater samples were collected by bailing from monitoring wells installed for this purpose; three wells were installed at the McAllister Point Landfill and two each at Tank Farms One and Four. Monitoring well installation is covered in Section E.

Ground water samples were collected from two other locations at Tank Farm One; one from a ground water collection pipe system normally discharging into an oil-water separator (which was bypassed during sampling) and the other from a manhole through which the oil-water separator effluent discharges to the Bay.

The ground water collection pipe system was sampled by direct discharge from an open end pipe into appropriate sample containers. The oil-water separator was bypassed for a minimum of 15 minutes into a nearby holding basin where the samples were collected at the discharge pipe at the retaining wall on the east end of the basin. The oil-water separator effluent was sampled by dipping with a long-handled sampling dipper.

Sampling of groundwater from monitoring wells involved the following steps:

- (a) Determination of water level;
- (b) Purging of the well by removal of three well volumes of water;
- (c) Collection of samples for laboratory analysis.

Groundwater elevations were measured from the top of the well protective casing to the water surface in the well before purging. The elevations were measured using a steel tape graduated at the top in one hundredth of a foot increments. Carpenters chalk, or other appropriate methods described in EPA Publication SW-846, were used on the bottom of the tape to indicate the static water level prior to purging. The water level was recorded and was used to determine the volume of water to be evacuated from the well based on the known depth to which the well was drilled. The tape was prepared for use at the next well by wiping with a clean, dry white paper towel.

The difference between the static water level and the bottom of the well was used to calculate the volume of water to be purged in a single evacuation. Three such volumes were evacuated from each of the wells prior to sampling. In some cases, a period of recovery was necessary before the purging could be completed.

The wells were purged using a bailer attached to a nylon rope. The bailers were of PVC construction and were up to six feet in length. The water withdrawn from the well during the purging procedure was placed in a container. When full, the container was emptied onto the ground downgrade of the well. This procedure was repeated until the predetermined quantity of water had been evacuated from the well.

All groundwater samples were collected using the same PVC bailer and nylon rope as was used for purging. To prevent cross-contamination, a separate bailer and rope were dedicated to each well to be sampled. The PVC bailers and nylon rope set-ups were pre-cleaned and brought to the site in clean plastic bags. The cleaning consisted of scrubbing in soapy water, soaking in soapy water for several hours, followed by a one-hour tap water rinse and a distilled water rinse.

While using the bailer to collect a sample, the plastic bag used to transport the bailer to the site was used as a liner in a 30-gallon trash container to receive the rope as it was withdrawn from the well, thereby preventing contaminants from being picked up by the rope. Samples were poured from the bailer into appropriate containers.

7. Sample Containers and Field Preservation

The following types of sample containers were used:

- One-liter and 500-milliliter wide-mouth glass bottles with Teflon or aluminum foil-lined screw caps.
- 500-milliliter plastic bottle with Teflon-lined screw cap.
- 50-milliliter glass, Teflon septum-capped vial.
- Zip-loc plastic bag (with sample pre-wrapped in aluminum foil).

All samples (except mussels) were preserved by placing them in coolers chilled with ice. In addition, the following preservation techniques were used for specific analyses on groundwater samples:

- Metals - Add 1-2 milliliters of concentrated nitric acid (pH < 2)
- Cyanide - Add 1-2 milliliters of 50% sodium hydroxide (pH > 12)
- Phenols - Add 1-2 milliliters of phosphoric acid (pH < 4) and 1+ gram copper sulfate crystals
- PBHC - Add 1 - 2 milliliters of sulfuric acid (pH<3).

The 50-milliliter vials for volatile organic and BTX testing were slowly filled to overflowing and capped to exclude air from the samples; for soil samples, the vials were filled as much as practical and then tightly capped. The mussel samples were packed in dry ice to freeze the mussels and keep them frozen until delivery to the laboratory.

Table 5 shows a summary of the sample containers and field preservation techniques for the various types of samples collected.

TABLE 5
SAMPLE CONTAINERS AND FIELD PRESERVATION - CHARACTERIZATION

<u>Sample Type</u>	<u>Container Description</u>	<u>Minimum Sample Quantity</u>	<u>Parameters to be Analyzed</u>	<u>Preservation Techniques</u>
Soil	Vial, 50-millileter	20 grams	Fingerprint	Cool, 4°C
Sediment	Plastic bottle, wide-mouth, one-liter	100 grams	Metals	Cool, 4°C
Mussels	Pre-wrapped in aluminum foil and placed in plastic bag	100 mussels	Metals	Freeze with dry ice
Ground-water	Vial, 50-milliliter	100 milliliters (2 vials)	VOC	Cool, 4°C
		50 milliliters	BTX	Cool, 4°C
		100 milliliters (2 vials)	Fingerprint	Cool, 4°C
	Glass bottle, one liter	2 liters (2 bottles)	Acid & B/N Extract	Cool, 4°C
	Glass bottle, 500 milliliters	500 milliliters	Pet. based Hyd. Carb.	H ₂ SO ₄ pH < 3 Cool, 4°C
		500 milliliters	Phenols	1 gram CuSO ₄ H ₃ PO ₄ to pH < 4, Cool, 4°C
	Plastic bottle, 500 milliliters or 1-liter	500 milliliters or 1-liter	Metals	HNO ₃ to pH < 2 Cool, 4°C
	500 milliliters	Cyanide	NaOH to pH > 12, Cool, 4°C	
	500 milliliters	pH, Chlorides	Cool, 4°C	
Water in tanks	Glass bottle 1 liter	2 liters (2 bottles)	Lead, PBHC, pH, TSS, BOD, NH ₃	Cool, 4°C

8. Sample Identification and Custody

Sample container identification and custody procedures used in the characterization step were the same as those used in the Verification Step and discussed in the previous section, except that the codes used in sample identification were as shown in Table 6. Executed sample Custody Laboratory Services Request/Custody sheets for the Characterization Step are presented in Volume II.

9. Control Samples - Characterization Step

The control samples collected in the characterization step (Station Nos. N1 and N2) are listed in Table 7. The locations of the sampling points are shown in Figure No. 2. The principal purpose of the control sampling program in the characterization step was to obtain data on mussels at and near the shoreline of areas not affected by any of the six sites. The mussel controls were repeated in the characterization step to account for temporal variations. For sediments, the control data from the verification step was used. The characterization step mussel data should not be compared to the verification step controls.

The control samples were collected at two sites in East Passage of Narragansett Bay - N1 north of Site 02 and N2 south of Site 14, the same as those used in the verification step.

The results of laboratory analyses on mussel samples are included in Appendix C and are presented for comparison with site specific data where appropriate in discussions of the findings in Sections F and J.

The variance in metals between the duplicates for control station No. N-2 occurred because the sample, consisting of about 100 mussels, was collected over a section of the intertidal zone typically covering an area of a few hundred square feet of beach (say 30 ft. x 10 ft.). Taking into account potential differences in the animals and in variations of exposure in their loci in the

TABLE 6
CODES USED IN SAMPLE IDENTIFICATION - CHARACTERIZATION STEP

<u>Code</u>	<u>Sample Types</u>
MS	Mussels (<u>Mytilus edulis</u>)
SD	Sediment
SL	Soil (suffixes A and B represent bottles for different types of analyses)
GW	Groundwater collected from monitoring wells (or from ground-water collection system at Tank Farm One); suffixes A through H represent different bottles for different types of analyses.
SP	Effluent of oil-water separator at Tank Farm One; suffixes A through C represent different bottles for different types of analyses.
TK	Water from bottom of inactive oil storage tanks.

TABLE 7
CONTROL SAMPLES COLLECTED - CHARACTERIZATION STEP

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>TIME</u>	<u>ANALYSIS FOR*</u>
			9-12-84	
2997	N1	Mussels	2:30 PM	Metals
2998	N2	Mussels	4:00	Metals

* Metals = Lead, Copper, Chromium, Nickel

environment, such variations are not unlikely. Since the QA/QC program indicated very good results on metals in fish, the variances are attributed to these differences in the mussel population sampled. Further discussion on this is presented in Appendix B.

D. LABORATORY ANALYSES

1. Basic Analytical References

Where applicable, all methods were conducted in accordance with the following manuals or references:

- a. Chemical Analysis of Water and Wastes, EPA-600/4-79-020, 1979;
- b. Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA-600/4-82-057, 1982;
- c. Procedures for Handling and Chemical Analysis of Sediment and Water Samples, EPA/CE81-1, 1981;
- d. Test Methods for Evaluating Solid Waste, EPA SW-846, 1980;
- e. Chemistry Laboratory Manual for Bottom Sediments and Elutriate Testing, EPA 905/4-79-014, PB 294, 1979;
- f. Standard Methods for the Examination of Water and Wastewater, 15th Edition, 1980;
- g. Methods for Analysis of Fish for PCB's, U.S. EPA, Northrup Repository.

The following sections present brief abstracts of the analytical methods used for the various types of analyses performed in this project.

2. Priority Pollutant Analyses

a. Miscellaneous

Both water and sediment samples were analyzed for priority pollutants. Metal concentrations were determined using the previously referenced methods.

Cyanides were analyzed according to Standard Methods for the Examination of Water and Wastewater, 15th Edition; APHA-AWWA-WPCF and Methods for Analysis of Water and Wastes, U.S. EPA 600/4-79-020.

Briefly, the cyanides were distilled from acid solution and absorbed into dilute sodium hydroxide. Cyanide was then determined colorimetrically using the pyridine-barbituric acid method.

Phenols were determined colorimetrically via the 4-aminoantipyrine method after distillation. References can be found in the previously cited works and in Procedures for Handling and Chemical Analysis of Sediment and Water Samples, U.S. EPA, May 1981, and in Standard Methods.

b. Volatiles

Water samples for volatile organics (purgeables) were analyzed using GC/MS/DS according to EPA Method 624 for Purgeable Organics. The method uses the purge and trap technique to strip the volatiles from the water which are then adsorbed onto a support which is then thermally desorbed into the GC/MS/DS. The instrumentation used was a Tekmar Model LSC-2 Liquid Sample concentrator interfaced with a Hewlett-Packard 5995B GC/MS/DS.

Soil samples were analyzed using the dynamic headspace purging technique in accordance with reference (a) cited above. A sample is weighed into a 40 ml septum vial. The vial is then attached to the LSC-2 and then purged at 80°C. Volatiles are then identified and quantified by GC/MS/DS.

c. Base/Neutral and Acidic Organics

The remaining organic priority pollutants (Base/Neutrals, Acids) were analyzed according to EPA Method 625. For water samples the water is extracted with methylene chloride, the extract dried and then concentrated to 1 ml. Samples are then injected into the GC/MS/DS to identify and quantitate the target compounds present.

Soil samples were air dried and then soxhlet extracted for 16 hours using equal volumes of acetone and hexane. The solvent was then concentrated to 1 ml and analyzed by GC/MS/DS.

3. Metals Analyses

All metal concentrations were determined by flame atomic absorption spectroscopy with the exception of arsenic, mercury and selenium. Arsenic and

selenium were determined via the hydride generation method while mercury was determined by the cold vapor technique.

Deuterium arc background correction was also used for arsenic and selenium.

Preliminary acid digestion and concentration steps varied depending on the types of samples analyzed. A brief description of the various methods (excluding mercury) is as follows:

a. Water Samples

All water samples were acidified with nitric acid and hydrochloric acid (except when silver was requested) and gently evaporated to ensure destruction of organic matter and to concentrate the sample.

After digestion, the samples were diluted volumetrically and the metal concentrations determined as previously stated.

b. Soils and Sediments

Samples were initially air dried and then weighed out into tared beakers. Samples were digested with nitric acid and hydrogen peroxide to ensure destruction of all organic matter.

After digestion, the samples were filtered and diluted volumetrically. Metals were then determined by atomic absorption.

c. Biological Samples

Immediately upon arrival at the laboratory, the mussel samples were transferred to a freezer and maintained at -15°C until analysis. Depuration of the samples was not carried out in this study.

It is noted that, in the verification step, a number of the mussels died during storage as indicated by relaxation of the adductor muscle. These particular animals were not analyzed. The effects of the aforementioned preservation techniques on the data for mussels is not clearly defineable; specific attention is directed, however, to the possibility that some of

the contaminants may have been lost from the samples during preservation in the verification step as indicated by the death of some of the animals. In our opinion, these losses, if in fact they occurred, would have applied to both control samples and to site specific samples and, consequently, would not affect the conclusions drawn on any of the sites investigated.

The analysis for metals was conducted using standard procedures. The procedure involved air-drying the samples followed by cryogenic homogenation of the tissue. Each sample was comprised of 10-15 mussels. The resulting prepared samples were then acid digested with a mixture of nitric acid and hydrogen peroxide, followed by perchloric acid to complete destruction and solubilization. The specific elements were then analyzed using atomic absorption techniques.

d. Mercury

All samples, except tissue samples, were analyzed using the following procedure:

Samples were weighed (solids) or measured (liquids) into 300 ml BOD bottles. To these were added nitric acid, sulfuric acid, potassium permanganate and potassium persulfate. After autoclaving, the samples were run via the cold vapor procedure.

The same procedure was also used for tissues, except that an aliquot of the digestate following perchloric acid oxidation was used.

4. Polychlorinated Biphenyls Analyses

A brief abstract of the methods used to determine the PCB content of the various types of samples is as follows:

a. Water Samples

Water samples were analyzed according to method reference (b) cited above, EPA Method 608, Organochlorine Pesticides and PCB's. The sample was

extracted with methylene chloride, the extract dried and concentrated to a volume less than 10 mls. Samples were then run via gas chromatography using an electron capture detector (Ni^{63}). Cleanup techniques were used as required. These techniques included florisisil and/or mercury treatment.

b. Soil and Sediment Samples

Soil and sediment samples were analyzed according to Procedures for Handling and Chemical Analysis of Sediment and Water Samples, U.S. EPA, May, 1981 and Chemistry Laboratory Manual for Bottom Sediments and Elutriate Testing, U.S. EPA, March, 1979.

The samples were initially air dried and then soxhlet extracted for 16 hours using equal volumes of acetone/hexane. The volume was then concentrated to less than 10 mls and analyzed via gas chromatography using an electron capture detector (Ni^{63}). Cleanup techniques were used as required.

c. Biological Samples

The comments made above in the discussion of metals analyses concerning sample preservation may also apply to the PCB determinations although there is even less evidence of potential loss of PCB than for metals.

The analysis for PCBs was conducted using procedures supplied by the Northrup Repository of the United States Environmental Protection Agency. The entire mussel tissue was analyzed on a dry-weight basis subsequent to air drying (ambient temperature of 65°F) and cryogenic homogenation. Each sample was comprised of 10-15 mussels.

The procedure involved the cryogenic homogenation of the air-dried tissue, followed by extraction with pesticide quality hexane. The extract was concentrated to less than 10 mls, and the PCBs (if present) were extracted by liquid-liquid partitioning using acetonitrile. The PCBs (if present) were then re-extracted back into hexane and concentrated to 1 ml.

The extract was further treated with florisisil to remove any other interferences. The final concentrate was then analyzed using gas chromatography with electron capture detection.

5. Miscellaneous Analyses

a. Oil and Grease

Samples for oil and grease were analyzed according to Standard Methods and Procedures for Handling and Chemical Analysis of Sediment and Water Samples. Basically, the procedure calls for extraction of the sample with Freon (separatory funnel extraction for water samples and Soxhlet extraction for soil samples) followed by evaporation of the Freon and weighing of the residue.

b. Petroleum-Based Hydrocarbons

Petroleum-based hydrocarbons are determined by the same method as oil and grease, except that prior to evaporation of the Freon, silica gel is added to adsorb fatty acids (polar materials). The solution is filtered, the Freon evaporated and the residue weighed.

6. Quality Control/Quality Assurance

In order to verify the overall accuracy and precision of the methods, various quality control and quality assurance procedures were followed in each aspect of the laboratory routine. The specific procedures used are delineated in the following paragraphs. A summary of the QA/QC data can be found in Appendix B.

a. Atomic Absorption Spectroscopy (Metals Determinations)

The most critical aspect of metals determination by atomic absorption spectroscopy (A.A.S.) is the quality of the standards used. As such, fresh standards were prepared for each metal analyzed from certified stock solutions¹. Reagent grade chemicals were used in all analyses.

¹Obtained from Scientific Products Division of American Hospital Supply Corporation.

Also laboratory standards and blanks were run through all of the digestion procedures and used to check recoveries and the technique of the analysts.

Calibration of the instrumentation was checked before and after each metal determination and recorded in laboratory notebooks. In addition, duplicates and referenced environmental standards were analyzed to indicate the precision of the methods used.

A summary of this data is included in Appendix B.

b. Gas Chromatography (Pesticides and PCB's)

Referenced U.S. EPA procedures were used in all gas chromatography analyses. Instrument calibration was checked each day at various concentrations in order to obtain a good linear working range. Gases and solvents used were of ultra high purity and commercial standards were obtained for calibration (see Appendix B).

Known environmental standards (obtained from Connecticut State Department of Health and U.S. EPA) were analyzed "blindly" to verify both analytical methods and accuracy. This data is summarized in Appendix B.

c. GC/MS Analysis

Samples for GC/MS analysis included volatile organics (EPA Method 624) and Base/Neutrals, Acids, and Pesticides (EPA Method 625). Initially, the instrument was calibrated at four levels for volatile organics and the samples analyzed. (Surrogate standards were added to each sample.) The same general calibration procedure was followed for the base/neutrals, acids and pesticides. Calibration was checked each day and internal standardization was used to quantify the compounds identified.

7. Results of Analytical Tests on Site Specific Samples Collected

The results of analyses on samples collected are shown in the laboratory reports in Appendix C. The results shown in Appendix C are also presented in tables in the text separately for each site in connection with the discussions of findings at each site.

8. Results of Analytical Tests on Control Samples Collected

The results of analyses on control samples collected are shown in the laboratory reports in Appendix C. The results shown in Appendix C are also presented in tables in the text where appropriate for comparison of site specific and control sample results in connection with the discussions of findings at each site. The following data show the control sample results:

PARAMETER	SEDIMENT		MUSSELS				
	Nov. 1983		Nov. 1983		Sept. 1984		
	Sta. N1	Sta. N2	Sta. N1	Sta. N2	Sta. N1	Sta. N2	Sta. N2
PCB	<0.5	<0.5	0.36	0.37			
Chromium	11.5	8.0	<2.5	<2.5	1.1	2.8	1.4
Cadmium	<0.05	<0.05	<0.5	<0.5			
Lead	27.5	6.8	<1.0	<1.0	4.9	3.8	5.2
Arsenic	<0.2	<0.2	<0.4	<0.4			
Mercury	<0.02	<0.02	<0.04	<0.04			
Selenium	<0.2	<0.2	<0.4	<0.4			
Silver	<0.5	<0.5	<1.0	<1.0			
Copper	18.3	10.3	7.2	4.3	6.8	8.2	5.4
Barium	<0.4	<0.4	<1.0	<1.0			
Nickel	21.3	11.3	<2.5	<2.5	4.9	5.1	4.9
Beryllium	<0.05	<0.05	<0.5	<0.5			
Antimony	<0.5	<0.5	<1.0	<1.0			
Tin	<5.0	<5.0	<10.0	<10.0			
Cyanide	31.	27.					

E. MONITORING WELL INSTALLATION

1. General

Monitoring wells were installed at seven locations on three sites as follows:

Site 01 - Stations 21, 22, and 23

Site 07 - Stations 06 and 07

Site 12 - Stations 10 and 11

The purpose of and principal details on each of the wells are presented in Sections F, H and I. This section covers the methods of installation and construction details. The well drillers logs and the details of the monitoring wells are presented in Appendix D. The data establishing the locations of the seven monitoring wells is presented in Appendices E and F.

2. Drilling and Soil Sampling Methods

The wells were drilled with a hollow stem auger. A roller bit was used for hard material at Site 01, Stations 21 and 22. A three-foot rock core was taken at the bottom of the hole at Station 21.

The following was recorded on the well drillers log:

- Boring number
- Total depth
- Depth to groundwater
- Date of installation

At all depths where changes in the nature of the material were observed, a sample was obtained by use of a split spoon sampler. The following was recorded on the well drillers log:

- Depths at which the nature of the material changed
- Description of the material
- Number of blows required to drive the sampler six inches with a 140-pound hammer with fall of 30 inches

3. Well Installation

All wells were constructed of two-inch nominal diameter threaded Schedule 80, Type 1 PVC including casing and screen. Each well was installed with a 10-foot length of screen near the bottom of the well and a casing extending above grade. The screens had a slot size of 0.12 inches and were provided with a bottom plug or cap. The annular space between the bore hole and screen and casing was filled with silica sand from the bottom of the well to at least five feet above the top of screen. In addition, some of the wells were enveloped in a non-woven filter fabric. The annular space above the silica sand was filled with a five-foot minimum depth of bentonite and the remaining space to grade was filled with stone-free on-site material. All materials placed in the annular space were well tamped.

A five-inch diameter protective steel casing was installed at the ground surface to enclose the top of the well casing. The protective casing was furnished with a hinged steel cap, with locking device, padlock, and keys. A six-inch thick, three-foot diameter concrete collar was placed around the protective casing and the collar was mounded over with about six inches of on-site material to insure that surface water drained away from the well. The wells were numbered and padlocked.

The wells were developed by pumping to waste using compressed air. The time for recovery of the wells after development is shown in Appendix D.

4. Groundwater Sampling

The procedures used for sampling of the monitoring wells are covered in Section C. The groundwater level was measured prior to sampling of each well and these data, along with the dates and times of sample collection, are presented in Sections F, H, and I covering the findings at the three sites.

F. FINDINGS AT SITE NO. 01 McALLISTER POINT LANDFILL

1. History of Waste Disposal

The history of waste disposal at this site was thoroughly covered in the IAS. The following discussion summarizes the background information contained in the IAS.

This landfill received all of the wastes generated at the Newport Naval complex from 1955 through the mid-1970's and is known to contain at least 200 gallons of PCB contaminated oil. Also in the landfill are spent acids, waste paints, solvents, and waste oils.

The operators of the landfill indicated that it was common practice for barrels filled with liquids to be brought to the landfill. These barrels contained paints, oils and other unidentifiable liquids. The barrels were crushed by the bulldozer operator before being covered. At least two transformers, each containing approximately 100 gallons of PCB contaminated oil, and at least 4 or 5 capacitors were disposed of in the landfill.

For the period 1955 through 1964, wastes were simply trucked to the site, spread out with a bulldozer, and then covered over. In 1965, an incinerator was built at the landfill. From 1965 through 1970-71, some 98 percent of all the wastes were burned before being disposed of in the landfill. The incinerator was closed about 1970 because of the air pollution problems. During the remaining years that the site was operational, all wastes were again disposed of directly into the landfill.

The site is located along the shoreline of Narragansett Bay. Throughout the time period that the site was operational, the landfill was extended out into the bay using the wastes as fill material. No hazardous wastes were deposited on the southern end of site; that is, south of Building 264 (Figure 3). The site was subject to periodic flooding until the elevation of the site was

increased through additional filling. Even though the site is no longer subject to flooding, the base of the landfill has remained in hydrologic contact with the bay and the groundwater.

Operations at the site were discontinued in the mid-1970's. A final covering of soil three feet thick was placed over the NETC landfill following its closure.

2. Existing Site Conditions

The landfill is located along the shoreline of Narragansett Bay and encompasses approximately ten acres. Various unvegetated bare areas are evident throughout the surface of the landfill. Surface runoff and groundwater from the landfill flow into Narragansett Bay. Two leachate streams are evident; the one located at Station 08 (see Figure No. 3) exhibits significant flow except at high tide while the one at Station 07 exhibits only slight flow in wet weather and no flow in dry weather. There is one area where water ponds on the surface in wet weather. There are some exposed waste deposits, particularly on the steep face of the fill in the vicinity of Station 07. The shoreline is littered with considerable amounts of metallic wastes, particularly south of Station 11.

3. Hydrogeological Data

The general hydrogeology of the NETC area was covered in the IAS. The following discussion summarizes conclusions drawn from the background hydrogeological data contained in the IAS and on monitoring well data.

Monitoring wells were installed as summarized in Table 8 and where shown on Figure 4. These wells were installed for the purpose of obtaining groundwater samples at the seaward edge of the landfill (Stations 21 and 22) and also at an upgradient well not affected by the landfill (Station 23). The wells were constructed as described in Section E. Ground water elevations are presented in Table 9.

TABLE 8

MONITORING WELLS

SITE NO. 01 - McALLISTER POINT LANDFILL

	<u>Station No. 21</u>	<u>Station No. 22</u>	<u>Station No. 23</u>
Location (See Appendix E)	West edge of fill (downgradient)	West edge of fill (downgradient)	Cemetery east of fill (upgradient)
Well depth (feet)	43.0	30.3	40.0
Elevations (MLW):			
Ground surface	26.9	15.8	39.9
Top of well casing	28.15	17.84	40.35
Top of protective casing	28.43	18.30	40.57
Bottom of well	(-)16.1	(-)14.5	(-) 0.1
Lengths (feet):			
Casing	30	17	30
Screen	10	10	10

TABLE 9

OBSERVED WATER LEVELS IN MONITORING WELLS
SITE NO. 01 - McALLISTER POINT LANDFILL

<u>Date</u>	<u>Time</u>	<u>Tide</u>	<u>Groundwater Elevation (MLW)</u>		
			<u>Station No. 21</u>	<u>Station No. 22</u>	<u>Station No. 23</u>
9-11-84	3:00 PM	Low		6.8	
9-12-84	1:30 PM	Ebb	4.9		
9-14-84	10:00 AM	High			17.9
9-14-84	1:00 PM	Ebb		6.8	
11-20-84	11:45 AM	Low		3.3	
11-20-84	12 noon	Low	3.7		
11-20-84	2:45 PM	Flood			18.7
12-17-84	1:10 PM	Flood			19.4
12-17-84	3:45 PM	High		6.0	
12-18-84	7:45 AM	Low	3.8		
1-07-85	7:20 AM	High			22.5
1-07-85	3:30 PM	Flood	4.5		
1-08-85	9:20 AM	High		3.9	
1-28-85	8:15 AM	Flood			21.9
1-28-85	2:15 PM	Ebb		3.1	
1-28-85	2:25 PM	Ebb	3.8		
Ground surface elevation			26.9	15.8	39.9
Bottom of well elevation			(-)16.1	(-)14.5	(-) 0.1

The groundwater in areas close to the bay is often within just two or three feet of the surface. The groundwater moves in a westward direction and discharges into Narragansett Bay. This factor and the history of waste deposition into the low-lying coastal area indicate that the hydrogeology of the site is characterized by groundwater movement through the waste deposits in a general east to west direction. This was confirmed by the data in Table 9 showing water elevations in the monitoring wells, with a significant gradient toward the Bay. Some deviations from this general pattern may be present due to the non-homogeneous nature of the deposits. The groundwater is not being utilized at NETC. Any wells in the area are upgradient from the site and beyond its influence.

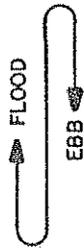
4. McAllister Point Landfill Samples - Verification Step

The samples collected in the verification step at the McAllister Point Landfill (Site No. 01) are listed in Table 10. The locations of the sample collection points are shown on Figure No. 3. The principal areas of interest for purposes of the sampling program in the verification step were:

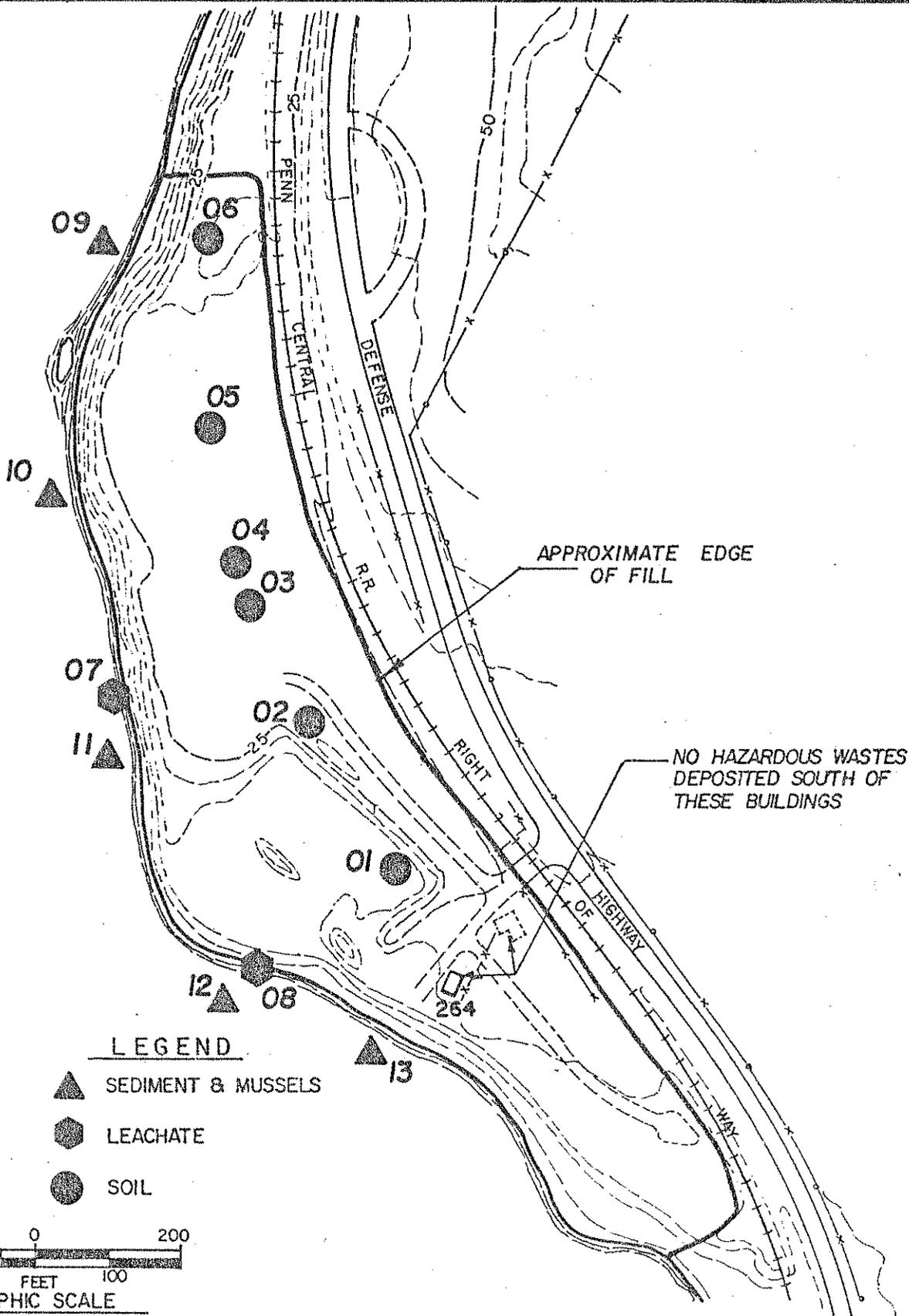
- a. The marine environment at and near the shoreline of the landfill.
- b. The surface soils on the site.
- c. The leachate discharges from the site.

The shoreline is almost 2000 feet long facing the East Passage of Narragansett Bay. The landfill is covered with soil but there are some exposed refuse deposits on the face of the landfill along the Bay. The shoreline is variable, ranging from shell and cobble beach areas to rip-rap, large rocks and exposed bedrock. A significant length of the beach has scattered deposits of metallic waste materials.

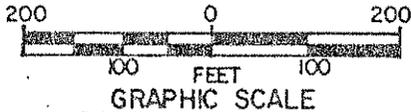
All five sediment samples (Station Nos. 09 to 13) were collected about 25 feet off-shore in one to three feet of water. All samples were surface sediments (0 to 4 inches deep). The deposits were very stony and samples of sediment were difficult to obtain.



NA RRAGANSETT BAY
EAST PASSAGE

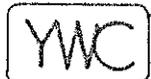


- LEGEND**
- ▲ SEDIMENT & MUSSELS
 - LEACHATE
 - SOIL



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

McALLISTER POINT LANDFILL
SITE NO 01
VERIFICATION SAMPLING POINTS



York Wastewater Consultants, Inc.
Stamford, Connecticut



LOUREIRO ENGINEERING ASSOCIATES

a professional corporation

CONSULTING ENGINEERS

AVON, CT.

FEB. 28, 1984
REVISED MAY 8, 1984

FIG. NO. 3

TABLE 10
SAMPLES COLLECTED - VERIFICATION STEP
SITE NO. 01 - McALLISTER POINT LANDFILL

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>DATE/TIME</u>	<u>ANALYSIS FOR</u>
			11-28-83	
8600	01	Soil	2:55 P.M.	*
8601	01	Soil	2:55	**
8602	02	Soil	3:00	*
8603	02	Soil	3:00	**
8604	03	Soil	3:05	*
8605	03	Soil	3:05	**
8606	04	Soil	3:10	*
8607	04	Soil	3:10	**
8608	05	Soil	3:15	*
8609	05	Soil	3:15	**
8610	06	Soil	3:20	*
8611	06	Soil	3:20	**
			11-29-83	
8612	08	Leachate-Wet Weather	10:00 A.M.	PP-Vol. Org.
8613	08	Leachate-Wet Weather	10:00	PP-Acid & B/N Ext.
8614	08	Leachate-Wet Weather	10:00	PP-Metals†
8615	08	Leachate-Wet Weather	10:00	PP-CN
8616	08	Leachate-Wet Weather	10:00	PP-Phenols
8617	07	Leachate-Wet Weather	10:30	PP-Vol. Org.
8618	07	Leachate-Wet Weather	10:30	PP-Acid & B/N Ext.
8619	07	Leachate-Wet Weather	10:30	PP-Metals†
8620	07	Leachate-Wet Weather	10:30	PP-CN
8621	07	Leachate-Wet Weather	10:30	PP-Phenols
8622	09	Mussels	10:00	PCB, Metals
8623	10	Mussels	10:00	PCB, Metals
8624	11	Mussels	10:30	PCB, Metals
8625	12	Mussels	11:00	PCB, Metals
8626	13	Mussels	11:30	††
8627	09	Sediment (0-4)	10:15	PCB, Metals
8628	10	Sediment (0-4)	10:30	PCB, Metals
8629	11	Sediment (0-4)	10:45	PCB, Metals
8630	12	Sediment (0-4)	11:00	PCB, Metals
8631	13	Sediment (0-4)	11:15	PCB, Metals
			11-30-83	
8632	13	Mussels	9:30 A.M.	††
8633	08	Leachate-Dry Weather	9:30	PP-Vol. Org.
8634	08	Leachate-Dry Weather	9:30	PP-Acid & B/N Ext.
8635	08	Leachate-Dry Weather	9:30	PP-Metals†
8636	08	Leachate-Dry Weather	9:30	PP-CN
8637	08	Leachate-Dry Weather	9:30	PP-Phenols

*Composited in equal proportions and analyzed for priority pollutants (volatile organics only)

**Composited in equal proportions and analyzed for priority pollutants (all except volatile organics)

†Metals = Cr, Cd, Pb, As, Hg, Se, Ag, Cu, Ba, Ni, Be, Sb, Sn

††Samples combined and analyzed for PCB, Metals

NOTE: PP signifies priority pollutants

All mussel samples were collected in the intertidal zone shoreward of the sediment sampling points (Station Nos. 09 to 13).

Soil samples were collected at six stations (Nos. 01 to 06) distributed along the approximate north-south central axis of the site. The points were selected at places where vegetation was absent. The six samples were composited in the laboratory for priority pollutant examination.

The two observable leachate discharges (Station Nos. 07 and 08) were sampled in wet weather immediately following a period of heavy rainfall. In addition, a sample of the southerly leachate discharge (Station 08) was repeated in dry weather.

5. Analytical Data on Samples Collected - Verification Step

The samples collected at the McAllister Point Landfill are summarized in Table 10 as previously discussed. The analyses were conducted for the parameters indicated in Table 10 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results is presented in Table 11 for the sediment and mussel samples and in Tables 12 and 13 for the soil and leachate samples.

6. Evaluation of Available Data - Verification Step

The analytical data on samples collected indicate that metals are accumulating in sediments and mussels near the McAllister Point Landfill. This judgment is based on comparison of the verification step sampling and analytical data with the control station data (see Table 11).

The surface layer of sediment at all five sampling points exhibited significantly high values of lead and copper; these were especially high at Station Nos. 12 and 13 which were closest to the larger of the two observed leachate discharges (Station No. 08). In addition, high values of nickel were evident at some of the stations, most notably Station Nos. 12 and 13. Slightly

TABLE 11
 SUMMARY OF SEDIMENT AND MUSSEL SAMPLE ANALYTICAL DATA
 SITE NO. 01 - McALLISTER POINT LANDFILL (NOV., 1983)
 (All results in ug/gm - dry weight basis)

Substrates and Parameters	Site Specific Station Numbers					Control Station Numbers	
	<u>09</u>	<u>10</u>	<u>11</u>	<u>12</u>	<u>13</u>	<u>N1</u>	<u>N2</u>
<u>SEDIMENT*:</u>							
PCB	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	7.5	7.0	6.3	17.5	14.8	11.5	8.0
Cadmium	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	70.0	77.5	57.5	900.	327.	27.5	6.8
Arsenic	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Mercury	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Silver	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Copper	28.3	133.2	153.4	1455.	655.	18.3	10.3
Barium	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Nickel	19.3	22.0	32.8	64.0	55.5	21.3	11.3
Beryllium	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Antimony	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
<u>MUSSELS:</u>							
PCB	0.38	<0.01	0.29	0.33	0.29	0.36	0.37
Chromium	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Lead	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Mercury	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Selenium	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Silver	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Copper	6.0	6.4	9.2	12.2	28.3	7.2	4.3
Barium	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nickel	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Antimony	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Tin	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0

*All sediment data is for the surface sediments at 0 to 4-inch depth.

TABLE 12
SUMMARY OF ORGANICS AND PESTICIDES PRIORITY POLLUTANT ANALYTICAL
DATA ON SOILS AND LEACHATE
SITE NO. 01 - McALLISTER POINT LANDFILL (NOV., 1983)

<u>Parameter</u>	<u>Station Numbers and Sample Types</u>			
	<u>01 to 06</u> <u>Soil</u> <u>Composite</u> <u>Sample</u> <u>(ug/kg*)</u>	<u>07</u> <u>Leachate</u> <u>Wet</u> <u>Weather</u> <u>(ug/l)</u>	<u>08</u> <u>Leachate</u> <u>Wet</u> <u>Weather</u> <u>(ug/l)</u>	<u>08</u> <u>Leachate</u> <u>Dry</u> <u>Weather</u> <u>(ug/l)</u>
VOLATILE ORGANICS				
Acrolein	<10	<100	<100	<100
Acrylonitrile	<10	<100	<100	<100
Ethylbenzene	<5	30	<10	<10
Toluene	<5	26	<10	<10
All Other Volatile Organics	<5	<10	<10	<10
BASE NEUTRAL EXTRACTABLE ORGANICS				
Benzo(GHI)Perylene	<1.25	<25	<25	<25
Dibenzo(A,H)Anthracene	<1.25	<25	<25	<25
Indeno(1,2,3-CD)Pyrene	<1.25	<25	<25	<25
All Other Base Neutral Extractable Organics	<0.5	<10	<10	<10
ACID EXTRACTABLE ORGANICS				
4,6-Dinitro-0-Cresol	<12.5	<250	<250	<250
2,4-Dinitrophenol	<12.5	<250	<250	<250
All Other Acid Extractable Organics	<1.25	<25	<25	<25
PESTICIDES	<0.5	<10	<10	<10

*Dry weight basis.

TABLE 13
SUMMARY OF PCB, METALS, CYANIDE AND PHENOL PRIORITY POLLUTANT
ANALYTICAL DATA ON SOILS AND LEACHATE
SITE NO. 01 - McALLISTER POINT LANDFILL (NOV., 1983)

<u>Parameter</u>	<u>Station Numbers and Sample Types</u>			
	<u>01 to 06</u> Soil Composite Sample (ug/gm*)	<u>07</u> Leachate Wet Weather (ug/l)	<u>08</u> Leachate Wet Weather (ug/l)	<u>08</u> Leachate Dry Weather (ug/l)
PCB's	<0.5	<0.010	<0.010	<0.010
Antimony	<0.5	<0.050	<0.050	<0.050
Arsenic	<0.2	<0.002	<0.002	<0.002
Beryllium	<0.05	<0.004	<0.004	<0.004
Cadmium	<0.05	0.028	0.058	0.054
Chromium	7.3	<0.020	0.028	0.032
Copper	13.5	<0.020	<0.020	<0.020
Lead	9.0	<0.040	<0.040	<0.040
Mercury	<0.02	<0.0002	<0.0002	<0.0002
Nickel	20.5	<0.020	<0.072	<0.090
Selenium	<0.2	<0.002	<0.002	<0.002
Silver	<0.5	<0.05	<0.05	<0.05
Thallium	<0.1	<0.01	<0.01	<0.01
Zinc	0.3	<0.01	<0.01	<0.01
Cyanides	0.047	0.017	0.876	0.097
Phenols	0.027	0.006	0.016	0.007
Chlorides			15,500	14,025

*Dry weight basis

elevated values of chromium were also found at Station Nos. 12 and 13 (by comparison to the control stations) but these do not appear to be significant. No PCB contamination was found in any of the sediment samples.

Slightly elevated copper concentrations were found in mussels at Station Nos. 11, 12 and 13 by comparison to the controls. These do not appear to be significantly high, however. No other metals were found in the mussel samples. The PCB levels in mussels were the same as those found in the controls. See Section D for additional evaluation of analytical data on mussels.

The priority pollutant examinations of the leachate samples indicated all priority pollutants to be below detection limits except for certain metals, cyanides and phenols. Low concentrations of ethylbenzene and toluene were found in one leachate sample. Tests for chlorides on leachate at Station 08 indicate brackish characteristics; it appears that bay water enters the fill and discharges at Station 08 on each tidal cycle.

The priority pollutant examination of the composite soil sample indicated no significantly high values. Except for chromium, copper, lead, nickel and zinc, all priority pollutants in soils were below detection limits.

7. Location of Suspected Contaminant Sources - Verification Step

The sediment samples seem to indicate that certain metals are accumulating in the vicinity of Station Nos. 12 and 13 near the south end of the landfill. The pollutants are not being concentrated by the mussels to the same extent, although the copper concentrations in the mussels were substantially higher near the south end of the landfill than at other stations further north or at the control stations. There is no significant accumulation of metals in the soil cover.

The data seems to indicate that the landfill has caused or is continuing to cause metal deposition near Station Nos. 12 and 13. Although the leachate

TABLE 14
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 01 - McALLISTER POINT LANDFILL

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>DATE/TIME</u>	<u>ANALYSIS FOR*</u>
			9-11-84	
2959	20	Sediment (0-4)	9:20 AM	Metals, EP Toxic Metals, Cyanide
2960	18	Sediment (0-4)	9:30	Metals, EP Toxic Metals, Cyanide
2961	15	Sediment (0-4)	9:40	Metals, EP Toxic Metals, Cyanide
2962	16	Sediment (0-4)	9:50	Metals, EP Toxic Metals, Cyanide
2963	19	Sediment (0-4)	10:00	Metals, EP Toxic Metals, Cyanide
2964	17	Sediment (0-4)	10:20	Metals, EP Toxic Metals, Cyanide
2965	14	Sediment (0-4)	10:30	Metals, EP Toxic Metals, Cyanide
2976	14	Mussels	2:00 PM	Metals
2977	13	Mussels	2:30	Metals
2978	12	Mussels	3:00	Metals
			11-20-84	
6797	21	Groundwater	12:50 PM	Cyanide
6798	21	Groundwater	12:50	Metals
6799	21	Groundwater	12:50	pH, Chlorides
6800	22	Groundwater	12:15	Cyanide
6801	22	Groundwater	12:15	Metals
6802	22	Groundwater	12:15	pH, Chlorides
6803	23	Groundwater	3:25	Cyanide
6804	23	Groundwater	3:25	Metals
6805	23	Groundwater	3:25	pH, Chlorides
			12-17-84	
6843	23	Groundwater	1:50 PM	Cyanide
6844	23	Groundwater	1:50	Metals
6845	23	Groundwater	1:50	pH, Chlorides
6850	22	Groundwater	4:50	Cyanide
6851	22	Groundwater	4:50	Metals
6852	22	Groundwater	4:50	pH, Chlorides
			12-18-84	
6853	21	Groundwater	9:45 AM	Cyanide
6854	21	Groundwater	9:45	Metals
6855	21	Groundwater	9:45	pH, Chlorides

* Metals = Lead, copper, chromium, nickel

TABLE 14(Cont'd)
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 01 - McALLISTER POINT LANDFILL

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>DATE/TIME</u>	<u>ANALYSIS FOR*</u>
1-07-85				
0631	23	Groundwater	8:25 AM	Cyanide
2	23	Groundwater	8:25 AM	PP, Metals
3	23	Groundwater	8:25 AM	pH, Chlorides
4	23	Groundwater	8:25 AM	PP - Vol. organics
5	23	Groundwater	8:25 AM	PP - Vol. organics
6	23	Groundwater	8:25 AM	PP - Acid/BN
7	23	Groundwater	8:25 AM	PP - Acid/BN
8	23	Groundwater	8:25 AM	Phenols
0639	21	Groundwater	4:20 PM	Cyanide
40	21	Groundwater	4:20 PM	PP, Metals
1	21	Groundwater	4:20 PM	pH, Chlorides
2	21	Groundwater	4:20 PM	PP - Vol. organics
3	21	Groundwater	4:20 PM	PP - Vol. organics
4	21	Groundwater	4:20 PM	PP - Acid/BN
5	21	Groundwater	4:20 PM	PP - Acid/BN
6	21	Groundwater	4:20 PM	Phenols
1-08-85				
0647	22	Groundwater	10:00 AM	Cyanide
8	22	Groundwater	10:00 AM	PP, Metals
9	22	Groundwater	10:00 AM	pH, Chlorides
50	22	Groundwater	10:00 AM	PP - Vol. organics
1	22	Groundwater	10:00 AM	PP - Vol. organics
2	22	Groundwater	10:00 AM	PP - Acid/BN
3	22	Groundwater	10:00 AM	PP - Acid/BN
4	22	Groundwater	10:00 AM	Phenols
1-28-85				
7001	23	Groundwater	8:50 AM	Cyanide
2	23	Groundwater	8:50 AM	Metals
3	23	Groundwater	8:50 AM	pH, Chlorides
21	22	Groundwater	2:30 PM	Cyanide
2	22	Groundwater	2:30 PM	Metals
3	22	Groundwater	2:30 PM	pH, Chlorides
4	21	Groundwater	2:50 PM	Cyanide
5	21	Groundwater	2:50 PM	Metals
6	21	Groundwater	2:50 PM	pH, Chlorides

* Metals = Lead, copper, chromium, nickel (when preceded by PP, the metals include all 13 priority pollutant metals)

PP = Priority Pollutants

discharge at Station No. 08 is suspect as a source because of its proximity to Station Nos. 12 and 13 the leachate samples did not exhibit high concentrations of contaminants.

8. McAllister Point Landfill Samples Collected - Characterization Step

The samples collected in the characterization step at the McAllister Point Landfill (Site No. 01) are listed in Table 14. The general locations of the sample collection points are shown on Figure No. 4. The data establishing the location of each station is presented in Appendix E. The principal areas of interest for purposes of the sampling program in the characterization step were:

- a. Repeat verification step mussel sampling at Stations 12 and 13 and extend mussel sampling south to Station 14 along the shoreline.
- b. Extend sediment sampling south along the shoreline to Station 14 and out into the Bay at Stations 15 to 20.
- c. Obtain a series of groundwater samples at upgradient well 23 and downgradient wells 21 and 22.

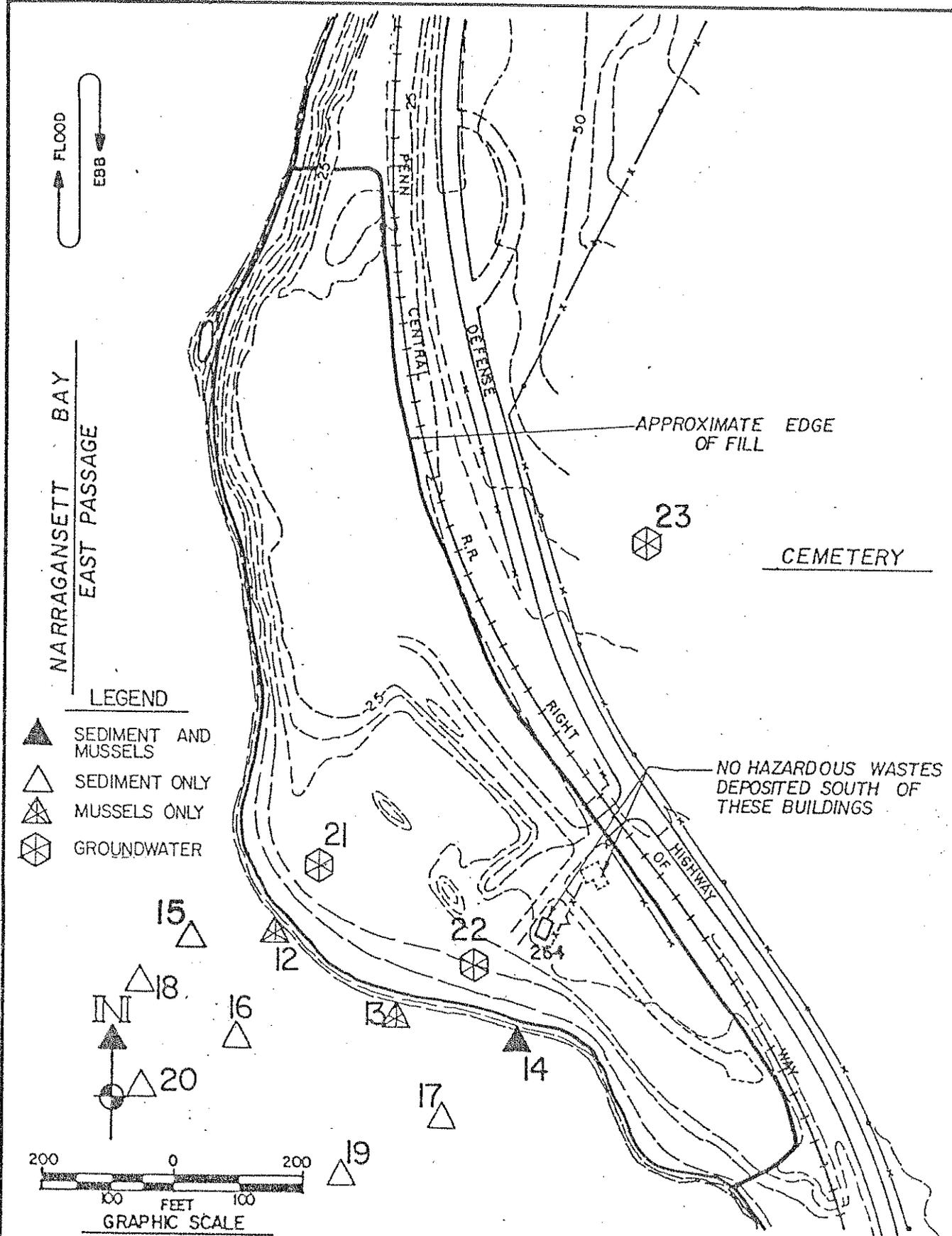
The sediment sample at Station No. 14 was collected 50 feet off-shore in three to five feet of water. The other six samples (Station Nos. 15 to 20) were collected in ten to twenty feet of water. All samples were surface sediments (0 to 4 inches deep). The deposits were very stony and samples of sediment were difficult to obtain.

All mussel samples were collected in the intertidal zone at Station Nos. 12 and 13.

Monitoring wells were installed as previously discussed.

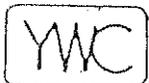
9. Analytical Data on Samples Collected - Characterization Step

The samples collected at the McAllister Point Landfill were analyzed for the parameters indicated in Table 14 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results is presented in



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

McALLISTER POINT LANDFILL
SITE NO 01
CHARACTERIZATION SAMPLING POINTS



York Wastewater Consultants, Inc.
Stamford, Connecticut

LEA LOUREIRO ENGINEERING ASSOCIATES

a professional corporation
CONSULTING ENGINEERS

AVON, CT.

MAR. 13, 1985

FIG. NO. 4

TABLE 15

SUMMARY OF SEDIMENT SAMPLE ANALYTICAL DATA
 SITE NO. 01 - McALLISTER POINT LANDFILL (Sept., 1984)

Station No.	Total Lead** (ug/gm*)	Total Copper** (ug/gm*)	Total Chromium** (ug/gm*)	Nickel		Total Cyanide (ug/gm*)
				Total (ug/gm*)	EP Tox. (mg/l)	
12***	900	1,455	17.5	64	-	-
13***	327	655	14.8	55.5	-	-
14	267	890	22.0	86.6	<0.20	<0.005
15	78.2	63.4	14.3	20.3	<0.20	<0.005
16	44.0	33.2	12.7	17.2	0.35	<0.005
17****	21.5	20.8	8.7	11.5	0.71	<0.005
17 (Dup.)	30.8	27.9	12.5	14.2	0.66	<0.005
18	34.9	22.8	17.1	16.9	0.20	<0.005
19	33.6	25.4	14.8	17.8	0.35	<0.005
20	32.3	16.6	14.3	14.2	<0.20	<0.005
N-1***	27.5	18.3	11.5	21.3	-	0.031
N-2***	6.8	10.3	8.0	11.3	-	0.027

* Dry weight basis.

** The EP toxic values for these metals were less than the following values for Stations 14 to 20:

Lead - EP toxic leachate <0.2 mg/l
 Copper - EP toxic leachate <0.20 mg/l
 Chromium - EP toxic leachate <0.10 mg/l

*** Data for Stations 12 and 13 and for the control stations is from the verification step.

**** The variances in Pb, Cu and Cr between the duplicates occurred even though the sample was well mixed before removing the two aliquots; since the QA/QC program indicated very good recovery of those metals from sediments, the variances are attributed to the non-homogeneous nature of the sediment. Further discussion on this is presented in Appendix B.

TABLE 16

SUMMARY OF MUSSEL SAMPLE ANALYTICAL DATA
SITE NO. 01 - McALLISTER POINT LANDFILL (Sept., 1984)

(All results in ug/gm - dry weight basis)

<u>Station</u> <u>No.</u>	<u>Lead</u>	<u>Copper</u>	<u>Chromium</u>	<u>Nickel</u>
12	19.9	20.6	3.5	6.6
13	7.5	9.2	1.0	4.0
14	19.7	14.1	1.4	4.4
N-1	4.9	6.8	1.1	4.9
N-2	3.8	8.2	2.8	5.1
N-2 (Dup.)	5.2	5.4	1.4	4.9

TABLE 17

SUMMARY OF ROUTINE GROUNDWATER SAMPLE
ANALYTICAL DATA

SITE NO. 01 - McALLISTER POINT LANDFILL (Nov., 1984 to Jan., 1985)

(All results in mg/l, except pH)

Station No. & Date	CN	Pb	Cu	Cr	Ni	pH	Cl
<u>Sta. 21</u>							
11-20-84	0.006	0.80	0.73	0.17	0.25	6.82	3.3
12-18-84	<0.005	0.34	0.22	0.04	0.06	7.01	340
1-07-85	0.008	<0.04	0.07	<0.02	<0.04	6.98	795
1-28-85	<0.005	1.58	0.95	0.22	0.30	6.41	624
<u>Sta. 22</u>							
11-20-84	0.006	1.00	1.04	0.11	0.19	6.43	2.2
12-17-84	0.006	0.76	0.59	0.07	0.10	6.57	1.3
1-08-85	0.013	0.14	0.16	0.04	<0.04	6.49	50.4
1-28-85	<0.005	0.70	0.55	0.07	0.12	6.54	108
<u>Sta. 23</u>							
11-20-84	0.005	0.10	0.06	0.09	0.19	5.95	3.8
12-17-84	<0.005	0.08	0.06	0.05	0.08	5.84	1.6
1-07-85	<0.005	<0.04	<0.04	<0.02	<0.04	5.87	2.8
1-28-85	0.009	<0.04	0.11	0.04	0.07	6.18	3.6

TABLE 18

SUMMARY OF ORGANICS, PESTICIDES, AND PCB PRIORITY POLLUTANT ANALYTICAL
DATA ON GROUNDWATER
SITE NO. 01 - McALLISTER POINT LANDFILL (Jan., 1985)

(All results in ug/l)

<u>Parameter</u>	<u>Station No. 21</u>	<u>Station No. 22</u>	<u>Station No. 23</u>
VOLATILE ORGANICS			
Acrolein	<100	<100	<100
Acrylonitrile	<100	<100	<100
All other volatile organics	<10	<10	<10
BASE NEUTRAL EXTRACTABLE ORGANICS			
Butyl benzyl phthalate	<10	<10	366
Bis (2-ethyl hexyl) phthalate	17	64	931
Di-n-octyl phthalate	19	62	553
All other base neutral extractable organics	<10	<10	<10
ACID EXTRACTABLE ORGANICS			
4,6-Dinitro-0-Cresol	<250	<250	<250
2,4-Dinitrophenol	<250	<250	<250
All other acid extractable organics	<25	<25	<25
PESTICIDES			
Alpha BHC	<0.005	<0.005	<0.005
Beta BHC	<0.005	<0.005	<0.005
Gamma BHC	<0.005	<0.005	<0.005
Delta BHC	<0.005	<0.005	<0.005
Heptachlor	<0.01	<0.005	<0.005
Aldrin	<0.005	0.015	<0.015
4,4' DDE	<0.005	<0.005	<0.005
Dieldrin	<0.005	<0.005	<0.005
4,4' DDD	<0.025	<0.005	<0.005
Endrin Aldehyde	<0.01	<0.01	<0.01
4,4' DDT	<0.025	<0.025	<0.025
Chlordane	<0.02	<0.02	<0.02
Endosulfan I	<0.01	<0.01	<0.01
Endosulfan II	<0.005	<0.005	<0.005
Endosulfan Sulfate	<0.025	<0.025	<0.025
Endrin	<0.005	<0.005	<0.005
Heptachlor Epoxide	<0.025	<0.025	<0.025
Toxaphene	<0.2	<0.2	<0.2
PCB (seven forms)	<0.2	<0.2	<0.2

TABLE 19

SUMMARY OF METALS, CYANIDE, AND PHENOL PRIORITY POLLUTANT
ANALYTICAL DATA ON GROUNDWATER
SITE NO. 01 - McALLISTER POINT LANDFILL (Jan., 1985)

(All results in ug/l)

<u>Parameter</u>	<u>Station No. 21</u>	<u>Station No. 22</u>	<u>Station No. 23</u>
Antimony	<100	<100	<100
Arsenic	<2	<2	<2
Beryllium	<10	<10	<10
Cadmium	<4	<4	<4
Chromium	<20	40	<20
Copper	72	158	<40
Lead	<40	140	<40
Mercury	0.7	<0.2	0.8
Nickel	<40	<40	<40
Selenium	<2	<2	<2
Silver	<40	<40	<40
Thallium	<100	<100	<100
Zinc	200	500	82
Cyanide	8	13	<5
Phenols	21	13	7

Table 15 for the sediment samples, Table 16 for the mussel samples, and in Tables 17, 18, and 19 for the groundwater samples.

10. Evaluation of Available Data - Characterization Step

The analytical data on samples collected in the verification step indicated that metals have accumulated in sediments and mussels near the McAllister Point Landfill. For this reason, additional sediment samples were collected further off-shore and additional mussel samples were collected in the intertidal zone to further define the extent of the contamination. In evaluating the characterization step data, control data collected in the verification step is used for comparison with sediment sample data but new control samples were collected for comparison with mussel sample data.

In general, the off-shore sediments sampled in the characterization step (Stations 15 to 20) were found to be less contaminated than the near-shore sediments (Stations 12 to 14) sampled in the characterization and verification steps. Elevated levels of lead, copper, and nickel were found in sediments close to shore (Stations 12, 13, and 14); the chromium concentrations at these stations were only slightly above the control sample concentrations. Lead and copper are being assimilated by mussels at rates higher than the controls at Stations 12 and 14 and to a lesser degree, at Station 13.

The concentrations of lead, copper, chromium, and nickel in sediments decrease with increased distance from shore. Stations 17 to 20 showed the lowest range of concentrations with Stations 15 and 16 showing intermediate values. The following summarizes these findings, all of which are expressed as total metal on a dry weight basis:

	Range of Concentrations (ug/gm) in Sediments			
	Lead	Copper	Chromium	Nickel
Near-shore samples (Stations 12 to 14)	267 - 900	655 - 1,455	14 - 22	55 - 87
Off-shore (Stations 15 and 16)	44 - 78	33 - 63	12 - 14	17 - 20
Out to 400' from shore (Stations 17 to 20)	21 - 35	17 - 21	9 - 17	11 - 18
Controls (Stations N-1 and N-2)	7 - 28	10 - 18	8 - 12	11 - 21

These data indicate that lead and copper concentrations in sediments at Stations 12 to 16 are significantly higher than the controls. Elevated nickel concentrations are restricted to the near-shore stations (12 to 14). None of the chromium concentrations is significantly higher than the controls. These findings are consistent with the data on mussels which showed elevated concentrations of lead, copper, and nickel in those locations where the sediments were high in these metals.

Lead was found in mussels at Stations 12 to 14 at levels up to four times that found in controls, copper at two to three times the controls, chromium at the same level as the controls, and nickel at one to 1.5 times the controls.

The sediment samples collected in the characterization step were analyzed to determine EP toxicity levels in accordance with the procedure using acetic acid in SW-846. This was done to approximate how readily the metals would be released from the sediment. These tests indicated that a very low percentage of the total metals was liberated into the extract. Although this procedure is not purported to be a direct measure of biological availability of the metals, it should be pointed out that Helsinger (1975) used acetic acid to estimate the exchangeable phase of contaminants in sediments.

Four sets of samples were collected from the three monitoring wells (Stations 21, 22, and 23). One set of samples was examined for priority pollutants and all sets were tested for lead, copper, chromium, nickel, pH value, cyanides, and chlorides. Samples from the two wells located in the

landfill (Stations 21 and 22) showed concentrations of lead and copper significantly higher than in the upgradient well (Station 23). However, none of the concentrations at Stations 21 and 22 were exceedingly high by comparison to levels which might be allowed in an industrial wastewater effluent discharge. There was also an indication of slightly elevated phenol concentrations. The results do not indicate that the landfill is a continuing major source of environmental contamination. This is shown in the following comparisons:

	<u>Wells downgradient of landfill (Stations 21 and 22)</u>	<u>Well upgradient of landfill (Station 23)</u>
Cyanide (mg/l)	<0.005 to 0.013	<0.005 to 0.009
Lead (mg/l)	<0.04 to 1.58	<0.04 to 0.10
Copper (mg/l)	0.07 to 1.04	<0.04 to 0.11
Chromium (mg/l)	<0.02 to 0.22	<0.02 to 0.09
Nickel (mg/l)	<0.04 to 0.30	<0.04 to 0.19
pH (std. units)	6.41 to 7.01	5.84 to 6.18
Chlorides (mg/l)	1.3 to 795	1.6 to 3.8
Phthalates (ug/l)	<10 to 64	366 to 931
Mercury (mg/l)	<0.0002 to 0.0007	0.0008
Zinc (mg/l)	0.2 to 0.5	0.082
Phenols (mg/l)	0.013 to 0.021	0.007
All other priority pollutants	None above detection limit	

The results on phthalates are unexpected since the upgradient well (No. 23) showed a much higher concentration than the downgradient wells. Although the monitoring well at Station No. 23 is located upgradient of the McAllister Point Landfill, it is located within 1000 feet of Tank Farm Five and at a lower elevation. Most of the Tank Farm Five site slopes to the north away from Station No. 23 and, furthermore, phthalates would not be expected to be present in contaminants from that site if, in fact, they have entered the groundwater. It is possible that phthalates may have been introduced from the well construction materials but this is unlikely with threaded Type 1 PVC which is unplasticized and does not require the use of solvent welds for assembly and installation.

Based on the data in Table Nos. 9 and 17 the tidal influence on the monitoring data is minor at Station Nos. 21 and 22 and is non-existent at the upgradient well at Station No. 23. At Station Nos. 21 and 22 chloride concentrations up to 795 mg/l were observed, but concentrations at levels equal to those in the upgradient well were also observed at Station Nos. 21 and 22. This indicates that at times there may be some salt water intrusion, although the chlorides could also be produced from materials leached from the landfill. A comparison of groundwater elevations at Station No. 21 and 22 with Narragansett Bay water levels indicates that the groundwater elevation is generally within about one to two feet of the high tide elevations for that particular date; the well water levels were always above the Bay water level except for one observation at high tide (January 8, 1985) when the water level in well No. 22 was slightly below the Bay water level. The following summarizes these comparisons.

Date	High Tide Elevations	Water Elevations at Time of Sampling			
		Well No. 21		Well No. 22	
		Bay	Well	Bay	Well
11-20-84	4.7, 4.3	(-)0.8	3.3		
11-20-84	4.7, 4.3			(-)0.8	3.7
12-17-84	4.1, 3.7			3.5	6.0
12-18-84	4.3, 3.7	0.2	3.8		
1-07-84	4.5, 3.7	0.1	4.5		
1-08-85	4.5, 3.9			4.2	3.9
1-28-85	3.3, 2.9	1.8	3.8		
1-28-85	3.3, 2.9			1.9	3.1

11. Location of Contaminant Sources and Actual/Potential Migration

The groundwater sampling program did not reveal any serious source(s) of environmental contamination from the landfill. Although there may be some leaching of metals, the concentration levels of metals in the groundwater within the landfill site are too low for the landfill to be considered a significant contaminant source.

Although the groundwater samples did not pinpoint the groundwater as a pathway for carrying contaminants into the Bay, it is evident that contaminants have in the past, or are continuing to be released from the landfill because the sediment and mussel sampling data indicate elevated concentrations of some metals (lead and copper). The most likely pathway for this is, or was, the groundwater passing under or through the fill.

12. Toxicity Data and Standards/Criteria for Contaminants Found

The contaminants found in the environment near the McAllister Point Landfill include copper, lead, and nickel in mussels and in bottom sediments. Specific standards or criteria for heavy metals in mussels and in marine sediments have not been established. The assessment of the severity of the contamination detected is, therefore, subjective and must be made by comparison to data on mussels and sediments obtained at control stations. These comparisons have been presented previously; they indicate that mussels and sediments close to shore have been affected by copper, lead, and nickel. There are no established limits for concentrations of these metals in foods such as mussels. However, the levels found in the mussels were, at most, four times the levels found in the controls.

Toxicity data for the contaminants found was presented in Section J of the verification step report. Specific toxicity data is related principally to water quality; the more important criteria relating to health effects and the marine environment are repeated here.

(a) Copper.

Copper is required in animal metabolism. It is important in invertebrate blood chemistry and for the synthesis of hemoglobin. In some invertebrate organisms a protein, hemocyanin, contains copper and serves as the oxygen-carrying mechanism in the blood. An overdose of ingested copper in mammals acts as an emetic.

Concentrations of copper found in natural waters are not known to have an adverse effect on humans. Prolonged oral administration of excessive quantities of copper may result in liver damage, but water supplies seldom have sufficient copper to effect such damages. Young children require approximately 0.1 mg/day of copper for normal growth and the daily requirement for adults was estimated to be about 2 mg/day (Sollman, 1957). Copper in excess of 1 mg/l may impart some taste to water. The EPA recommends a limit of 1 mg/l copper in drinking water because of a possible undesirable taste.

Copper is present in seawater at a concentration of approximately 3 ug/l but copper added to the marine environment is readily precipitated in the alkaline and saline environment. Toxicity of copper to fishes in marine waters has not been studied, but for *Nereis virens*, a polychaete invertebrate, the toxic threshold for copper was 100 ug/l (Raymont and Shields, 1964). Copper is toxic to oysters at concentrations above 100 ug/l (Galtsoff, 1932). Clendenning and North (1960) found inhibition of photosynthesis in the giant kelp, *Macrocystis pyrifera*, at copper concentrations of 60 ug/l. This commercially important marine plant is used for several industrial processes and for important food additives.

Adult softshell clams, *Mya arenaria*, were the most sensitive marine macroorganisms tested in static copper toxicity bioassays. LC_0 , LC_{50} , and LC_{100} values after 168 hours at 30 o/oo salinity and 22°C were 25, 35 and 50 ug/l respectively. At 17°C, these values were 75, 86 and 100 ug/l, respectively, for the same time period. Copper is selectively concentrated over zinc by adult softshell clams, *Mya arenaria*. Concentrations of greater than 20 ug/l are fatal after exposure for several weeks (Pringle, et al. 1968). The 9-day LC_{50}

for newly hatched *Fundulus heteroclitus* larvae was 160 ug/l (Gentle, 1975).

To protect marine aquatic life, criteria of 4.0 ug/l as a 24-hour average, not to exceed 23.0 ug/l at any time, are recommended.

(b) Lead

As far as is known, lead has no beneficial or desirable nutritional effects. Lead is a toxic metal that tends to accumulate in the tissues of man and other animals. Although seldom seen in the adult population, irreversible damage to the brain is a frequent result of lead intoxication in children. The major toxic effects of lead include anemia, neurological dysfunction, and renal impairment. The most common symptoms of lead poisoning are anemia, severe intestinal cramps, paralysis of nerves (particularly of the arms and legs), loss of appetite, and fatigue; the symptoms usually develop slowly. High levels of exposure produce severe neurologic damage, often manifested by encephalopathy and convulsions; such cases frequently are fatal. Lead is strongly suspected of producing subtle effects (i.e., effects due to low level or long term exposures insufficient to produce overt symptoms) such as impaired neurologic and motor development and renal damage in children (EPA, 1973). Subclinical lead effects are distinct from those of residual damage following lead intoxication.

There is no question that some marine organisms can concentrate the lead present in seawater. Wilder (1952) reported lobster dying in 6 to 20 days when held in lead-lined tanks. Calabrese, et al. (1973) found a 48-hour LC_{50} of 1.730 ug/l and a 48-hour LC_{50} of 2,450 ug/l for oyster, *Crassostrea virginica*, eggs. The remarkable ability of the eastern oyster, *Crassostrea virginica*, to concentrate lead was

demonstrated (Pringle, et al. 1968) by exposing them to flowing seawater containing lead concentrations of 25 ug/l, 50 ug/l, 100 ug/l and 200 ug/l; after 49 days, the total accumulation of lead amounted to 17, 35, 75 and 200 ppm (wet weight), respectively, and those oysters exposed to the two highest lead levels, upon gross examination, showed considerable atrophy and diffusion of the gonadal tissue, edema, and less distinction of hepatopancreas and mantle edge.

North and Clendenning (1958) reported that lead nitrate at 4.1 mg/l of lead showed no deleterious effect on the photosynthesis rate in kelp, *Macrosystis pyrifera*, exposed for 4 days. The EPA has suggested marine aquatic criterion for acute and chronic toxicity of 668 ug/l and 25 ug/l, respectively. These levels would be lower for more sensitive species which have not been tested.

(c) Nickel.

Nickel is considered to be relatively nontoxic to man (Schroeder, et al. 1961) and a limit for nickel is not included in the EPA National Primary Drinking Water Regulations. However, to protect human health, a criterion of 13.4 ug/l is recommended. The toxicity of nickel to aquatic life, as reported by McKee and Wolf (1963), indicates tolerances that vary widely and that are influenced by species, pH, synergistic effects, and other factors.

Calabrese, et al. (1973) reported a 48-hour LC₅₀ of 1,180 ug/l for American oyster embryos, *Crassostrea virginica*, and 310 ug/l for embryos of the hard shell clam, *Mercenaria mercenaria* (Calabrese and Nelson, 1974). Jones (1939) reported a 96-hour LC₅₀ of 800 ug/l for the euryhaline stickleback, *Gasterosteus aculeatus*. Gentile (1975) found that the 96-hour LC₅₀ for the marine copepod, *Acartia tonsa*,

was 625 ug/l. To protect marine aquatic life, the criterion are: 7.1 ug/l as a 24-hour average never to exceed 140 mg/l.

Based on the above discussions on toxic effects, the contaminants of greatest concern in the marine environment are (1) lead, because of the known harmful effects on marine biota and humans, and (2) copper, because of toxic effects on marine biota. There is very little data available on "unacceptable" or "harmful" concentrations of copper or lead in mussels and sediments. One example of such data is by Eisler (1979), who summarized data on copper accumulations in marine biota; survival of *M. edulis* was satisfactory in waters containing 0.025 - 0.027 ppm copper with 29 - 60 ppm copper in the mussels (dry weight basis). The concentrations of lead and copper in mussels used for food are not regulated so there are no standards for judging suitability of mussels for food except to say that ingestion of lead from any source is to be avoided.

Lead and copper in sediments are also of concern because the metals could be transferred to the food chain by various paths. However, the mobilization of contaminants from sediments to marine biota or to the food chain is not well understood or documented. The release of contaminants from sediments is widely variable depending on site conditions and on a multiplicity of physical, chemical and biological factors. Most data on these questions have evolved from studies of mining operations and dredging of rivers and harbors. In evaluating sediments, the Rhode Island Department of Environmental Management uses guidelines developed by the New England River Basins Commission in the "Interim Plan for the Disposal of Dredged Material From Long Island Sound" (1980). This document presents the following data:

Metal	Observed Concentrations in Central Long Island Sediments (ug/gm dry basis)		Level of Contamination (ug/gm)		
	Average	Range	Low	Moderate	High
Lead	27.8	6-63	<100	100-200	>200
Copper	69.6	2-269	<200	200-400	>400

The average values and ranges are from data developed by the Corps of Engineers from numerous ports and harbors and from non-spoil sediments in the vicinity of open water disposal areas.

The last three columns are used to make qualitative judgments on the class of sediment for the purpose of determining how dredged material should be disposed of. A "high" level of contamination is generally taken to mean that the sediment may have a high probability of being "toxic" to marine bottom fauna.

Rhode Island does not have detailed groundwater quality standards. Consequently, the quality of groundwater must be assessed against other available yardsticks such as drinking water standards, background levels or other available data. For the parameters of concern on this site, the federal drinking water standards are (40 CFR 141 and 143):

	<u>Standard</u>
Chromium	0.05 mg/l
Lead	0.05 mg/l
Copper	1.0 mg/l
Nickel	None currently stated but a value of 0.0134 mg/l has been recommended.
Cyanide	None stated
pH	6.5 - 8.5
Cl	250 mg/l

The above chromium and lead concentrations also apply to hazardous constituents as upper limits for groundwater monitoring programs under 40CFR 264.94 for permitted hazardous waste facilities. The above standards are, of course, not directly applicable to this site because the groundwater is not used for drinking nor is the site a permitted hazardous waste facility.

Groundwater monitoring programs under the federal hazardous waste regulations allow (1) comparisons with promulgated standards for compliance (as with chromium and lead), or (2) comparisons with background levels (upgradient wells, for example). A comparison of upgradient and downgradient well results is presented in the earlier sub-section on evaluation of available data.

The data on groundwater contaminants in the downgradient wells can be compared with effluent limitations for existing point source discharges for the metal finishing industry under 40 CFR 433.13:

	<u>Average Effluent Limitation for BPT* (mg/l)</u>	<u>Range of Contaminants in Downgradient Wells (mg/l)</u>
Copper	2.07	0.07 to 1.04
Lead	0.43	<0.04 to 1.58
Nickel	2.38	<0.04 to 0.30
Cyanide	0.65	<0.005 to 0.013
pH	6 - 9	6.41 to 7.01

*Best Practicable Control Technology

This comparison is presented to show that, although contaminants are present in the downgradient wells, the concentrations do not indicate gross levels of contamination; the comparison is not intended to show that these leachate contaminant levels are "acceptable" under state or federal regulations.

13. Recommendations

Hazardous wastes are known to have been deposited in the McAllister Point Landfill and there is evidence that contaminants have migrated out of the landfill and into the environment (mussels and sediments). The sediments found at the near-shore stations (12, 13, 14) are considered to have a high level of contamination (lead 267-900 ug/gm and copper 655-1455 ug/gm) and to have a high probability of being toxic to biota under the New England River Basins Commission "Interim Plan for the Disposal of Dredged Material From Long Island Sound", which defines lead >200 ug/gm and copper >400 ug/gm as high level contamination.

Mussels near stations 12-14 showed evidence of elevated lead and copper accumulations to levels up to 5 times that of the controls, the lead being

7.5-19.9 ug/gm and copper 9.2-20.6 ug/gm compared to controls of 3.8-5.2 and 5.4 to 8.2 ug/gm, respectively. These may have been derived from the sediments or from leachate from the landfill, although, as discussed later insufficient data was obtained to define the migration pathways.

Station 14 was selected as the southernmost sampling station because it is south of the reported southern limit of deposition of hazardous wastes. The laboratory data showed elevated lead and copper concentrations in both the sediments and the mussels at this station. It is possible, therefore, that sediment and mussels could be contaminated south of Station 14. Sediment samples from stations 15 to 20 (off-shore of stations 12, 13 and 14) showed metals concentrations higher than those at the control stations, but at levels considered to be low in toxicity by the New England River Basins Commission. The highest sediment contamination is limited to a narrow strip about 500 feet along the shore, although the southern end of potential contamination was not defined by the sampling program (south of Station No. 14).

With respect to the landfill itself, although there was an increase in metals in the groundwater as it passed through the landfill, the concentrations do not seem high enough to point to the underlying groundwater as a continuing major source of environmental contamination. This is based on sampling from wells at Stations 21 and 22 (Table 17) located about 300 feet apart near Stations 12, 13 and 14 where environmental contamination was found. In the verification step, no evidence was found to indicate that the overlying soils or the visible leachate discharges were sources of environmental contamination. This means that no migration pathway was defined by the study to account for the environmental contamination found.

However, the proximity of the contaminated mussels and sediments to the landfill strongly points to the landfill as the source of the contamination. Surface runoff and visible leachate discharges flow into the Bay and the groundwater hydraulic gradients indicate that the groundwater is moving into the

Bay along with any subsurface leachate which may be generated. None of these potential migration pathways was carrying contaminants in significant concentrations at the points and at the times sampled in this study. The following scenarios need to be considered, therefore, in developing recommendations for the McAllister Point Landfill site:

- I - The landfill is continuing to contribute contaminants into the Bay and the pathway(s) are at a location(s) not sampled in this study, and
 - (A) The rate of contaminant dispersion out into the Bay proper is faster than the rate of release from the landfill so that localized environmental effects (Stations 12, 13, 14) are decreasing with time, or
 - (B) The rate of contaminant dispersion out into the Bay is slower than the rate of release from the landfill so that localized environmental effects are increasing with time.
- II - The landfill is no longer contributing contaminants into the Bay and the existing localized contamination will decrease with time as dispersion out into the Bay proper occurs.

A determination of which scenario is representative of actual conditions would require additional detailed investigations and environmental sampling over an extended period of time to determine if environmental conditions are improving. A question which arises in connection with extended additional studies is - "Are there any serious imminent health or safety hazards associated with the landfill?" On the basis of the existing limited knowledge on mobilization of contaminants from sediments, there is no justification for an action such as removal of contaminated sediments to a disposal area. The elevated levels of metals in mussels is an obvious concern and the data should be reported to the State of Rhode Island. Any action with respect to the taking of mussels for food from the area would be at the discretion of the State of Rhode Island.

Additional studies are recommended to determine which of the above scenarios applies and to conduct a feasibility study for selection of remedial actions. The format of these studies should be governed by the requirements of 40 CFR 300.68 which covers Remedial Investigation/Feasibility Study (RI/FS) activities

for a hazardous waste site. Guidance for such studies is covered by EPA/540/G-85/002 and /003, June 1985. The purpose of the investigations would be:

- Determine if there are any migration pathways such as groundwater, leachate or surface runoff by more extensive monitoring well installations and sampling of groundwater, soil and surface water.
- Repeat sediment and mussel sampling periodically to determine if the contaminant levels are changing.
- Conduct feasibility studies to develop and analyze remedial alternatives.

Since the contaminant levels in the environment are relatively low, remedial actions such as groundwater or seawater cutoff walls, or interception and treatment of leachate do not seem justifiable, because the environmental benefit would not be commensurate with the cost. If the additional studies show that leachate and/or groundwater are, in fact, contributing to the environmental contamination, then a response action such as a clay cap would reduce percolation through the fill and reduce, but not completely eliminate, leachate generation. Another response might be "no action" with periodic monitoring of the sediment and mussels to determine if environmental contaminant levels are changing; if the levels show a decrease with time a minimal response such as regrading the surface and rip-rapping the face might be sufficient.

To determine an order of magnitude cost for a remedial measure, a cost estimate was made for a clay cap (3 feet thick) which would have, in general, the same goals as the closure and post-closure care requirements of 40 CFR 265.310. This regulation is, of course, not applicable to the NETC nor is it applicable to any landfills not receiving hazardous waste after November 19, 1980. The regulation does, however, present those actions which would be expected to minimize releases from the landfill, namely, provision and

maintenance of adequate cover and operation of a groundwater monitoring system.

The landfill is, in general, fairly well graded for handling runoff. However, there are areas where surface water becomes ponded on the landfill; this water must either evaporate or percolate through the landfill to produce leachate. Therefore, regrading would be necessary to eliminate such ponding.

There is a considerable depth of unsaturated fill (more than 20 feet at Station No. 21) above the normal groundwater level. This part of the fill is not in contact with the groundwater moving under the fill but it is subject to leachate generation due to percolation of rainfall from the surface of the fill. To minimize this percolation, a clay cap would be provided over the entire landfill (about 10 acres). Some sections of the landfill are subject to erosion due to wave action and there are some sections where waste materials are exposed. All such wastes would be buried (including the scattered metallic debris along the shoreline) and the seaward face provided with rip-rap to minimize erosion of the face. This would provide a closure consistent with 40 CFR 265.310.

The site monitoring program would continue for a five-year period to determine groundwater quality and to determine if sediment and mussel contaminants are increasing or decreasing.

The estimated cost for this work is \$1,100,000 exclusive of well installation, sampling and analysis. As mentioned above an RI/FS program should be instituted before proceeding with any remedial measures.

G. FINDINGS AT SITE NO. 02 MELVILLE NORTH LANDFILL

1. History of Waste Disposal

The history of waste disposal at this site was thoroughly covered in the IAS. The following discussion summarizes the background information contained in the IAS.

This site was used as a landfill from World War II to 1955. Wastes disposed of in this landfill included mostly domestic type refuse and also spent acids, waste paints, solvents, waste oils (diesel, fuel and lube), and PCB's. Definitive information was not available on specific types of wastes received and the operating practices used. However, the IAS indicated that wastes disposed of in this landfill would have been similar to those discussed for the McAllister Point Landfill. Also, since the site is low lying and subject to periodic flooding, it can be presumed that wastes were deposited in wet conditions. It appears that there was some recent disposal of oil-soaked earth on one part of the site.

2. Existing Site Conditions

The site is situated in the Melville North area in a low-lying wetland type area along the shoreline of Narragansett Bay, as shown in Figure No. 5. Surface drainage and groundwater flow from the site is directly into the bay. The area is also subject to periodic flooding and lies within the 100 year flood plain. There are several areas which accumulate water and appear to be wet even in dry weather.

This site has been sold by the Government and is now in private ownership. It has an area of about 10 acres.

There are several mounds of oil-soaked soil which appeared to have been trucked to the site and dumped. These oil contaminated mounds could be the oil sludge material obtained from the tank farms during tank cleaning operations, or the results of cleanup operations following oil spills.

3. Hydrogeological Data

The general hydrogeology of the NETC area was covered in the IAS. The following discussion summarizes conclusions drawn from the background hydrogeological data contained in the IAS.

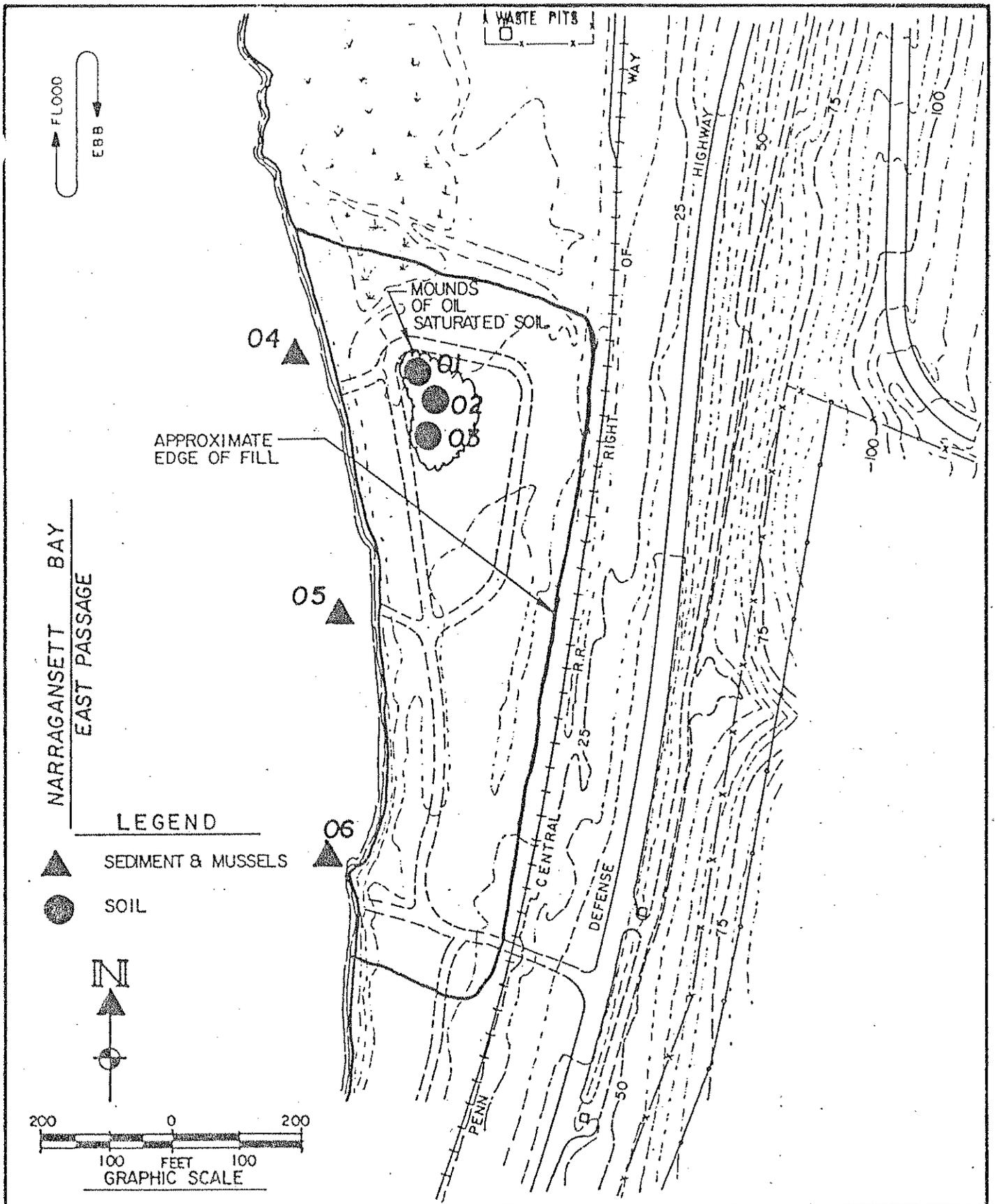
The groundwater in areas close to the bay is often within just two or three feet of the surface. Due to the low-lying configuration of the site, groundwater levels are very shallow and in fact portions of the site, particularly on the north and east sides are very wet. The groundwater moves in a westward direction and discharges into Narragansett Bay. This factor and the history of waste deposition into the low-lying coastal area indicate that the hydrogeology of the site is characterized by groundwater movement through the waste deposits in a general east to west direction. Some deviations from this general pattern may be present due to the non-homogeneous nature of the deposits. There was no evidence of any direct leachate discharges into the Bay. The groundwater is not being utilized at NETC. Any wells in the area are upgradient from the site and beyond its influence.

4. Melville North Landfill Samples - Verification Step

The samples collected in the verification step at the Melville North Landfill (Site No. 02) are listed in Table 20. The locations of the sample collection points are shown on Figure No. 5. The principal areas of interest for purposes of the sampling program in the verification step were:

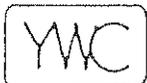
- a. The marine environment at and near the shoreline of the landfill.
- b. The surface soils on the site.

The shoreline is more than 1000 feet long facing the East Passage of Narragansett Bay. The landfill is covered with soil but there are some exposed piles of soil suspected to contain oils. The shoreline has a cobble and shell beach with some large rock outcrops.



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

MELVILLE NORTH LANDFILL
SITE NO 02
VERIFICATION SAMPLING POINTS



York Wastewater Consultants, Inc.
Stamford, Connecticut



LOUREIRO ENGINEERING ASSOCIATES
a professional corporation
CONSULTING ENGINEERS

AVON, CT.

FEB. 28, 1984

FIG. NO. 5

The nine sediment samples were collected from Station Nos. 04 to 06 about 25 feet off-shore in one to three feet of water. The deposits were predominantly silt and sand and were penetrable with the hand coring equipment. The three surface sediment samples (0-4 inches) were analyzed as indicated in Table 20, but the other samples (at depths up to 30 inches) were reserved for future use if required.

All mussel samples were collected in the intertidal zone shoreward of the sediment sampling stations (Nos. 04 to 06).

Three soil samples were collected at points distributed along piles of soil where suspected oily deposits are visible (Station Nos. 01 to 03). The three samples were composited in the laboratory for examination for lead, PCB and petroleum based hydrocarbons.

5. Analytical Data on Samples Collected - Verification Step

The samples collected at the Melville North Landfill are summarized in Table 20 as previously discussed. The analyses were conducted for the parameters indicated in Table 20 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results is presented in Table 21 for the sediment and mussel samples and in Table 22 for the soil samples.

6. Evaluation of Available Data - Verification Step

The analytical data on samples collected indicate that there is no significant accumulation of metals or PCBs in sediment or mussels collected at the three marine sampling points. This judgment is based on comparison of the verification step analytical data with the control station data (see Table 21).

The composite soil sample indicated the presence of lead and very high concentrations of petroleum based hydrocarbons. No PCBs were found in the soil. As mentioned above, there is no evidence of lead accumulations in sediments or mussels. See Section D for additional evaluation of analytical data on mussel samples.

TABLE 21
 SUMMARY OF SEDIMENT AND MUSSEL SAMPLE ANALYTICAL DATA
 SITE NO. 02 - MELVILLE NORTH LANDFILL (NOV., 1983)
 (all results in ug/gm - dry weight basis)

Substrates and Parameters	Site Specific Station Numbers			Control Station Numbers	
	<u>04</u>	<u>05</u>	<u>06</u>	<u>N1</u>	<u>N2</u>
<u>SEDIMENT*:</u>					
PCB	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	4.3	9.3	5.8	11.5	8.0
Cadmium	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	2.3	7.5	5.8	27.5	6.8
Arsenic	<0.2	<0.2	<0.2	<0.2	<0.2
Mercury	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	<0.2	<0.2	<0.2	<0.2	<0.2
Silver	<0.5	<0.5	<0.5	<0.5	<0.5
Copper	4.0	16.0	5.5	18.3	10.3
Barium	<0.4	<0.4	<0.4	<0.4	<0.4
Nickel	8.3	10.8	10.3	21.3	11.3
Beryllium	<0.05	<0.05	<0.05	<0.05	<0.05
Antimony	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	<5.0	<5.0	<5.0	<5.0	<5.0
<u>MUSSELS:</u>					
PCB	0.08	0.35	0.03	0.36	0.37
Chromium	<2.5	<2.5	<2.5	<2.5	<2.5
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5
Lead	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic	<0.4	<0.4	<0.4	<0.4	<0.4
Mercury	<0.04	<0.04	<0.04	<0.04	<0.04
Selenium	<0.4	<0.4	<0.4	<0.4	<0.4
Silver	<1.0	<1.0	<1.0	<1.0	<1.0
Copper	<2.5	<2.5	<2.5	7.2	4.3
Barium	<1.0	<1.0	<1.0	<1.0	<1.0
Nickel	<2.5	<2.5	<2.5	<2.5	<2.5
Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5
Antimony	<1.0	<1.0	<1.0	<1.0	<1.0
Tin	<10.0	<10.0	<10.0	<10.0	<10.0

*All sediment data is for the surface
 sediments at 0 to 4-inch depth

TABLE 22
SUMMARY OF SOIL SAMPLE ANALYTICAL DATA
SITE NO. 02 - MELVILLE NORTH LANDFILL (NOV., 1983)
(All results in ug/gm - dry weight basis)

<u>Parameter</u>	<u>Composite from Stations 01, 02 and 03</u>
Petroleum Based Hydrocarbon	32,508
Lead	60.0
PCB	<0.5

The composite soil sample indicated the presence of lead and very high concentrations of petroleum based hydrocarbons. No PCBs were found in the soil. As mentioned above, there is no evidence of lead accumulations in sediments or mussels. See Section D for additional evaluation of analytical data on mussel samples.

7. Location of Suspected Contaminant Sources - Verification Step

The only known potential contaminants which could be carried off-site are contained in the oil saturated soil deposits piled in one area on the site. If there are other sources, their effects on the environment, if any, were not detected.

8. Melville North Landfill Samples Collected - Characterization Step

The samples collected in the characterization step at the Melville North Landfill (Site No. 02) are listed in Table 23. The general locations of the sample collection points are shown on Figure No. 6. The data establishing the location of each station is presented in Figure No. 7. The principal areas of interest for purposes of the sampling program in the characterization step were the surface soils on the site.

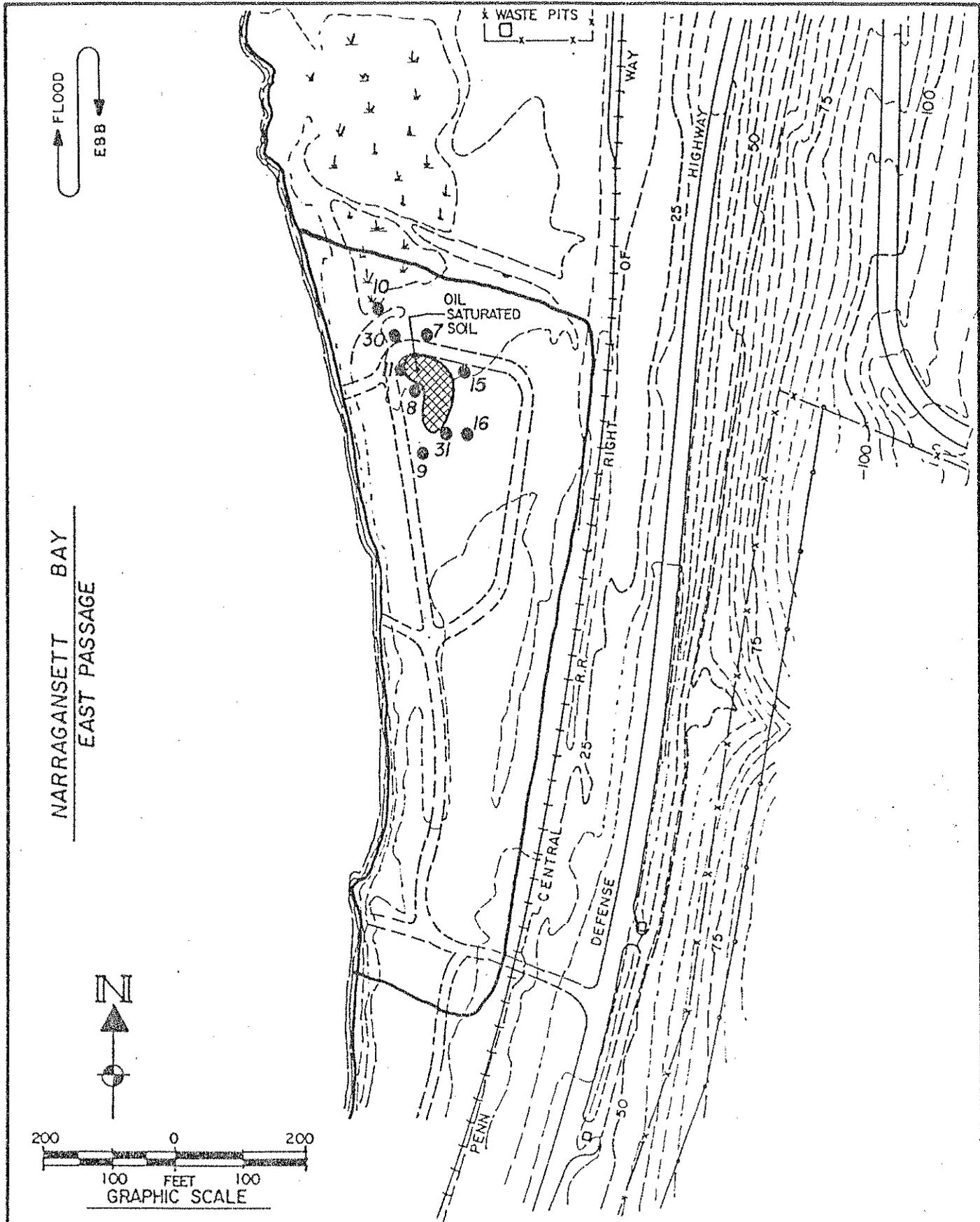
The only contamination found in the verification step was in the soil piles which were found to contain oil. The characterization step sampling was conducted to make field determinations of the extent to which the oil from these piles had contaminated the soil.

9. Field Observations on Samples Collected - Characterization Step

Field observations were made on the soil as excavations were made down to a depth of three feet. A summary of these observations is shown in Table 24. No analyses were conducted on the two samples submitted to the laboratory.

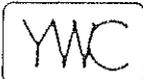
10. Evaluation of Available Data - Characterization Step

The analytical data on samples collected in the verification step indicated that there is no significant accumulation of metals or PCBs in sediment or mussels collected at the marine sampling points, but a sample of the oily soil piles indicated the presence of lead and very high concentrations of petroleum



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
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MELVILLE NORTH LANDFILL
SITE NO 02
CHARACTERIZATION SAMPLING POINTS



York Wastewater Consultants, Inc.
Stamford, Connecticut

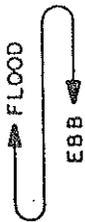


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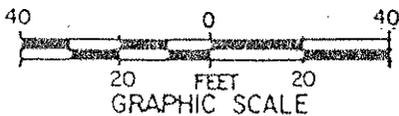
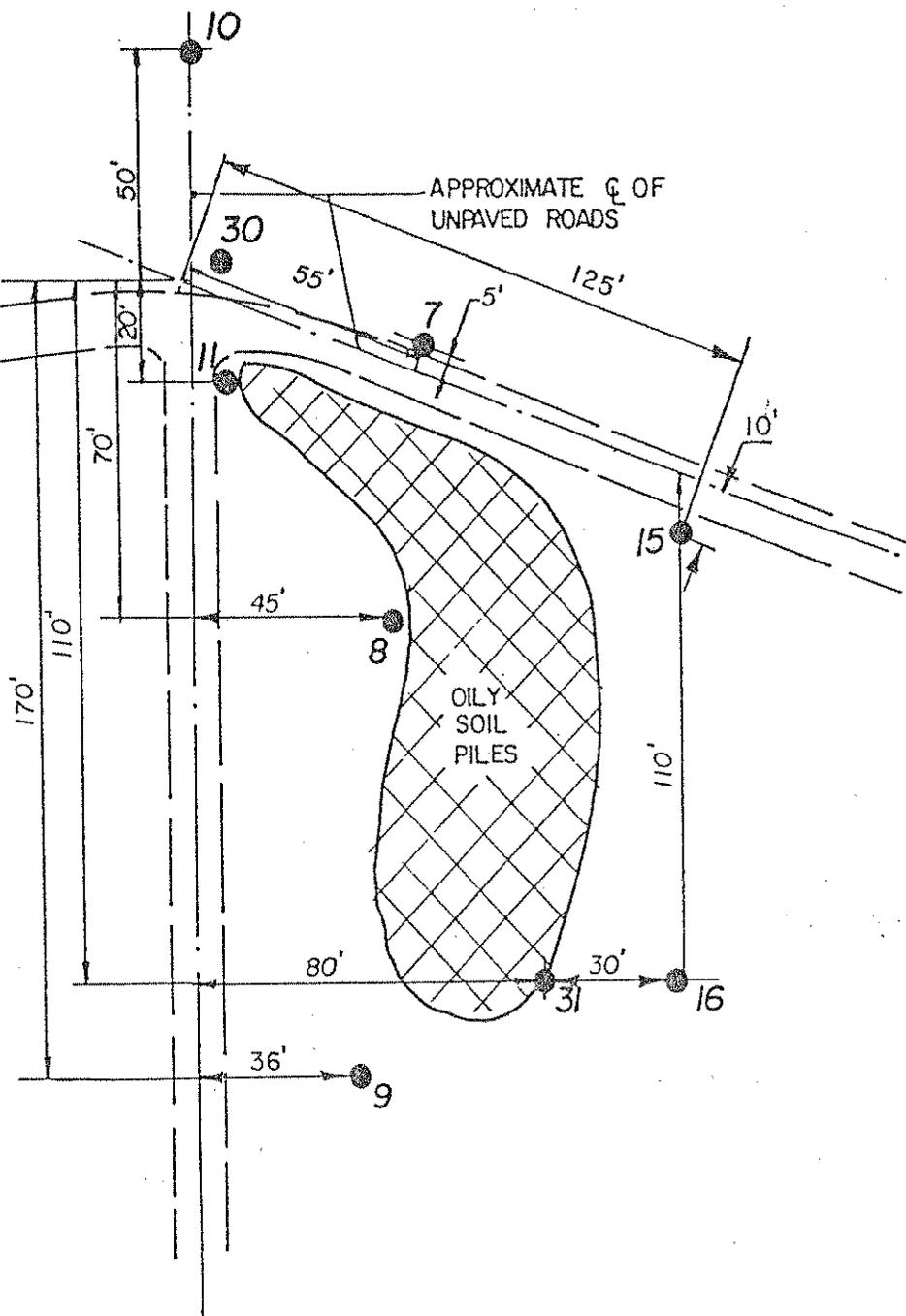
MAR. 13, 1985

FIG. NO. 6

OILY SOIL PILES = 6000 S.F. @ 3 FEET
AVE. DEPTH = 670 C.Y.



NARRAGANSETT BAY
EAST PASSAGE



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

MELVILLE NORTH LANDFILL
SITE NO. 02
SOIL SAMPLING LOCATIONS



Yonkers Water Consultants, Inc.
Stamford, Connecticut



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FIG. NO. 7

TABLE 23
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 02 - MELVILLE NORTH LANDFILL

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>DATE</u>	<u>FIELD OBSERVATIONS*</u>
2957	31	Soil**	9-10-84	Appearance and odor
2958	08	Soil**	9-10-84	Appearance and odor
None	07	Soil	9-10-84	Appearance and odor
None	09	Soil	9-10-84	Appearance and odor
None	10	Soil	9-10-84	Appearance and odor
None	11	Soil	9-10-84	Appearance and odor
None	15	Soil	9-10-84	Appearance and odor
None	16	Soil	9-10-84	Appearance and odor
None	30	Soil	9-10-84	Appearance and odor

* Field observations were made at various depths down to three feet
 ** Sampled at three-foot depth (No analysis conducted)

TABLE 24

SUMMARY OF FIELD OBSERVATIONS ON SOIL EXCAVATIONS
SITE NO. 02 - MELVILLE NORTH LANDFILL (Sept., 1984)

<u>Station No.</u>	<u>Observations</u>
07	No evidence of oil contamination down to three-foot depth.
08	Broken paving materials on surface and at several levels down to three feet deep; no evidence of oil contamination.
09	Overgrown area; no surface contamination and no evidence of oil contamination down to three feet deep.
10	Broken paving materials on surface and intermittently down to 18-inch depth; no evidence of oil contamination.
11	Broken paving materials on surface and intermittently down to three-foot depth; no evidence of oil contamination.
15	No evidence of oil contamination down to three-foot depth.
16	Overgrown area; no surface contamination and no evidence of oil contamination down to three feet deep.
30	Broken paving materials on surface and intermittently down to 18-inch depth; no evidence of oil contamination.
31	Broken paving materials on surface and intermittently down to three-foot depth; no evidence of oil contamination.

based hydrocarbons. No PCBs were found in the soil. The concentration levels for lead in soil are reported to range from 2 to 200 ppm with an average of about 10 ppm (Lindsay, 1979). The concentration of lead found in soil from the Melville North Landfill site is higher than that found at Tank Farm One (15.3, 27.5 and 8.5 ppm) and at Tank Farm Four (3.25 ppm). However, the 60 ppm concentration level at Melville North Landfill is within the normal range of that found in soils and is well below the suggested maximum level of 1000 ppm in soil ("Hazardous Waste Land Treatment", EPA, 1983) upon closure of a land treatment system. Generally, lead is tightly absorbed by soil as is evident in this case because significant lead was not found in the marine environment. For these reasons, the characterization step was limited to defining the extent of the oil contamination from the oily soil piles found in the north part of the site. The extent of these piles is shown in Figure No. 7. None of the test holes showed any significant travel of oil laterally away from the piles. Some of the holes showed accumulations of waste bituminous paving material. These investigations indicate that the oily material has not migrated laterally away from the surface piles of the soil. Some downward migration may have occurred under the piles, but there was no indication of this at Stations 08, 11, and 31 adjacent to the piles.

11. Location of Contaminant Sources and Actual/Potential Migration

The only known potential contaminants which could be carried off-site are contained in the oily soil deposits piled in one area on the site. If there are other sources, their effects on the environment, if any, were not detected. The location and extent of these deposits are shown on Figure No. 7. The volume of these piles is estimated to be 670 cubic yards.

12. Toxicity Data and Standards Criteria for Contaminants Found

Petroleum based hydrocarbons and lead were found in the oily soil piles on

the north part of the site, but sampling showed that these contaminants have not migrated from the piles. Consequently, the marine environment has not been affected and toxicity considerations need to be based on land use rather than the marine environment.

(a) Petroleum Based Hydrocarbons.

A major difficulty encountered in the setting of criteria for petroleum products is that these are not definitive chemical categories, but include thousands of organic compounds with varying physical, chemical, and toxicological properties. They may be volatile or nonvolatile, soluble or insoluble, persistent or easily degraded. Many of these compounds are carcinogenic. It is well known that these materials interfere with growth of vegetation and, if concentrations are high enough in the soil, all vegetation will be killed. This is evident at the piles of soil found on the site.

(b) Lead.

As far as is known, lead has no beneficial or desirable nutritional effects. Lead is a toxic metal that tends to accumulate in the tissues of man and other animals. Although seldom seen in the adult population, irreversible damage to the brain is a frequent result of lead intoxication in children. The major toxic effects of lead include anemia, neurological dysfunction, and renal impairment. The most common symptoms of lead poisoning are anemia, severe intestinal cramps, paralysis of nerves (particularly of the arms and legs), loss of appetite, and fatigue; the symptoms usually develop slowly. High levels of exposure produce severe neurologic damage, often manifested by encephalopathy and convulsions; such cases frequently are fatal. Lead is strongly suspected of producing subtle effects (i.e., effects

due to low level or long term exposures insufficient to produce overt symptoms) such as impaired neurologic and motor development and renal damage in children (EPA, 1973). Subclinical lead effects are distinct from those of residual damage following lead intoxication.

The availability of Pb in soils is related to moisture content, soil pH, organic matter, and the concentration of calcium and phosphates. Under waterlogged conditions, naturally occurring lead becomes reduced and mobile. Organometallic complexes may be formed with organic matter and these soil organic chelates are of low solubility. Increasing pH and calcium ions diminish the capacity of plants to absorb lead as calcium ions compete with the lead for exchange sites on the soil and root surfaces.

Lead is not an essential element for plant growth. It is, however, taken up by plants in certain forms. The amount taken up decreases as the pH, cation exchange capacity, and available phosphorus of the soil increase. Under conditions of high pH, CEC and available phosphorus, lead becomes less soluble and is more strongly adsorbed.

Lead toxicity to plants is uncommon. Symptoms of lead toxicity are found only in plants grown on acid soils. In solution culture, root growth of sheep fescue is retarded by 30 ppm and stopped by 100 ppm Pb. Lead content in plants grown on soil with a high lead level increases only slightly over that of plants grown on soil of average lead content. Clover tops show an increase of 7.55 ppm, while kale and lettuce leaves show an increase of less than 1 ppm. The lead taken up by plants is rarely translocated since it becomes chelated in the roots. Tops of barley grown on a soil extremely high in lead contained 3 ppm while the roots contained 1,475 ppm lead. Translocation of Pb to

grain is less than translocation to vegetative parts.

Cattle and sheep are more resistant to lead toxicity than horses. There is, however, some tendency for cattle to accumulate lead in tissues, and lead can be transferred to milk in concentrations that are toxic to humans. Based on human health considerations, the maximum allowable lead content in domestic animals is 30 ppm (National Academy of Science, 1980). Cattle ingest large amounts of soil when grazing and may consume up to ten times as much lead from soil as from forage. Lead poisoning has been reported in cattle grazing in Derbyshire, England, where the soil is naturally high in the element (Barltrop et al., 1974).

13. Recommendations and Cost Estimate

Since no adverse environmental effects were found in the marine environment, the only remedial action needed is to remove the oily soil piles to remove the source of petroleum based hydrocarbons and replacement with clean soil and loam to establish vegetative cover.

The following summarizes the remedial actions recommended for Site 02 - Melville North Landfill:

- Remove the oily soil piles to the limits shown on Figure No. 7 and dispose of the material as oil spill clean-up material.
- Fill the disturbed area with clean soil, grade to drain and provide loam to promote growth of grass.

The estimated cost for this work is \$80,000. A breakdown of the estimate is as follows:

<u>ITEM</u>	<u>AMOUNT</u>
Remove and dispose of oily soil piles	\$67,000
Regrade, hydroseed and fertilize	<u>1,500</u>
Sub-total	68,500
Contingency (15%)	<u>11,500</u>
TOTAL ESTIMATED CONSTRUCTION COST	\$80,000

H. FINDINGS AT SITE NO. 07 TANK FARM ONE

1. History of Waste Disposal

The history of waste disposal at this site was thoroughly covered in the IAS. The following discussion summarizes the background information contained in the IAS.

Tank Farm One is located in Melville North and consists of six underground tanks. Each of these tanks has a storage capacity of 60,000 barrels. Five of these tanks are now used for the storage of oils including aviation fuel. One tank is no longer used. In the past, these tanks were periodically cleaned to remove the sludge material which, over time, settles on the bottoms of the tanks. This practice occurred from World War II until the 1970's.

When the tanks were cleaned, the sludge material was placed in a pit which was approximately 20 feet long, 10 feet wide, and 4 feet deep. These disposal pits were simply dug in the general vicinity of the tank being cleaned. The sludge was placed in the pits and allowed to weather for a few weeks. The pits were then covered over and marked with signs warning of tetraethyl lead. These pits are spread throughout the tank farm, but through the years, most of the signs marking the disposal areas have disappeared. Only two markers remain at this time and samples were collected at those two locations. The third sample was collected at a point which was believed to be a disposal location (near Tank No. 18).

2. Existing Site Conditions

The existing site is in active use as a tank farm. It is owned by the Navy but it is operated by a contractor. Disposal of tank sediments on the site has been discontinued as previously mentioned and there is no visible surface evidence of the past tank sediment disposal practices. The site is located well above flood elevation so that any pollutants released from buried tank sediments could escape the site only by migration with the groundwater flow.

When the tanks were installed, groundwater drains were placed around each tank. These were individually valved and piped to a common drain. This drain was later extended to the west where an oil separator is provided to remove oil if present before release of the water to Narragansett Bay. This drain was utilized to obtain a groundwater sample for analysis in the verification step.

The Melville Public Fishing Area is an impoundment located immediately north of Tank Farm One (see Figure No. 8). In 1981 an investigation was conducted by the U.S. Army Environmental Hygiene Agency concerning a complaint of oil discharge to the Melville Public Fishing Area. As part of this investigation, a shallow well was installed near the Melville Public Fishing Area for the purpose of observing groundwater conditions. This well was used for collection of groundwater samples in the verification step. There was no visible evidence of oil pollution in the reservoir at the time of sample collection in the verification step.

The U.S. Army report on the oil spill complaint concluded that the petroleum hydrocarbon material discovered on the Melville Public Fishing Area was not due to leakage in the pipelines or the tanks of the tank farm.

3. Hydrogeological Data

The general hydrology of the NETC area was covered in the IAS. The following discussion summarizes the background hydrogeological data contained in the IAS as well as that presented in the more site specific study conducted by the U.S. Army Environmental Hygiene agency in response to the reported oil spill in 1981 and monitoring wells installed in the characterization step.

The IAS reported that portions of the tank farm drain northward into the Melville Public Fishing Area, with other areas draining toward Narragansett Bay. The U.S. Army report, however, indicated that the general groundwater movement is in a northwesterly direction which is one of the reasons they concluded that

the existing tanks could not have caused the contamination of the Public Fishing Area.

Of even greater significance to this confirmation study is the complex geology of the area at the Tank Farm One area. The U.S. Army report describes this geology in considerable detail.

The major formation underlying the area is the Pennsylvanian aged, nonmarine, sedimentary formation called the Rhode Island Formation. It underlies the entire region occupied by Narragansett Bay and forms part of a large syncline which plunges to the south. In the vicinity of Tank Farm One, the outcrops and near-surface members are composed of gray to black thin-bedded shale with a few outcrops of thick-bedded graywackes located in the eastern section. All rock layers observed are heavily fractured and jointed with many small displacement normal faults whose strike is at approximate right angles to synclinal strike.

There are numerous fractures, joints and faults in the subsurface. This fracturing is so intense that it was difficult to determine if a major fault system transected the area. Likewise, the fracturing and other complexities make it impossible to reliably interpret subsurface data obtained from borings, excavations or monitoring wells.

Two new monitoring wells were installed to evaluate the possibility that the oily waste deposits are affecting groundwater quality. These wells were installed where shown on Figure 10 and pertinent well data are present in Table 25. The wells are downgradient of the fuel tanks and oily waste deposits. The groundwater elevations at the two monitoring wells are shown in Table 26. In general, the groundwater levels are three to four feet below the ground surface and with a significant gradient toward the Bay.

TABLE 25

MONITORING WELLS

SITE NO. 07 - TANK FARM ONE

	<u>Station No. 06</u>	<u>Station No. 07</u>
Location (See Exhibit B)	Downgradient of buried oily deposits	Downgradient of buried oily deposits
Well depth (feet)	45.0	30.0
Elevations (MLW):		
Ground surface	27.0	22.1
Top of well casing	27.08	22.99
Top of protective casing	27.55	23.25
Bottom of well	(-)18.8	(-) 7.9
Lengths (feet):		
Casing	35	20
Screen	10	10

TABLE 26

OBSERVED WATER LEVELS IN MONITORING WELLS
SITE NO. 7 - TANK FARM ONE

<u>Date</u>	<u>Time</u>	<u>Tide</u>	<u>Groundwater Elevation (MLW)</u>			
			<u>Station</u> <u>No. 06</u>	<u>Δ</u>	<u>Station</u> <u>No. 07</u>	<u>Δ</u>
9-13-84	10:30 AM	High	0.0*			
9-13-84	1:30 PM	Ebb			6.1*	16.0
11-21-84	7:30 AM	Ebb	23.6	3.4		
11-21-84	7:55 AM	Ebb			18.2	3.9
12-17-84	7:45 AM	Low	24.0	3.0		
12-17-84	8:30 AM	Low			18.4	3.7
1-07-85	9:10 AM	High	24.3	2.7		
1-07-85	10:15 AM	Ebb			18.7	3.4
1-28-85	10:10 AM	Flood			18.3	3.8
1-28-85	10:25 AM	Flood	24.0	3.0		
Ground surface elevation			27.0		22.1	
Bottom of well elevation			(-)18.0		(-) 7.9	

*These water level observations were made on the day of drilling; the great difference from the other observations is due to the very slow recovery rates of these wells.

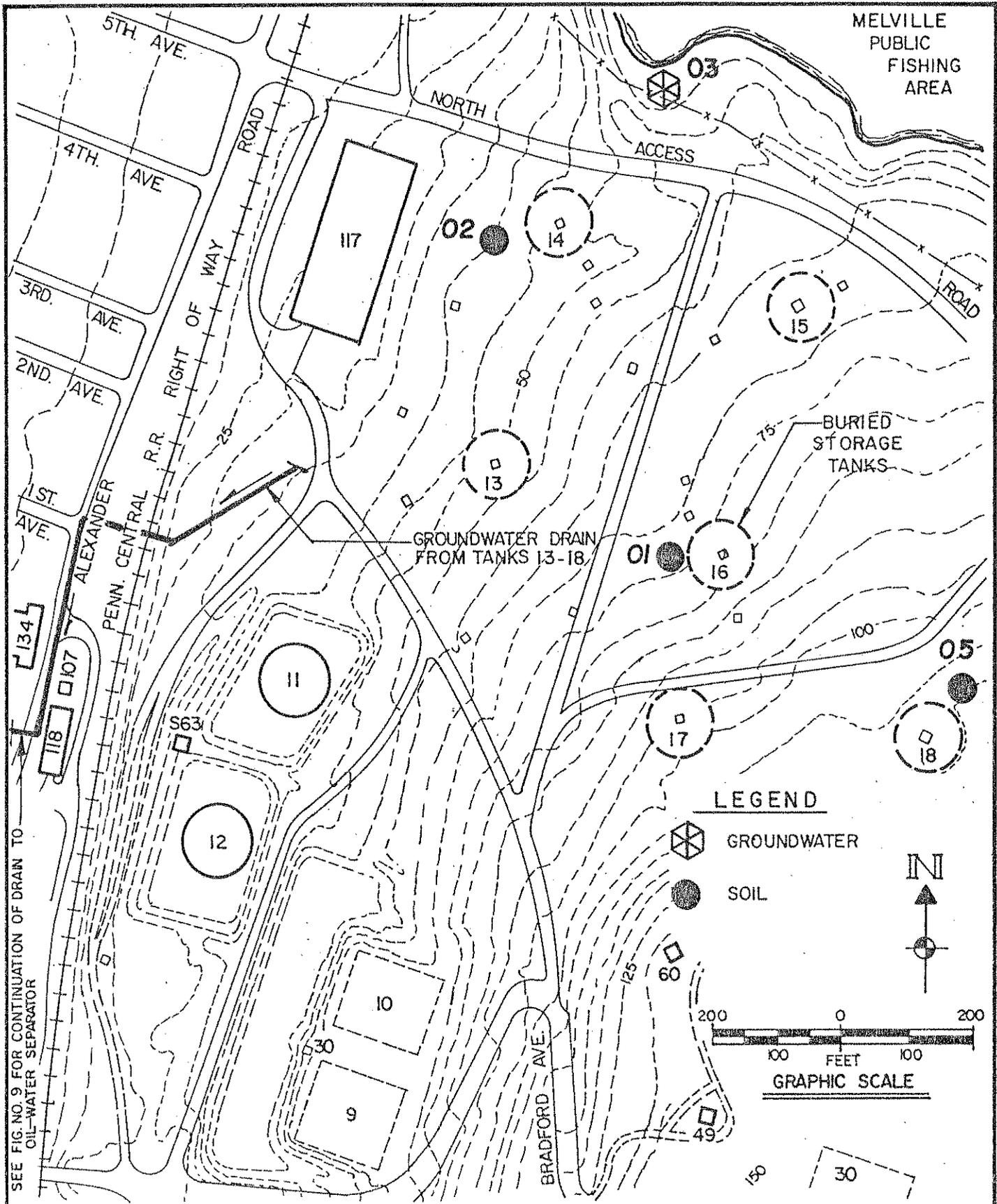
4. Tank Farm One Samples - Verification Step

The samples collected in the verification step at Tank Farm One (Site No. 07) are listed in Table 27. The locations of the sample collection points are shown on Figure Nos. 8 and 9. The principal areas of interest for purposes of the sampling program in the verification step were:

- a. The groundwater at the site.
- b. The soils on the site.

The groundwater samples were collected at two stations (Nos. 03 and 04) under both wet and dry weather conditions. One pair of the samples was from a groundwater observation well (Station No. 03) near the Melville Public Fishing Area north of Tank Farm One. The other pair was from a bypass around an oil - water separator (Station No. 04) on a system which drains groundwater from around the storage tanks at Tank Farm One.

The soil samples were collected from a depth of three feet at three locations (Station Nos. 01, 02 and 05) where sludges from storage tanks had been disposed of in pits and covered. The three samples were composited in the laboratory prior to examination.



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
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TANK FARM ONE
SITE NO 07
VERIFICATION SAMPLING POINTS



York Wastewater Consultants, Inc.
Stamford, Connecticut



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AVON, CT.

FEB. 28, 1984

FIG. NO. 8

CHAMBER 163

NOTE: THIS DRAIN COLLECTS GROUNDWATER FROM THE VICINITY OF BURIED TANKS NUMBERED 13 TO 18 (SEE FIG. NO. 8 FOR CONTINUATION)

SLAB TO BLDG 65

QUARTERS D

OIL-WATER SEPARATOR

NOTE: THESE BYPASS LINES WERE USED DURING SAMPLING AT STATION 04

HOLDING BASIN 04

OIL-WATER SEPARATOR

ROAD

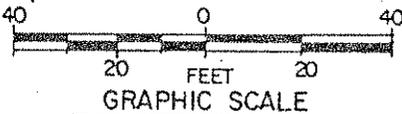
ALEXANDER

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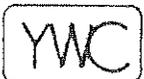
LEGEND

GROUNDWATER



CONFIRMATION STUDY ON HAZARDOUS WASTE SITES NEWPORT NAVAL EDUCATION & TRAINING CENTER

TANK FARM ONE - OIL-WATER SEPARATOR SITE NO 07 VERIFICATION SAMPLING POINTS



York Wastewater Consultants, Inc. Stamford, Connecticut

LEA LOUREIRO ENGINEERING ASSOCIATES

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FEB. 28, 1984

FIG. NO. 9

TABLE 27
SAMPLES COLLECTED - VERIFICATION STEP

SITE NO. 07 - TANK FARM ONE

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>TIME</u>	<u>ANALYSIS FOR</u>
			11-28-83	
8685	03	Groundwater-Dry Weather	11:30 A.M.	BTX
8686	03	Groundwater-Dry Weather	11:30	PBHC*
8687	03	Groundwater-Dry Weather	11:30	Lead
8688	04	Groundwater-Dry Weather	11:55	BTX
8689	04	Groundwater-Dry Weather	11:55	PBHC
8690	04	Groundwater-Dry Weather	11:55	Lead
			11-29-83	
8691	04	Groundwater-Wet Weather	1:55 P.M.	BTX
8692	04	Groundwater-Wet Weather	1:55	PBHC
8693	04	Groundwater-Wet Weather	1:55	Lead
8694	03	Groundwater-Wet Weather	2:25	BTX
8695	03	Groundwater-Wet Weather	2:25	PBHC
8696	03	Groundwater-Wet Weather	2:25	Lead
			11-30-83	
8697	05	Soil	7:45 A.M.	**
8698	02	Soil	8:00	**
8699	01	Soil	8:15	**

*Petroleum Based Hydrocarbons.

**Samples analyzed for lead and oil and grease.

5. Analytical Data on Samples Collected - Verification Step

The samples collected at the Tank Farm One site are summarized in Table 27 as previously discussed. The analyses were conducted for the parameters indicated in Table 27 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results is presented in Table 28 for the soil samples and in Table 29 for the groundwater samples.

6. Evaluation of Available Data - Verification Step

The analytical data on all samples collected indicate the presence of oil or gasoline contaminants in the soil and groundwater at Tank Farm One. This judgment is based on the magnitude of the oil and grease concentrations in soil samples and the BTX concentrations in groundwater samples. Although some lead was found in the soil samples, the concentrations were relatively low and no lead was found in groundwater. The concentrations of BTX and petroleum based hydrocarbons in the groundwater samples were high; BTX contamination indicates pollutants from light oils such as gasoline.

7. Location of Suspected Contaminant Sources - Verification Step

The analytical data confirms the presence of oil and grease and deposits at the suspected locations of previous tank sediment burial pits.

The analysis of groundwater samples at Station No. 04 confirms that BTX contaminants are present in the groundwaters at one or more of the buried storage tanks numbered 13 to 18 at Tank Farm One.

The groundwater samples at Station No. 03 also exhibited significantly high levels of BTX in groundwater. However, the hydrogeological data developed by the U.S. Army Environmental Hygiene Agency indicates that contaminants found at this sampling point do not originate from Tank Farm One.

TABLE 28
 SUMMARY OF SOIL SAMPLE ANALYTICAL DATA
 SITE NO. 07 - TANK FARM ONE (NOV., 1983)
 (All results in ppm - dry weight basis)

<u>Parameter</u>	<u>Station Numbers</u>		
	<u>01</u>	<u>02</u>	<u>05</u>
Lead	15.3	27.5	8.5
Oil and Grease	2194	1321	2013

TABLE 29
 SUMMARY OF GROUNDWATER SAMPLE ANALYTICAL DATA
 SITE NO. 07 - TANK FARM ONE (NOV., 1983)
 (All results in ppb (ug/l) except as noted)

<u>Parameter</u>	<u>Station Numbers</u>			
	<u>03</u> Dry <u>Weather</u>	<u>04</u> Dry <u>Weather</u>	<u>03</u> Wet <u>Weather</u>	<u>04</u> Wet <u>Weather</u>
Benzene	18	479	160	40
Toluene	281	735	203	59
Xylenes	561	226	91	26
Lead	<40	<40	<40	<40
Petroleum Based Hydrocarbons (ppm)	3.9	2.8	1.6	5.5

8. Tank Farm One Samples Collected - Characterization Step

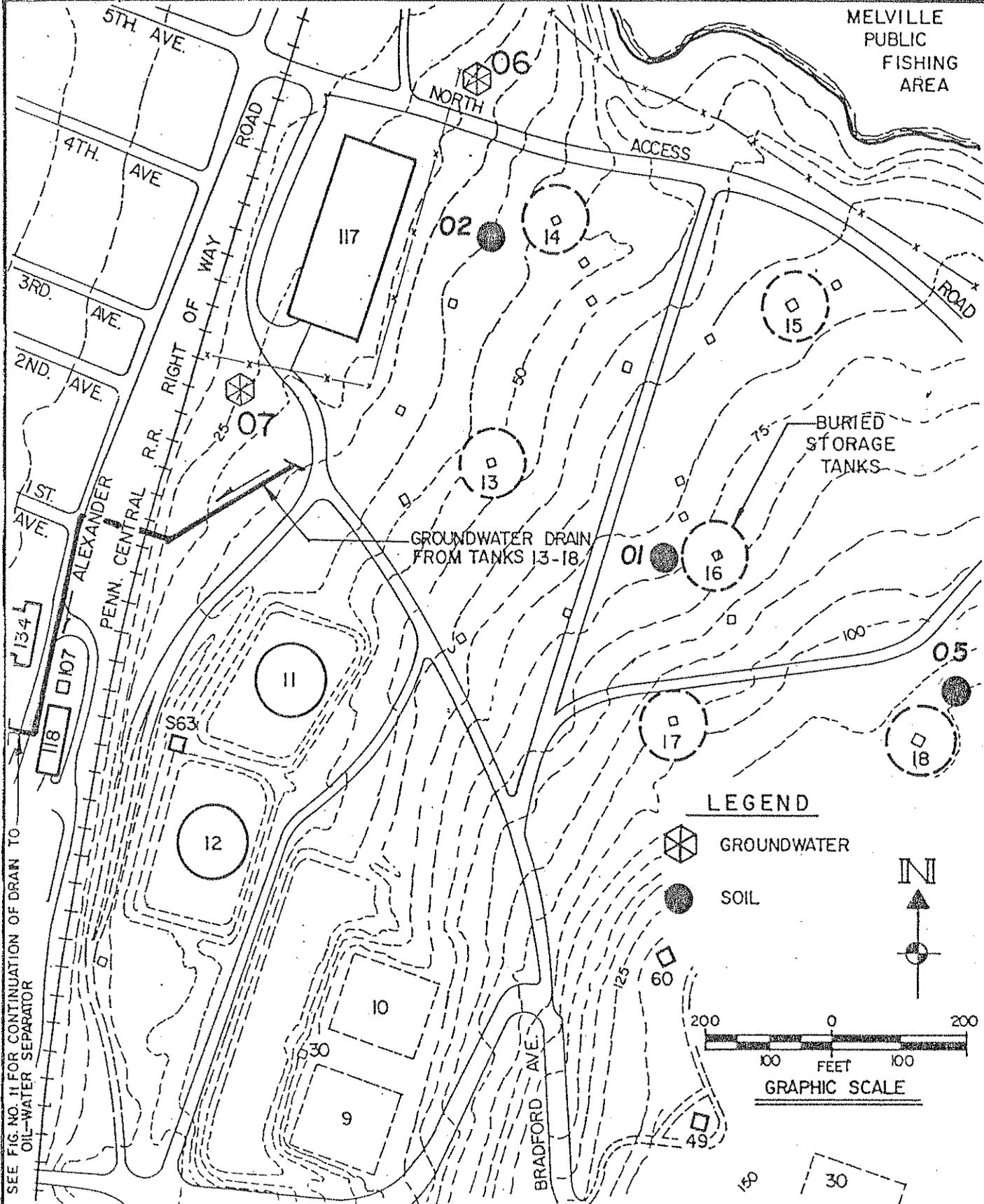
The samples collected in the characterization step at Tank Farm One (Site No. 07) are listed in Table 30. The general locations of the sample collection points are shown on Figure Nos. 10 and 11. The data establishing the locations of the monitoring wells is presented in Appendix F. The principal areas of interest for purposes of the sampling program in the characterization step were:

- a. The groundwater at the site.
- b. The soils on the site.
- c. A comparison of the volatile organics in the soil and groundwater.
- d. A comparison of the influent and effluent quality of the oil-water separator.

The soil samples were collected from a depth of three feet at three locations (Station Nos. 01, 02 and 05) where sludges from storage tanks had been disposed of in pits and covered.

Monitoring wells (Stations 06 and 07) were installed as summarized in Table 25. These wells were installed for the purpose of comparing the volatile organic characteristics of the groundwater with that of the soil samples. The wells were constructed as described in Section E. At Station 04, samples of groundwater were obtained from a groundwater collection system draining the area of fuel tank Nos. 13 to 18. This groundwater normally discharges through an oil-water separator to Narragansett Bay. The separator was by-passed for 15 minutes before sampling at Station 04. The oil-water separator effluent was sampled at Station 08.

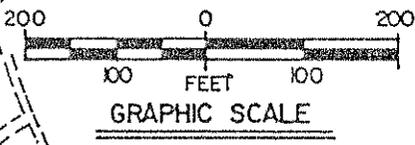
MELVILLE
PUBLIC
FISHING
AREA



SEE FIG. NO. 11 FOR CONTINUATION OF DRAIN TO OIL-WATER SEPARATOR

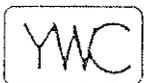
LEGEND

- GROUNDWATER
- SOIL



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

TANK FARM ONE
SITE NO 07
CHARACTERIZATION SAMPLING POINTS



York Wastewater Consultants, Inc.
Stamford, Connecticut

LEA LOUREIRO ENGINEERING ASSOCIATES
a professional corporation

CONSULTING ENGINEERS AVON, CT.

MAR. 13, 1985

FIG. NO. 10

CHAMBER 163

NOTE: THIS DRAIN COLLECTS GROUNDWATER FROM THE VICINITY OF BURIED TANKS NUMBERED 13 TO 18 (SEE FIG. NO. 10 FOR CONTINUATION)

SLAB TO BLDG 65

6" AC. B.S. BW

QUARTERS D

OIL-WATER SEPARATOR

NOTE: THESE BYPASS LINES WERE USED DURING SAMPLING AT STATION 04

HOLDING BASIN

04

OIL-WATER SEPARATOR

08

M.H.

ALEXANDER ROAD

IN

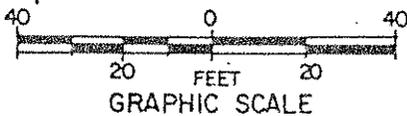
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OIL-WATER SEPARATOR EFF

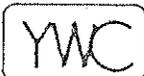


GROUNDWATER



CONFIRMATION STUDY ON HAZARDOUS WASTE SITES NEWPORT NAVAL EDUCATION & TRAINING CENTER

TANK FARM ONE - OIL-WATER SEPARATOR SITE NO 07 CHARACTERIZATION SAMPLING POINT



York Wastewater Consultants, Inc. Stamford, Connecticut



LOUREIRO ENGINEERING ASSOCIATES a professional corporation CONSULTING ENGINEERS AVON, CT.

MAR. 13, 1985

FIG. NO. 11

TABLE 30
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 07 - TANK FARM ONE

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>TIME</u>	<u>ANALYSIS FOR</u>
			9-12-84	
2991	02	Soil	1:45 PM	*
2992	02	Soil	1:45	**
2993	01	Soil	2:15	*
2994	01	Soil	2:15	**
2995	05	Soil	2:45	*
2996	05	Soil	2:45	**
			11-21-84	
6811	07	Groundwater	8:30 AM	PBHC
6812	07	Groundwater	8:30	***
6813	06	Groundwater	8:55	PBHC
6814	06	Groundwater	8:55	***
6815	08	Oil-water Separator Effluent	9:15	PBHC
6816	08	Oil-water Separator Effluent	9:15	***
6817	04	Groundwater	9:25	PBHC
6818	04	Groundwater	9:25	***
			12-17-84	
6831	06	Groundwater	8:55 AM	PBHC
6832	06	Groundwater	8:55	***
6833	06	Groundwater	8:55	***
6834	07	Groundwater	9:20	PBHC
6835	07	Groundwater	9:20	***
6836	07	Groundwater	9:20	***
6837	08	Oil-water Separator Effluent	9:40	PBHC
6838	08	Oil-water Separator Effluent	9:40	***
6839	08	Oil-water Separator Effluent	9:40	***
6840	04	Groundwater	10:00	PBHC
6841	04	Groundwater	10:00	***
6842	04	Groundwater	10:00	***

* Characteristic fingerprint
 ** No analysis conducted
 *** Characteristic fingerprint and BTX

TABLE 30(Cont'd)
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 07 - TANK FARM ONE

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>TIME</u>	<u>ANALYSIS FOR</u>
1-07-85				
0661	06	Groundwater	11:00 AM	PBHC
2	06	Groundwater	11:00 AM	***
3	06	Groundwater	11:00 AM	***
4	07	Groundwater	11:20 AM	PBHC
5	07	Groundwater	11:20 AM	***
0672	07	Groundwater	11:20 AM	***
0666	08	Oil-water separator effluent	1:25 PM	PBHC
7	08	Oil-water separator effluent	1:25 PM	***
8	08	Oil-water separator effluent	1:25 PM	***
9	04	Groundwater	1:45 PM	PBHC
70	04	Groundwater	1:45 PM	***
1	04	Groundwater	1:45 PM	***
1-28-85				
7004	08	Oil-water separator effluent	9:35 AM	PBHC
5	08	Oil-water separator effluent	9:35 AM	***
6	08	Oil-water separator effluent	9:35 AM	***
7	08	Oil-water separator effluent	9:35 AM	***
8	04	Groundwater	9:50 AM	PBHC
9	04	Groundwater	9:50 AM	***
10	04	Groundwater	9:50 AM	***
11	04	Groundwater	9:50 AM	***
7014	07	Groundwater	11:00 AM	PBHC
5	07	Groundwater	11:00 AM	***
6	07	Groundwater	11:00 AM	***
31	07	Groundwater	11:00 AM	***
7017	06	Groundwater	11:15 AM	PBHC
8	06	Groundwater	11:15 AM	***
9	06	Groundwater	11:15 AM	***
20	06	Groundwater	11:15 AM	***

* Characteristic fingerprint
 ** No analysis conducted
 *** Characteristic fingerprint and BTX

9. Analytical Data on Samples Collected - Characterization Step

The samples collected at the Tank Farm One site were analyzed for the parameters indicated in Table 30 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results is presented in Table 31 for the gas chromatographic scans on soil samples, groundwater samples, and oil-water separator effluent samples. Table 32 presents a summary of PBHC and BTX analyses on groundwater samples and oil-water separator effluent samples.

10. Evaluation of Available Data - Characterization Step

The analytical data on all samples collected in the verification step indicated the presence of oil or gasoline contaminants in the soil and groundwater at Tank Farm One. This was based on the oil and grease concentrations in soil samples and the BTX concentrations in groundwater samples. Although some lead was found in the soil samples, the concentrations were relatively low and no lead was found in groundwater.

To further evaluate the site, samples of soil from old tank sediment burial locations (Stations Nos. 01, 02, and 05) were subjected to chromatographic scans to establish the type(s) of oil present. These scans were compared with scans of a series of four groundwater samples about one month apart collected from the groundwater drainage system (Station No. 04) and the two monitoring wells. A similar series of samples was collected from the oil-water separator effluent (Station No. 08) for comparison with the influent (Station No. 04). Samples from Stations 04, 06, 07, and 08 were also examined for benzene, toluene, and xylene (BTX), which is indicative of the presence of light petroleum products, such as gasoline.

The results indicate that the petroleum products found in the soils from the old burial locations are weathered materials similar to No. 6 or Bunker C fuel

TABLE 31

SUMMARY OF GAS CHROMATOGRAPHIC SCANS OF SAMPLES
OF SOIL, GROUNDWATER, AND OIL WATER SEPARATOR EFFLUENT
SITE 07 - TANK FARM ONE (Sept., 1984 to Jan., 1985)

<u>Station No.</u>	<u>Sample of</u>	<u>Date</u>	<u>Summary of Scan</u>
01	Soil	9-12-84	All samples contained a weathered petroleum based oil with a pattern similar to a No. 6 or Bunker C Fuel.
02	Soil	9-12-84	
05	Soil	9-12-84	
04	Groundwater	11-21-84	All samples contained a series of hydrocarbons with a pattern similar to weathered gasoline. The hydrocarbons present were in the C ₈ to C ₁₃ range which indicate a weathered gasoline product.
		12-17-84	
		1-07-85	
		1-28-85	
08	Oil-water separator effluent	11-21-84	All samples contained a series of hydrocarbons with a pattern similar to weathered gasoline. The hydrocarbons present were in the C ₈ to C ₁₃ range which indicate a weathered gasoline product.
		12-17-84	
08	Water separator effluent	1-07-85	Insufficient levels to fingerprint " " " "
		1-28-85	
06	Groundwater (monitoring well)	11-21-84	Insufficient levels to fingerprint " " " " " " " " " " " "
		12-17-84	
		1-07-85	
		1-28-85	
07	Groundwater (monitoring well)	11-21-84	Insufficient levels to fingerprint " " " " " " " " " " " "
		12-17-84	
		1-07-85	
		1-28-85	

TABLE 32

SUMMARY OF PBHC AND BTX ANALYTICAL DATA ON SAMPLES OF
GROUNDWATER AND OIL-WATER SEPARATOR EFFLUENT
SITE 07 - TANK FARM ONE (Nov., 1984 to Jan., 1985)

<u>Station No.</u>	<u>Date</u>	<u>Petroleum Hydrocarbons mg/l (ppm)</u>	<u>Benzene ug/l (ppb)</u>	<u>Toluene ug/l (ppb)</u>	<u>Xylene ug/l (ppb)</u>	
04	Groundwater	11-21-84	<1.0	150	160	28
	(influent	12-17-84	2.6	140	190	39
	to oil-water	1-07-85	<1.0	167	198	351
	separator	1-28-85	<1.0	88	65	520
08	Oil-water	11-21-84	8.6	20	120	80
	separator	12-17-84	5.0	30	110	74
	effluent	1-07-85	3.3	<10	<10	<10
		1-28-85	<1.0	10	<10	22
06	Groundwater	11-21-84	<1.0	<10	<10	<10
	monitoring	12-17-84	6.3	<10	<10	<10
	well	1-07-85	2.1	<10	<10	<10
		1-28-85	<1.0	<10	<10	<10
07	Groundwater	11-21-84	<1.0	<10	<10	<10
	monitoring	12-17-84	3.8	<10	<10	<10
	well	1-07-85	3.1	<10	<10	<10
		1-28-85	<1.0	<10	<10	<10

oil. The petroleum products found in all other samples were significantly different and were indicative of weathered gasoline. No evidence was found to indicate that oil from previous disposal practices is entering the groundwater.

There are some petroleum-based hydrocarbons and BTX present in the groundwater underdrainage system and the oil-water separator is generally performing well in limiting these discharges to the Bay. No BTX was found in either groundwater monitoring well (Stations 06 and 07).

The fingerprinting technique was used principally as a comparative tool to determine if similar hydrocarbons were present in the soil and in the groundwater. This technique has a relatively high detectable limit (20 ppm) so that, even though there were "insufficient levels to fingerprint", it cannot be concluded that there are no hydrocarbons present. However, the preponderance of data on the groundwater indicates that the soil is not the source of the hydrocarbons because the characteristics are entirely different. Further discussion on this is presented in Appendix B.

Although it appears that the groundwater underdrainage is intercepting some contaminants, a determination of whether or not these are coming from the active storage tanks or other current activities is beyond the scope of this study. However, it can be stated that the weathered gasoline found in the fingerprinting could have come from aviation fuel leaks from the existing tanks but confirmation of this can only be resolved by sampling of tank contents for comparison. Furthermore, the presence of benzene in the influent to the oil-water separator indicates "recent" contamination because benzene tends to break down rather quickly. Further investigation is needed to determine whether or not the existing tanks are, in fact, leaking.

The water levels in the monitoring wells were significantly above the Bay water level and were not affected by tidal variations.

11. Recommendations

The results of the studies indicate that some light petroleum products have entered the groundwater but not from previous waste disposal practices. Consequently, the site does not require further study, investigation, or remedial action under the NACIP program.

I. FINDINGS AT SITE NO. 12 TANK FARM FOUR

1. History of Waste Disposal

The history of waste disposal at this site was thoroughly covered in the IAS. The following discussion summarizes the background information contained in the IAS.

This site has 12 concrete underground tanks, each with a capacity of 60,000 barrels. These tanks were used by the Navy to store No. 5 and No. 6 fuel oils. The latest use of some of the tanks was under lease to a private contractor but the types of oils stored are not known. The use of these tanks was discontinued several years ago, when they were emptied (but not cleaned) and refilled with water.

Until the mid-1970's, the bottom sludge was periodically removed and disposed of by burning; however, there was some suspicion that the cleanings were disposed of on the ground in the general vicinity of the tank being cleaned. There is no indication on the site as to specifically where these deposits, if any, were made.

2. Existing Site Conditions

The site is no longer used as a tank farm. The tanks are filled, or partially filled with water and/or oil and are reported to contain any sediments or oil residues remaining when the tanks were emptied upon deactivation of the tank farm. No further waste disposal activities have taken place since deactivation and there is no visible surface evidence of the past tank sediment disposal practices. The site is located well above flood elevation so that any pollutants released from buried tank sediments could escape only by migration with the groundwater flow.

Norman's Brook flows across the southwest corner of the site just before discharging into Narragansett Bay. A swale carries intermittent wet weather runoff westerly from the vicinity of Tank No. 41 to Norman's Brook. When this

runoff was sampled in the verification step, the source of the runoff was seepage out of the ground in the more steeply sloped areas near the swale. The northern part of the site drains toward Narragansett Bay but not via Norman's Brook.

3. Hydrogeological Data

The general hydrogeology of the NETC area was covered in the IAS. The following discussion summarizes the background hydrogeological data contained in the IAS and includes data based on monitoring wells installed in the characterization step.

Soil sampling and other observations made during the verification step sampling indicated that the groundwater level is at about a depth of two to three feet, and based on surface grades it appeared that the groundwater moves in a westward direction and discharges into Narragansett Bay. However, as shown on Table 33 and Figure 12, two new monitoring wells were installed during the characterization step to evaluate the possibility that previous waste disposal practices might be affecting groundwater quality. These wells are located downgradient of the existing tanks and oil burial locations near the tanks. The groundwater elevations at the two monitoring wells are shown in Table 34. These show groundwater levels at depths of 5-15 feet and a gradient toward the south indicating that groundwater movement is toward Norman's Brook and the Bay. There was no evidence of any direct leachate discharges into the Bay. The groundwater is not being utilized at NETC. Any wells in the area are upgradient from the site and beyond its influence.

TABLE 33

MONITORING WELLS

SITE NO. 12 - TANK FARM FOUR

	<u>Station No. 10</u>	<u>Station No. 11</u>
Location (See Exhibit B)	Downgradient of oil tanks	Downgradient of oil tanks
Well depth (feet)	25.0	31.5
Elevations (MLW):		
Ground surface	20.8	18.8
Top of well casing	22.07	19.63
Top of protective casing	22.32	20.44
Bottom of well	(-) 4.2	(-)12.4
Lengths (feet):		
Casing	16	20
Screen	10	10

TABLE 34

OBSERVED WATER LEVELS IN MONITORING WELLS
SITE NO. 12 - TANK FARM FOUR

<u>Date</u>	<u>Time</u>	<u>Tide</u>	<u>Groundwater Elevation (MLW)</u>	
			<u>Station No. 10</u>	<u>Station No. 11</u>
9-12-84	2:30 PM	Low	9.8	
9-12-84	4:00 PM	Low		4.1
11-20-84	4:05 PM	High	11.6	
11-20-84	4:12 PM	High		6.9
12-17-84	2:30 PM	High	15.3	
12-17-84	2:50 PM	High		8.2
1-07-85	2:00 PM	Low	15.1	
1-07-85	2:25 PM	Low		9.7
1-28-85	3:15 PM	Ebb	13.3	
1-28-85	3:25 PM	Ebb		8.7
Ground surface elevation			20.8	19.1
Bottom of well elevation			(-) 4.2	(-)12.4

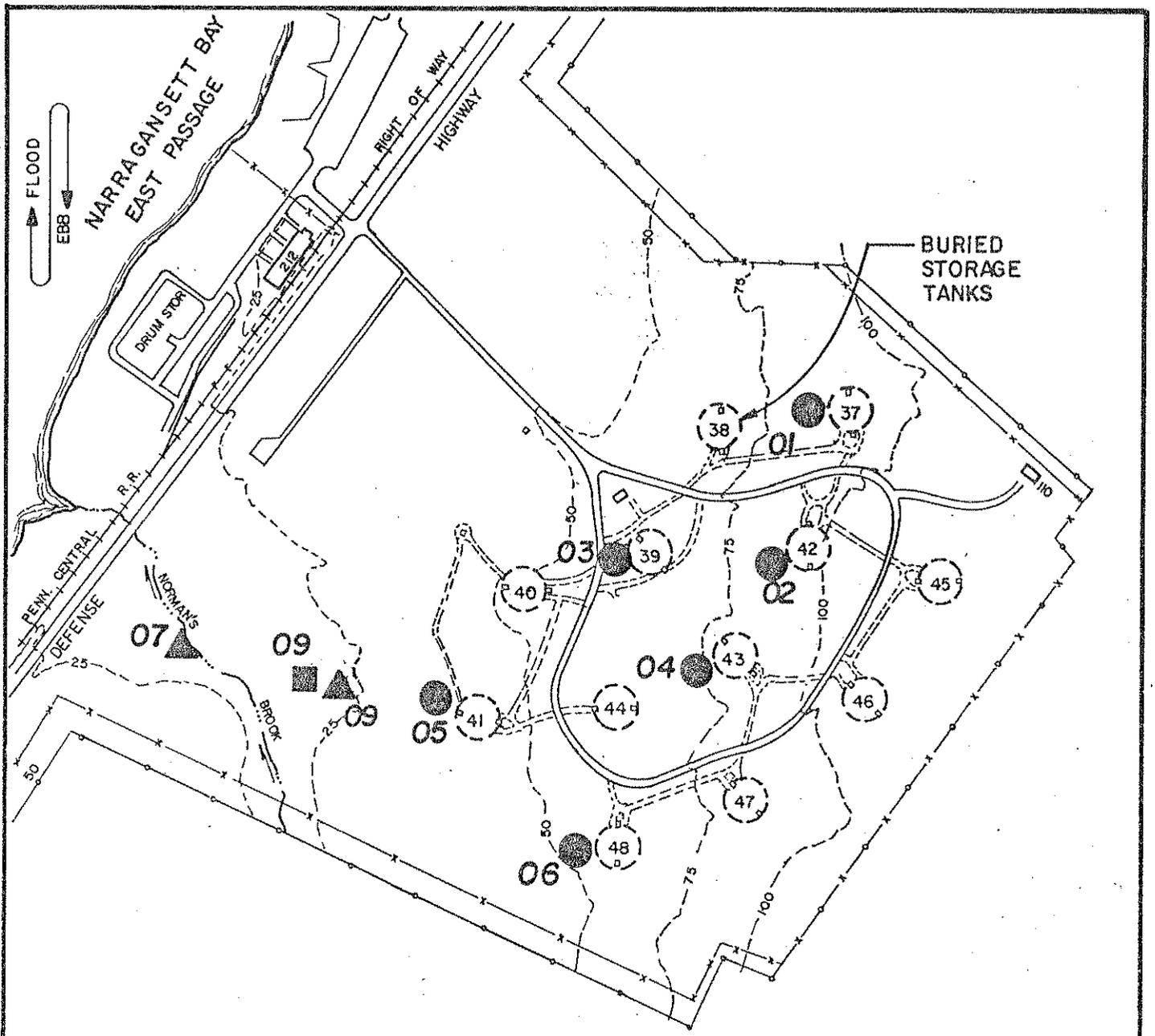
4. Tank Farm Four Samples - Verification - Step

The samples collected in the verification step at Tank Farm Four (Site No. 12) are listed in Table 35. The locations of the sample collection points are shown on Figure No. 12. The principal areas of interest for purposes of the sampling program in the verification step were:

- a. Groundwater at the site.
- b. The soils on the site.

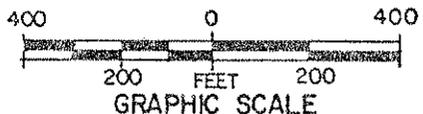
There were no readily available ground water observation points or sample points on or near the site. However, the sample of surface water collected from a swale (Station No. 09) several hours after period of rainfall may be considered to be representative of shallow groundwater since most of the contributory flow was observed to be seepage out of the ground rather than overland runoff.

The soil samples were collected from a depth of three feet at six locations (Station Nos. 01 to 06) where sludges from storage tanks were suspected to have been disposed of in pits and covered. The six soil samples were composited in the laboratory prior to examination.



LEGEND

-  N
-  SEDIMENT
-  SURFACE WATER
-  SOIL

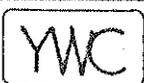


NOTE:

THE SURFACE WATER AT STATION 09 WAS ACTUALLY GROUNDWATER SEEPAGE IN WET WEATHER.

CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

TANK FARM FOUR
SITE NO 12
VERIFICATION SAMPLING POINTS



York Wastewater Consultants, Inc.
Stamford, Connecticut



LOUREIRO ENGINEERING ASSOCIATES
a professional corporation
CONSULTING ENGINEERS
AVON, CT.

FEB. 28, 1984

FIG. NO. 12

TABLE 35
SAMPLES COLLECTED - VERIFICATION STEP

SITE NO. 12 - TANK FARM FOUR

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>TIME</u>	<u>ANALYSIS FOR</u>
8710	07	Sediment (0-4)	11-28-83 3:45 P.M.	*
8711	09	Sediment (0-4)	11-29-83 3:15 P.M.	Lead, PBHC**
8712	09	Surface Water-Wet Weather	3:10	PBHC
8713	09	Surface Water-Wet Weather	3:10	Lead
8714	01	Soil	2:15	†
8715	02	Soil	2:30	†
8716	03	Soil	2:45	†
8717	04	Soil	3:00	†
8718	05	Soil	3:15	†
8719	06	Soil	3:30	†

*Sample not analyzed in the verification stage.

**Petroleum Based Hydrocarbons

†Samples were composited into one sample and analyzed for lead and oil and grease

TABLE 36
SUMMARY OF SURFACE WATER, SOIL AND SEDIMENT SAMPLE ANALYTICAL DATA
SITE NO. 12 - TANK FARM FOUR (NOV., 1983)

<u>Parameter</u>	<u>Station Numbers and Sample Types</u>		
	<u>01 to 06 Composite Soil Sample</u>	<u>09 Sediment</u>	<u>09 Surface Water</u>
Lead	3.25 ppm	<0.5 ppm	<0.04 mg/l
Petroleum Based Hydrocarbons	*	478 ppm	3.6 mg/l
Oil and Grease	216 ppm		

*No analysis performed

5. Analytical Data on Samples Collected - Verification Step

The samples collected at the Tank Farm Four Site are summarized in Table 35 as previously discussed. The analyses were conducted for the parameters indicated in Table 35 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results is presented in Table 36.

6. Evaluation of Available Data - Verification Step

The analytical data on samples collected indicate that there is oil and grease contamination in the soil and some petroleum based hydrocarbon contamination in sediments in a wet weather brook on the south side of the site. There was a low level of petroleum based hydrocarbon contamination in the runoff in this brook.

7. Location of Suspected Contaminant Sources - Verification Step

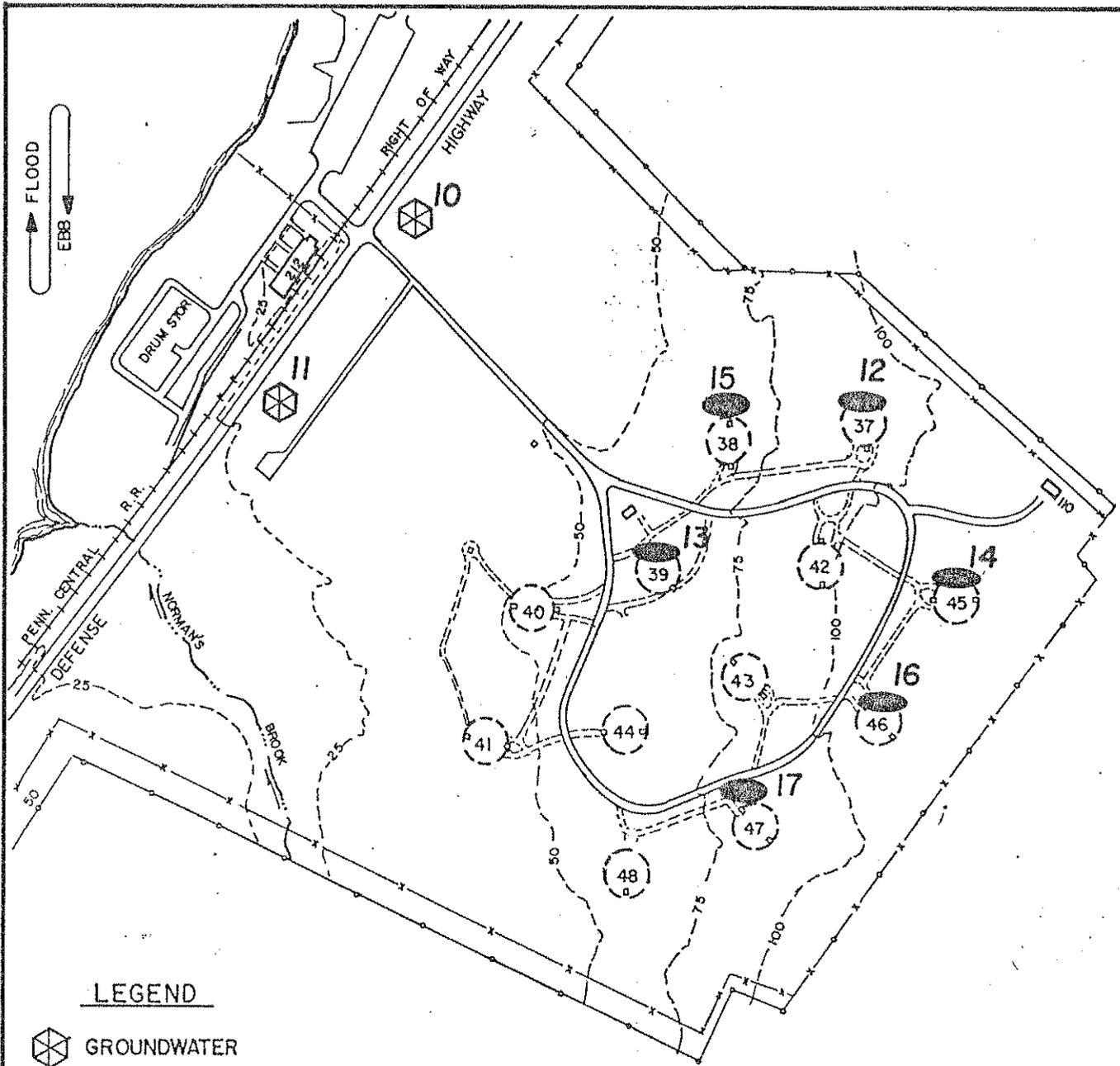
The analytical data indicate that one or more of the soil samples (Station Nos. 01 to 06) is high in oil and grease and that some petroleum based hydrocarbons may be escaping via surface runoff. The sources of these contaminants could be either of the following:

- Undefined locations of burial or dumping areas for tank bottom sediments.
- Leakage from tanks numbered 37 to 48 which were emptied but not cleaned when taken out of service.

8. Samples Collected - Characterization Step

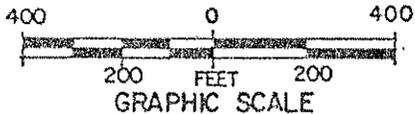
The samples collected in the characterization step at Tank Farm Four (Site No. 12) are listed in Table 37. The general locations of the sample collection points are shown on Figure No. 13. The data establishing the locations of the monitoring wells is presented in Appendix F. The principal areas of interest for purposes of the sampling program in the characterization step were:

- a. Groundwater at the site.
- b. The characteristics of the water in the inactive oil storage tanks.



LEGEND

-  GROUNDWATER
-  TANK SAMPLE



CONFIRMATION STUDY
 ON HAZARDOUS WASTE SITES
 NEWPORT NAVAL EDUCATION &
 TRAINING CENTER

**TANK FARM FOUR
 SITE NO 12
 CHARACTERIZATION SAMPLING POINTS**

YWC
 York Wastewater Consultants, Inc.
 Stamford, Connecticut

LEA LOUREIRO ENGINEERING ASSOCIATES
 a professional corporation
 CONSULTING ENGINEERS AVON, CT.

MAR. 13, 1985
 FIG. NO. 13

TABLE 37
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 12 - TANK FARM FOUR

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>TIME</u>	<u>ANALYSIS FOR</u>
9-12-84				
2979	13	Water - Tank 39	9:00 AM	*
2980	13	Water - Tank 39	9:05	*
2981	15	Water - Tank 38	9:45	*
2982	15	Water - Tank 38	9:50	*
2983	12	Water - Tank 37	10:00	*
2984	12	Water - Tank 37	10:05	*
2985	14	Water - Tank 45	10:30	*
2986	14	Water - Tank 45	10:35	*
2987	16	Water - Tank 46	11:00	*
2988	16	Water - Tank 46	11:05	*
2989	17	Water - Tank 47	11:30	*
2990	17	Water - Tank 47	11:35	*
11-20-84				
6826	10	Groundwater	5:00 PM	PBHC
6827	10	Groundwater	5:00	Lead
6828	11	Groundwater	4:40	PBHC
6829	11	Groundwater	4:40	Lead
12-17-84				
6846	10	Groundwater	3:25 PM	PBHC
6847	10	Groundwater	3:25	Lead
6848	11	Groundwater	4:25	PBHC
6849	11	Groundwater	4:25	Lead
01-07-85				
0676	10	Groundwater	3:05 PM	PBHC
7	10	Groundwater	3:05 PM	Lead
8	11	Groundwater	4:50 PM	PBHC
9	11	Groundwater	4:50 PM	Lead
01-28-85				
7027	10	Groundwater	4:00 PM	PBHC
8	10	Groundwater	4:00 PM	Lead
9	11	Groundwater	5:00 PM	PBHC
30	11	Groundwater	5:00 PM	Lead

NOTE: All water samples were collected at the bottom of the tank.

* Lead, petroleum based hydrocarbons, pH, total suspended solids, BOD, ammonia (the two bottles from each tank were mixed together before analysis)

Samples of water were collected from the bottom of six of the 12 inactive oil storage tanks (Stations 12 to 17); tank Nos. 37, 38, 39, 45, 46, and 47 were sampled. The purpose of the sampling was to determine the characteristics of the water for evaluation of methods of disposal when oil is removed from the tanks.

Monitoring wells (Stations 10 and 11) were installed as summarized in Table 33. These wells were installed to determine if previous disposal of tank cleanings by on site burial is affecting groundwater quality.

9. Analytical Data on Samples Collected - Characterization Step

The samples collected at the Tank Farm Four Site were analyzed for the parameters indicated in Table 37 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results on groundwater is presented in Table 38 and for water in the oil tanks in Table 39.

10. Evaluation of Available Data - Characterization Step

The analytical data on samples collected indicate that there is some petroleum-based hydrocarbon contamination in the groundwater. No significant concentrations of lead were found. Since the direction of groundwater movement is toward Norman's Brook and the Bay, no water supplies could be affected by this contamination and any impact on beneficial uses of the groundwater or the Bay would be practically non-detectable.

The pollutants found in the bottom water of the oil storage tanks are such that the waters could be discharged to a sanitary sewer during oil removal operations if necessary. A temporary oil-water separator would be desirable to avoid the possibility of a discharge of oil to the sewer system. The water levels in the monitoring wells were significantly above the Bay water level and were not affected by tidal variations.

TABLE 38

SUMMARY OF ANALYTICAL DATA ON SAMPLES OF GROUNDWATER
SITE NO. 12 - TANK FARM FOUR (Nov., 1984 to Jan., 1985)

<u>Station No.</u>	<u>Date</u>	<u>Lead mg/l (ppm)</u>	<u>Petroleum-based Hydrocarbons mg/l (ppm)</u>
10	11-20-84	0.04	<1.0
	12-17-84	<0.04	3.3
	1-07-85	<0.04	2.7
	1-28-85	<0.04	<1.0
11	11-20-84	0.06	1.9
	12-17-84	<0.04	12.3
	1-07-85	0.10	3.6
	1-28-85	<0.04	2.3

TABLE 39

SUMMARY OF ANALYTICAL DATA ON SAMPLES OF BOTTOM WATER
FROM INACTIVE OIL STORAGE TANKS
SITE NO. 12 - TANK FARM FOUR (Sept., 1984)

(All results in mg/l)

<u>Tank No.</u>	<u>Station No.</u>	<u>pH</u>	<u>Lead</u>	<u>Total Suspended Solid</u>	<u>Ammonia-Nitrogen</u>	<u>Biochemical Oxygen Demand (5-day)</u>	<u>Petroleum-Based Hydrocarbons</u>
37	12	7.17	<0.04	79.2	0.76	46	7.5
38	15	7.60	<0.04	25.6	0.89	12	4.0
39	13	7.85	<0.04	7.2	0.74	3	7.3
45	14	7.40	<0.04	99.6	0.48	20	14.2
46	16	7.50	<0.04	29.2	0.67	17	21.9
47	17	7.60	<0.04	37.6	0.48	7	36.7

11. Location of Contaminant Sources and Actual/Potential Migration

The only possible contaminant sources are (1) the old burial locations for tank bottom cleaning, and (2) leaks from the inactive tanks. The results of studies at Tank Farm Four practically rule out the old burial locations as contaminant sources. The more likely source of PBHC in the groundwater is leaking tanks but even this contamination is minimal and has little, if any, environmental impact.

12. Toxicity Data and Standards/Criteria for Contaminants Found

Petroleum-based hydrocarbons were found in small amounts in the groundwater monitoring wells on the west part of the site. These materials are undesirable in the marine environment, in water supplies, and in the food chain but the studies did not reveal significant movement of these contaminants through the ground. There are no specific standards or criteria for petroleum-based hydrocarbons in water supplies or in the food chain. Toxicity data for PBHCs was presented in Section J of the verification step report. Specific toxicity data is related principally to water quality; the more important criteria relating to PBHC are repeated here.

It has been estimated that between 5 and 10 million metric tons of oil enter the marine environment annually (Blumer, 1970). A major difficulty encountered in the setting of criteria for petroleum products is that these are not definitive chemical categories, but include thousands of organic compounds with varying physical, chemical, and toxicological properties. They may be volatile or nonvolatile, soluble or insoluble, persistent or easily degraded.

Field and laboratory evidence has demonstrated both acute lethal toxicity and long term sublethal toxicity of oils to aquatic organisms. Events such as the Tampico Maru wreck of 1957 in Baja, Calif., (Diaz-Piferrer, 1962), and the

No. 2 fuel oil spill in West Falmouth, Mass., in 1969 (Hampson and Sanders, 1969), both of which caused immediate death to a wide variety of organisms, are illustrative of the lethal toxicity that may be attributed to oil pollution.

Because of the wide range of compounds included in the category of oil, it is impossible to establish meaningful 96-hour LC₅₀ values for oil and grease without specifying the product involved. However, the data show that the most susceptible category of organisms, the marine larvae, appear to be intolerant of petroleum pollutants, particularly the water soluble compounds, at concentrations as low as 0.1 mg/l.

The long term sublethal effects of oil pollution include interferences with cellular and physiological processes such as feeding and reproduction and do not lead to immediate death of the organism. Disruption of such behavior apparently can result from petroleum product concentrations as low as 10 to 100 ug/l.

Bioaccumulation of petroleum products presents two especially important public health problems: (1) the tainting of edible, aquatic species, and (2) the possibility of edible marine organisms incorporating in their tissues the high boiling, carcinogenic polycyclic aromatics. Nelson-Smith (1971) reported that 0.01 mg/l of crude oil caused tainting in oysters. Moore, et al. (1973) reported that concentrations as low as 1 to 10 ug/l could lead to tainting within very short periods of time. It has been shown that chemicals responsible for cancer in animals and man (such as 3,4-benzopyrene) occur in crude oil (Blumer, 1970). It has also been shown that marine organisms are capable of incorporating potentially carcinogenic compounds into their body fat where the compounds remain unchanged (Blumer, 1970).

Oil pollutants may also become incorporated into sediments. There is evidence that once this occurs in the sediments below the aerobic surface layer,

petroleum oil can remain unchanged and toxic for long periods, since its rate of bacterial degradation is slow. For example, Blumer (1970) reported that No. 2 fuel oil incorporated into the sediments after the West Falmouth spill persisted for over a year, and even began spreading in the form of oil-laden sediments to more distant areas that had remained unpolluted immediately after the spill. The persistence of unweathered oil within the sediment could have a long term effect on the structure of the benthic community or cause the demise of specific sensitive important species. Moore, et al. (1973) reported concentrations of 5 mg/l for the carcinogen, 3,4-benzopyrene in marine sediments.

Because of the great variability in the toxic properties of oil, it is difficult to establish a numerical criterion which would be applicable to all types of oil. Thus, for a given discharge situation, an upper allowable limit of an individual petrochemical should be determined by applying a factor of 0.01 to the lowest continuous flow 96-hour LC₅₀ for several important and sensitive resident species.

There is a paucity of toxicological data on the ingestion of the components of refinery wastewaters by humans or test animals. It is apparent that any tolerable health concentrations for petroleum-derived substances far exceed the limits of taste and odor. Since petroleum derivatives become organoleptically objectionable at concentrations far below the human chronic toxicity, it appears that hazards to humans will not arise from drinking oil-polluted waters (Johns Hopkins University, 1956; Mckee and Wolf, 1963). Oils of animal or vegetable origin generally are nontoxic to humans and aquatic life.

In view of the problem of petroleum oil incorporation in sediments, its persistence and chronic toxicity potential, and the present lack of sufficient toxicity data to support specific criteria, concentrations of oils in sediments should not approach levels that cause deleterious effects to important species

or the bottom community as a whole.

13. Recommendations

Based on the data obtained there is no evidence to indicate that hazardous wastes are now or were in the past stored in the tanks. Likewise the data do not indicate that any hazardous wastes were buried on the site. These conclusions are based on the definitions of hazardous wastes in EPA 40 CFR 261. The State of Rhode Island Hazardous Waste Rules and Regulations, however, cover a wider range of materials and it is possible the State DEM may consider the buried materials to be hazardous wastes. In any case the only contaminant found in the monitoring wells was PBHC; this was found in relatively low concentrations in the groundwater in an area having very little environmental impact since the groundwater is not used for any purpose and moves directly into the Bay. Therefore, any decision on remedial action for Tank Farm Four would be based primarily on consideration of the State of Rhode Island Regulations for Underground Storage Facilities Used for Petroleum Products and Hazardous Materials. These regulations do not apply to tanks used for storage of No. 5 or No. 6 fuel oil, which was the only use of these tanks by the Navy. However, if in fact a private contractor used these tanks for lighter fuels such as diesel oil, then the tanks would be covered by the State regulations. Further investigations are needed to resolve whether or not the tanks do fall under the State underground tank regulations. This should include additional record searches, additional sampling and complete inventory of the contents of all tanks to (1) determine if the tanks do fall under the State regulation, (2) determine the quantities of oil and water to be reclaimed and/or disposed of, (3) define a remedial action program to empty the tanks, clean the tanks and inspect the tanks for defects, and (4) establish the extent of groundwater contamination if the tank inspection indicates that leaks may have occurred.

These studies should be coordinated with the Rhode Island DEM to insure proper compliance with State regulations and to resolve any potential differences in interpretations of the regulations. If it is found that diesel fuel, for example, was stored in any of these tanks, then the tanks would be subject to the provisions of the Rhode Island underground tank regulation.

Some of the provisions of these regulations are not possible to comply with for tanks such as these at Tank Farm Four. For example, permanent closure of the tanks allows either:

- (1) Removal - cleaning and removal of tanks with inspection of surrounding and/or underlying soil for evidence of leakage, or
- (2) Closure in Place - performance of a precision test showing no leakage, cleaning, and filling with inert solid material.

In the first case (removal), the cost would be prohibitive and not commensurate with the environmental benefit. In the second case, a precision test cannot be conducted on tanks of this size. It is obvious that, although Tank Farm Four might fall within the scope of the Rhode Island underground tank regulations, the detailed requirements of the regulations were adopted principally to control a different type and size of tank (service stations, for example). Therefore, the Rhode Island DEM should be asked to accept an alternative program affording equal environmental protection with respect to Tank Farm Four if permanent closure is required under the regulations. Such an alternative program might include, for example:

- Removal of tank contents with disposal and/or reclamation of oils and disposal of water phase to the sanitary sewer after pretreatment.
- Cleaning of the tanks.
- Inspection of the interior of the tanks for defects or cracks and entry of groundwater to evaluate the possibility that the tank(s) have leaked.

- If evidence of possible leakage is found, install additional groundwater monitoring wells and conduct a groundwater sampling and analysis program to evaluate groundwater contamination and a cleanup program if necessary.
- Destruction of tanks or securing of tanks in a safe condition at the option of the Navy.

Temporary closure of underground tanks is also allowed under the Rhode Island regulations for tanks removed from service for 180 days or less, with extensions permitted for good cause. If the Navy should elect to maintain the tank farm (or a selected number of tanks) for possible future use as a tank farm, then temporary closure should be requested and special terms negotiated with the State of Rhode Island to include consideration of the unique nature of the facility as a defense installation. The terms of the temporary closure agreement would be similar to that suggested for permanent closure.

To determine an order of magnitude cost for a remedial measure, a cost estimate was made for demolition of the tanks.

The tanks would be emptied and cleaned and the roofs of the tanks demolished by collapsing them into the bottom of the tank. Several holes would be made in the bottom of each tank and all piping removed. The tanks would then be filled with bank run gravel or on-site material, if available. A request should be made to waive the DEM soil inspection requirements.

A groundwater monitoring program would be conducted to determine if groundwater contamination exists and, if so, what remedial measures are needed.

The estimated cost for this work is \$2,600,000 exclusive of well installation, sampling and analysis.

J. FINDINGS AT SITE NO. 14 GOULD ISLAND DISPOSAL AREA

1. History of Waste Disposal

The history of waste disposal at this site was thoroughly covered in the IAS. The following discussion summarizes the background information contained in the IAS.

This site was used throughout the World War II period and received all the wastes generated on the island. Some wastes were incinerated on the site and the ash was dumped on the site along with other wastes. The deposits were made on a steep slope facing Narragansett Bay on the west side of the island. The site was last used about 30 years ago. In addition to the normal types of industrial refuse, there was considerable waste production from electroplating and degreasing operations on the island during World War II. Wastes from these operations would have gone to this site unless they were discharged directly into Narragansett Bay. These wastes would have included muriatic acid, chromic acid, copper cyanide, sodium cyanide, sodium hydroxide, nickel sulfate, and Anodex cleaner.

2. Existing Site Conditions

This site is located along the shoreline of Narragansett Bay on the west side of Gould Island. The disposal area is situated along an embankment which drops down steeply to a beach area. The length of the landfill along the shoreline is about 400 feet. The extent of the waste deposits inland to the east is not known but is probably not more than 100 yards at any point. The site is on land conveyed to the State of Rhode Island in 1975.

Most of the site is vegetated. However, waste deposits are exposed at many locations particularly at the lower levels where the wastes come into direct contact with the waters of Narragansett Bay at high tide. Surface runoff from the site is directly into the Bay. There are no significant areas where ponding in surface water occurs over the fill area.

The shoreline contains accumulations of waste materials such as metal scrap, wood, pipes, rusted out drums, concrete blocks, and oil tanks.

3. Hydrogeological Data

The general hydrogeology of the NETC area was covered in the IAS. The following discussion summarizes the conclusions drawn from background hydrogeological data contained in the IAS.

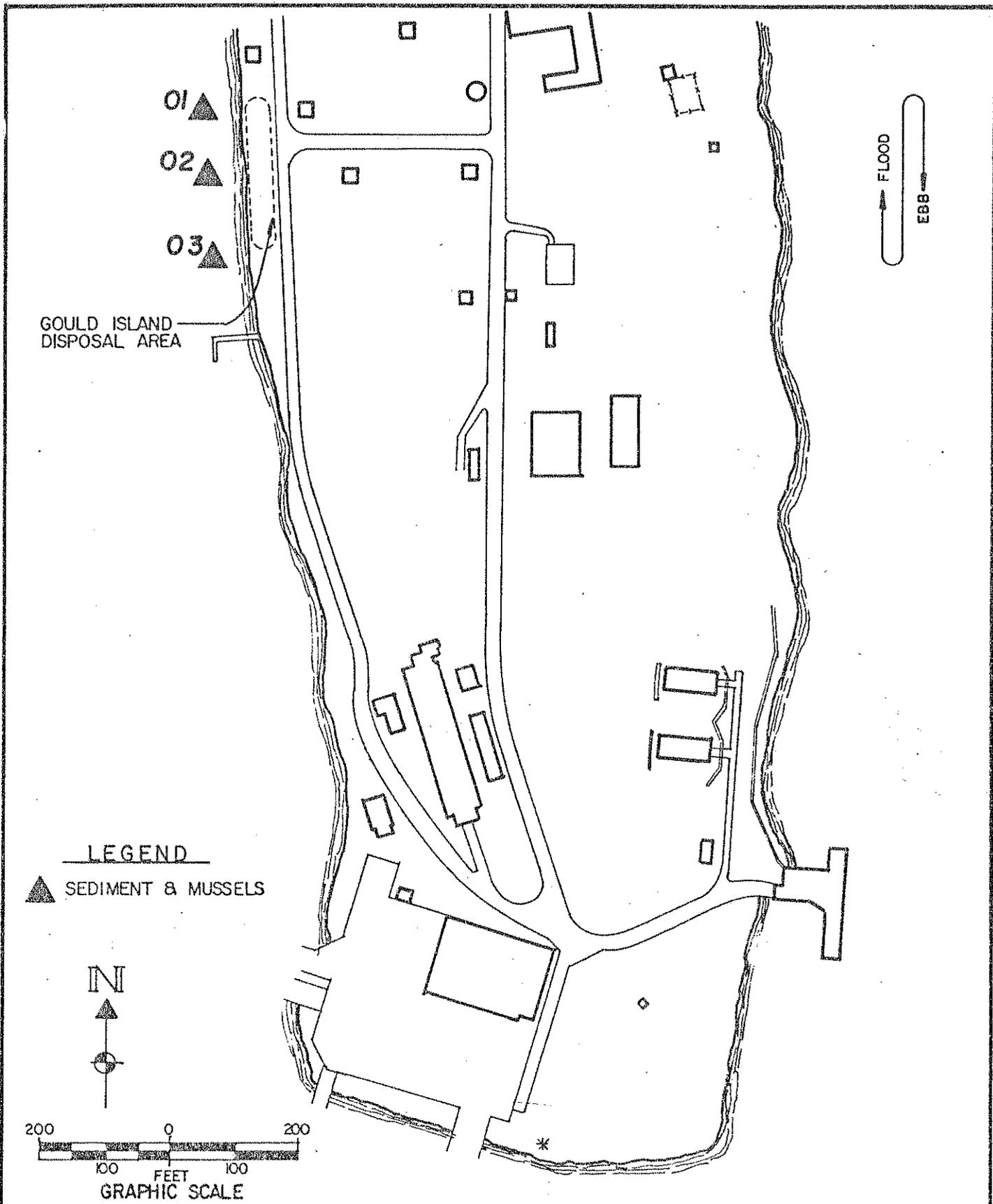
The landfill site is so steeply sloped that there is no question that groundwater moves in a westward direction and discharges into Narragansett Bay. The groundwater recharge area on the island is so small that no significant groundwater flow can be anticipated except in very wet seasons. These factors and the history of waste deposition onto the steep embankment along the coastal area indicate that the hydrogeology of the site is characterized by groundwater movement in very thin layers toward the Bay. There was no evidence of any direct leachate discharges into the Bay. The groundwater is not being utilized at NETC and there are no known wells on the Island.

4. Gould Island Disposal Area Samples - Verification Step

The samples collected in the verification step at the Gould Island Disposal Area (Site No. 14) are listed in Table 40. The locations of the sample collection points are shown on Figure No. 14. The principal areas of interest for purposes of the sampling program in the verification step were in the marine environment at and near the shoreline of the disposal area.

The shoreline is about 400 feet long facing the East Passage of Narragansett Bay. The landfill is covered with soil but there are some exposed deposits on the face of the fill area. The shoreline has a cobble and shell beach with some large rock outcrops and scattered deposits of metallic and other waste materials.

All three sediment samples (Station Nos. 01 to 03) were collected about 25



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GOULD ISLAND DISPOSAL AREA
SITE NO. 14
VERIFICATION SAMPLING POINTS



York Wastewater Consultants, Inc.
Stamford, Connecticut



LOUREIRO ENGINEERING ASSOCIATES

a professional corporation

CONSULTING ENGINEERS

AVON, CT.

FEB. 28, 1984

FIG. NO. 14

TABLE 40
SAMPLES COLLECTED - VERIFICATION STEP
SITE NO. 14 - GOULD ISLAND DISPOSAL AREA

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>TIME</u>	<u>ANALYSIS FOR</u>
			12-1-83	
8730	03	Sediment (0-4)	10:45 A.M.	PCB, Metals*
8731	02	Sediment (0-4)	11:00	PCB, Metals
8732	01	Sediment (0-4)	11:00	PCB, Metals
8733	01	Mussels	10:45	PCB, Metals
8734	03	Mussels	10:45	PCB, Metals
8735	02	Mussels	11:30	PCB, Metals

*Metals = Cr, Cd, Pb, As, Hg, Se, Ag, Cu, Ba, Ni, Be, Sb, Sn

feet off-shore in one to three feet of water. All samples were surface sediments (0 to 4 inches deep). The deposits were very stony and samples of sediment were difficult to obtain.

All mussel samples were collected in the intertidal zone shoreward of the sediment sampling points (Station Nos. 01 to 03).

5. Analytical Data on Samples Collected - Verification Step

The samples collected at the Gould Island Disposal Area site are summarized in Table 40 as previously discussed. The analyses were conducted for the parameters indicated in Table 40 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results is presented in Table 41.

6. Evaluation of Available Data - Verification Step

The analytical data on samples collected indicate that metals are accumulating in sediments and mussels near the Gould Island Disposal area. This judgment is based on comparison of the verification step sampling and analytical data with the control station data (see Table 41).

The surface layer of sediment at all three sampling points exhibited significantly high values of lead and copper. In addition, slightly high values of nickel and chromium were evident at two of the stations (by comparison to the control stations), but these do not appear to be significant. No PCB contamination was found in any of the sediment samples.

Slightly elevated copper concentrations were found in mussels by comparison to the controls. These do not appear to be significantly high, however. No other metals were found in the mussel samples. The PCB levels in mussels were lower than those found in the controls. See Section D for additional evaluation of analytical data on mussels.

TABLE 41
 SUMMARY OF SEDIMENT AND MUSSEL SAMPLE ANALYTICAL DATA
 SITE NO. 14 - GOULD ISLAND DISPOSAL AREA (NOV., 1983)
 (All results in ug/gm - dry weight basis)

Substrates and Parameters	Site Specific Station Numbers			Control Station Numbers	
	01	02	03	N1	N2
SEDIMENT*:					
PCB	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	8.0	17.8	15.0	11.5	8.0
Cadmium	<0.05	<0.05	<0.05	<0.05	<0.05
Lead	70.0	310.	270.	27.5	6.8
Arsenic	<0.2	<0.2	<0.2	<0.2	<0.2
Mercury	<0.02	<0.02	<0.02	<0.02	<0.02
Selenium	<0.2	<0.2	<0.2	<0.2	<0.2
Silver	<0.5	<0.5	<0.5	<0.5	<0.5
Copper	134.	242.	292.	18.3	10.3
Barium	<0.4	<0.4	<0.4	<0.4	<0.4
Nickel	14.3	29.3	29.0	21.3	11.3
Beryllium	<0.05	<0.05	<0.05	<0.05	<0.05
Antimony	<0.5	<0.5	<0.5	<0.5	<0.5
Tin	<5.0	<5.0	<5.0	<5.0	<5.0
MUSSELS:					
PCB	0.23	0.17	0.16	0.36	0.37
Chromium	<2.5	<2.5	<2.5	<2.5	<2.5
Cadmium	<0.5	<0.5	<0.5	<0.5	<0.5
Lead	<1.0	<1.0	<1.0	<1.0	<1.0
Arsenic	<0.4	<0.4	<0.4	<0.4	<0.4
Mercury	<0.04	<0.04	<0.04	<0.04	<0.04
Selenium	<0.4	<0.4	<0.4	<0.4	<0.4
Silver	<1.0	<1.0	<1.0	<1.0	<1.0
Copper	7.5	17.5	9.5	7.2	4.3
Barium	<1.0	<1.0	<1.0	<1.0	<1.0
Nickel	<2.5	<2.5	<2.5	<2.5	<2.5
Beryllium	<0.5	<0.5	<0.5	<0.5	<0.5
Antimony	<1.0	<1.0	<1.0	<1.0	<1.0
Tin	<10.0	<10.0	<10.0	<10.0	<10.0

*All sediment data is for the surface
 sediments at 0 to 4-inch depth

7. Location of Suspected Contaminant Sources - Verification Step

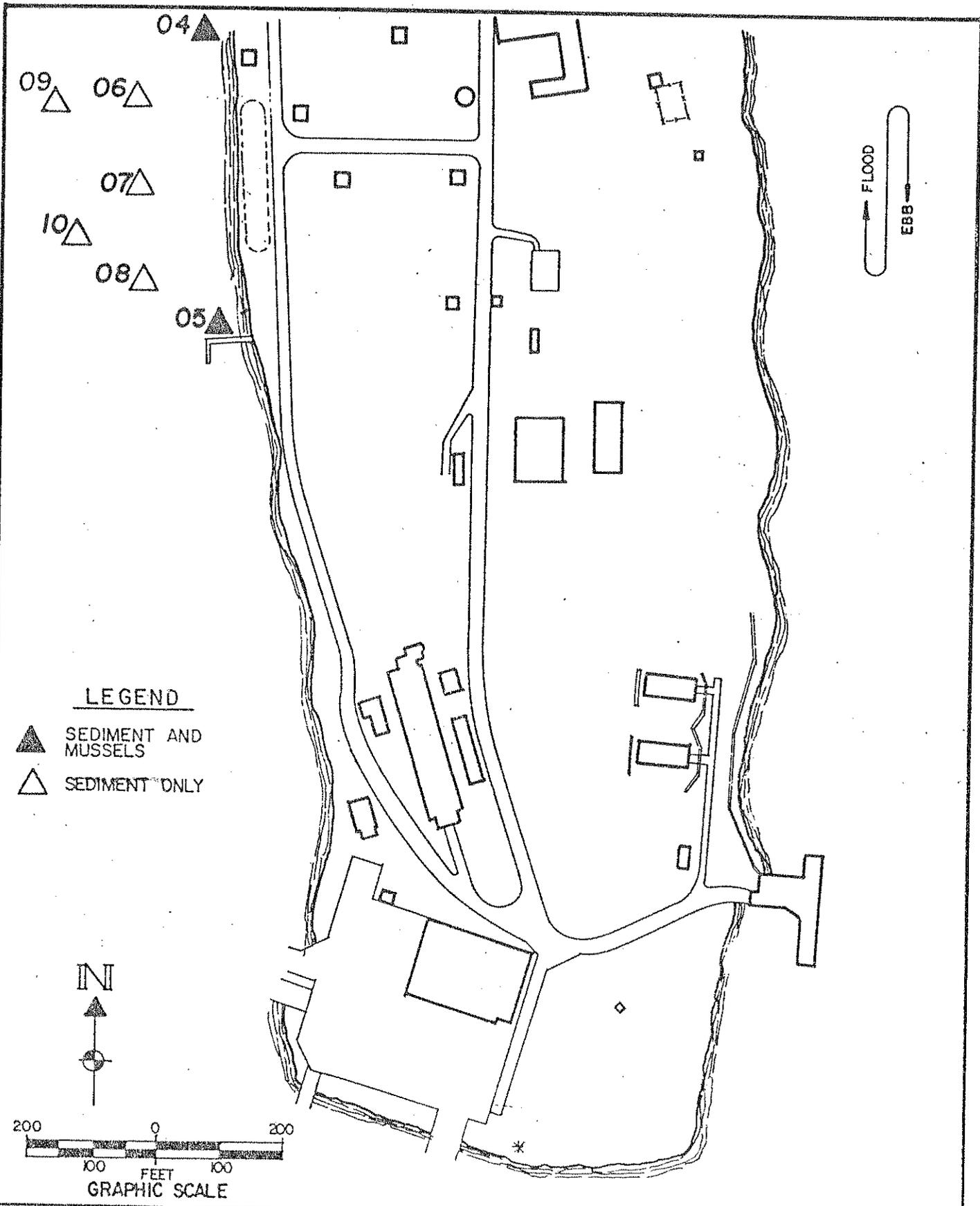
Neither the field reconnaissance nor the analytical data provide information to define the location of suspected contaminant sources. The location of the sediment sample points with the highest metal concentration are not the same for the various metals. Station No. 02 exhibited the highest copper concentration in mussels.

8. Samples Collected - Characterization Step

The samples collected in the characterization step at the Gould Island Disposal Area (Site No. 14) are listed in Table 42. The general locations of the sample collection points are shown on Figure No. 15. The data establishing the locations of the sediment sampling stations is presented in Appendix F. The principal areas of interest for purposes of the sampling program in the verification step were in the marine environment at and near the shoreline of the disposal area.

The seven sediment samples (Station Nos. 04 to 10) were collected in three to five feet of water in the near-shore samples (04 and 05) and in ten to thirty feet of water in the off-shore samples (06-10). All samples were surface sediments (0 to 4 inches deep). The deposits were very stony and samples of sediment were difficult to obtain.

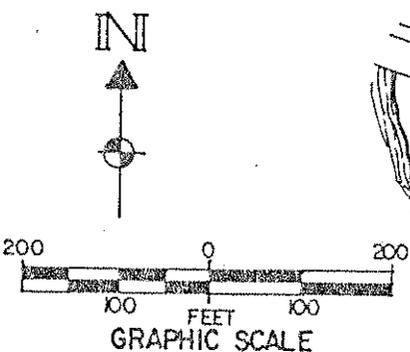
All mussel samples were collected in the intertidal zone at Station Nos. 04 and 05.



LEGEND

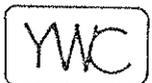
▲ SEDIMENT AND MUSSELS

△ SEDIMENT ONLY



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

GOULD ISLAND DISPOSAL AREA
SITE NO 14
CHARACTERIZATION SAMPLING POINTS



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LOUREIRO ENGINEERING ASSOCIATES
a professional corporation
CONSULTING ENGINEERS
AVON, CT.

MAR. 13, 1985

FIG. NO. 15

TABLE 42
SAMPLES COLLECTED - CHARACTERIZATION STEP

SITE NO. 14 - GOULD ISLAND DISPOSAL AREA

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>TIME</u>	<u>ANALYSIS FOR*</u>
			9-11-84	
2966	08	Sediment (0-4)	1:20 PM	Metals, EP Toxic Metals, Cyanide
2967	10	Sediment (0-4)	1:40	Metals, EP Toxic Metals, Cyanide
2968	07	Sediment (0-4)	1:50	Metals, EP Toxic Metals, Cyanide
2969	09	Sediment (0-4)	2:05	Metals, EP Toxic Metals, Cyanide
2970	06	Sediment (0-4)	2:15	Metals, EP Toxic Metals, Cyanide
2971	04	Sediment (0-4)	2:30	Metals, EP Toxic Metals, Cyanide
2972	05	Sediment (0-4)	2:40	Metals, EP Toxic Metals, Cyanide
2973	04	Mussels	2:40	Metals
2974	05	Mussels	3:00	Metals

* Metals = Lead, copper, chromium, nickel

9. Analytical Data on Samples Collected - Characterization Step

The samples collected at the Gould Island Disposal Area site were analyzed for the parameters indicated in Table 42 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results on sediment samples is presented in Table 43, and for mussels in Table 44.

10. Evaluation of Available Data - Characterization Step

The analytical data on samples collected in the verification step indicated that metals have accumulated in sediments and mussels near the Gould Island Disposal Area. For this reason, additional sediment samples were collected north and south of the verification step stations, as well as further off-shore, and additional mussel samples were collected in the intertidal zone to further define the extent of the contamination. In evaluating the characterization step data, control data collected in the verification step was used for comparison with sediment sample data but new control samples were collected for comparison with mussel sample data.

In general, the off-shore sediments sampled in the characterization step (Stations 06 to 10) were found to be less contaminated than the near-shore sediments (Stations 01 to 05) sampled in the characterization and verification steps. Elevated levels of lead and copper were found in sediments close to shore (Stations 01, 02, 03, and 05); the chromium and nickel concentrations at these stations were only slightly above the control sample concentrations, but even some of these concentrations were less than some of the controls. Lead and copper are being assimilated by mussels at rates higher than the controls at Stations 04 and 05, and to a lesser degree at Station 02.

The concentrations of lead, copper, chromium, and nickel in sediments decrease with increased distance from shore. All of the values for these metals

TABLE 43

SUMMARY OF SEDIMENT SAMPLE ANALYTICAL DATA
 SITE NO. 14 - GOULD ISLAND DISPOSAL AREA (Sept., 1984)

Station No.	Total Lead** (ug/gm*)	Total Copper** (ug/gm*)	Total Chromium** (ug/gm*)	Nickel		Total Cyanide (ug/gm*)
				Total (ug/gm*)	E.P. Tox. (mg/l)	
01***	70.0	134.0	8.0	14.3	-	-
02***	310.0	242.0	17.8	29.3	-	-
03***	270.0	292.0	15.0	29.0	-	-
04	15.2	14.1	5.3	8.3	0.3	<0.005
05	163	136	11.7	29.2	<0.20	<0.005
05 (Dupl)	-	-	-	-	<0.20	<0.005
06	28.4	19.8	10.8	10.4	<0.20	<0.005
06 (Dupl)	25.4	15.1	9.0	8.3	<0.20	-
07	14.8	8.8	9.2	7.7	<0.20	<0.005
08	27.2	19.8	11.1	10.1	<0.20	<0.005
09	17.3	11.9	9.7	7.9	0.9	<0.005
10	20.9	13.4	15.4	9.7	<0.20	<0.005
N-1***	27.5	18.3	11.5	21.3	-	0.031
N-2***	6.8	10.3	8.0	11.3	-	0.027

* Dry weight basis.

** The EP toxic values for these metals were less than the following values for Stations 04 to 10:

Lead - EP toxic leachate <0.2 mg/l
 Copper - EP toxic leachate <0.20 mg/l
 Chromium - EP toxic leachate <0.10 mg/l

*** Data for Stations 01, 02, and 03 and for the control stations is from the verification step.

TABLE 44

SUMMARY OF MUSSEL SAMPLE ANALYTICAL DATA
SITE NO. 14 - GOULD ISLAND DISPOSAL AREA (Sept., 1984)
(All results in ug/gm - dry weight basis)

<u>Station</u> <u>No.</u>	<u>Lead</u>	<u>Copper</u>	<u>Chromium</u>	<u>Nickel</u>
04	17.9	14.2	3.4	10.1
05	13.2	11.7	1.7	4.7
N-1	4.9	6.8	1.1	4.9
N-2	3.8	8.2	2.8	5.1
N-2 (Dup1)	5.2	5.4	1.4	4.9

for Station Nos. 04, 06, 07, 08, 09, and 10 (one near-shore and all off-shore stations) were comparable to those found at the control stations. The following summarizes these findings:

	Range of Concentrations (ppm) in Sediments			
	Lead	Copper	Chromium	Nickel
Near-shore samples, (Stas.01-05 including verification step)	15 - 310	14 - 292	5 - 18	8 - 29
Off-shore samples (Stas.06-10)	15 - 28	9 - 20	9 - 15	8 - 10
Controls (Stas.N-1 and N-2)	7 - 28	10 - 18	8 - 12	11 - 21

These data indicate that lead and copper concentrations in sediments at near-shore stations are significantly higher than the controls, although Station 04 was free of any elevated metals concentrations. None of the chromium and nickel concentrations is significantly higher than the controls. Lead was found in mussels at Stations 04 and 05 at levels up to four times that found in the controls, but the copper, chromium, and nickel concentrations were comparable to the controls. The stony nature of the sediments did not affect the metals concentrations based on comparisons with controls and other sampling stations at other sites with stony sediments.

The sediment samples collected in the characterization step were analyzed to determine EP toxicity levels in accordance with the procedure in SW-846. This was done to approximate how readily the metals would be released from the sediment. Although this procedure is not purported to be a direct measure of biological availability of the metals, it should be pointed out that Helsinger (1975) used acetic acid to estimate the exchangeable phase of contaminants in sediments. These tests indicated that a very low percentage of the total metals was liberated into the extract.

11. Location of Contaminant Sources and Actual/Potential Migration

It is evident that contaminants have, in the past, or are continuing to be released from the landfill because the sediment and mussel sampling data indicate elevated concentrations of some metals (lead and copper). The most

likely pathways for this are, or were, the groundwater passing under or through the fill or surface water passing over exposed deposits.

12. Toxicity Data and Standards/Criteria for Contaminants Found

Specific standards or criteria for heavy metals in mussels and in marine sediments have not been established. The assessment of the severity of the contamination detected is, therefore, subjective and must be made by comparison to data on mussels and sediments obtained at control stations. These comparisons have been presented previously; they indicate that mussels and sediments close to shore have been affected by copper and lead. There are no established limits for metals concentrations in foods such as mussels. However, the levels found in the mussels were, at most, four times the levels found in the controls.

Toxicity data for the contaminants found was presented in Section J of the verification step report.

(a) Copper

Copper is required in animal metabolism. It is important in invertebrate blood chemistry and for the synthesis of hemoglobin. In some invertebrate organisms a protein, hemocyanin, contains copper and serves as the oxygen-carrying mechanism in the blood. An overdose of ingested copper in mammals acts as an emetic.

Concentrations of copper found in natural waters are not known to have an adverse effect on humans. Prolonged oral administration of excessive quantities of copper may result in liver damage, but water supplies seldom have sufficient copper to effect such damages. Young children require approximately 0.1 mg/day of copper for normal growth and the daily requirement for adults was estimated to be about 2 mg/day (Sollman, 1957). Copper in excess of 1 mg/l may impart some taste to

water. The EPA recommends a limit of 1 mg/l copper in drinking water because of a possible undesirable taste.

Copper is present in seawater at a concentration of approximately 3 ug/l but copper added to the marine environment is readily precipitated in the alkaline and saline environment. Toxicity of copper to fishes in marine waters has not been studied, but for *Nereis virens*, a polychaete invertebrate, the toxic threshold for copper was 100 ug/l (Raymont and Shields, 1964). Copper is toxic to oysters at concentrations above 100 ug/l (Galtsoff, 1932). Clendenning and North (1960) found inhibition of photosynthesis in the giant kelp, *Macrocystis pyrifera*, at copper concentrations of 60 ug/l. This commercially important marine plant is used for several industrial processes and for important food additives.

Adult softshell clams, *Mya arenaria*, were the most sensitive marine macroorganisms tested in static copper toxicity bioassays. LC_0 , LC_{50} , and LC_{100} values after 168 hours at 30 o/oo salinity and 22°C were 25, 35 and 50 ug/l respectively. At 17°C, these values were 75, 86 and 100 ug/l, respectively, for the same time period. Copper is selectively concentrated over zinc by adult softshell clams, *Mya arenaria*. Concentrations of greater than 20 ug/l are fatal after exposure for several weeks (Pringle, et al. 1968). The 9-day LC_{50} for newly hatched *Fundulus heteroclitus* larvae was 160 ug/l (Gentle, 1975).

To protect marine aquatic life, criteria of 4.0 ug/l as a 24-hour average, not to exceed 23.0 ug/l at any time, are recommended.

(b) Lead

As far as is known, lead has no beneficial or desirable nutritional effects. Lead is a toxic metal that tends to accumulate in the tissues of man and other animals. Although seldom seen in the adult population, irreversible damage to the brain is a frequent result of lead

intoxication in children. The major toxic effects of lead include anemia, neurological dysfunction, and renal impairment. The most common symptoms of lead poisoning are anemia, severe intestinal cramps, paralysis of nerves (particularly of the arms and legs), loss of appetite, and fatigue; the symptoms usually develop slowly. High levels of exposure produce severe neurologic damage, often manifested by encephalopathy and convulsions; such cases frequently are fatal. Lead is strongly suspected of producing subtle effects (i.e., effects due to low level or long term exposures insufficient to produce overt symptoms) such as impaired neurologic and motor development and renal damage in children (EPA, 1973). Subclinical lead effects are distinct from those of residual damage following lead intoxication.

There is no question that some marine organisms can concentrate the lead present in seawater. Wilder (1952) reported lobster dying in 6 to 20 days when held in lead-lined tanks. Calabrese, et al. (1973) found a 48-hour LC₅₀ of 1.730 ug/l and a 48-hour LC₅₀ of 2,450 ug/l for oyster, *Crassostrea virginica*, eggs. The remarkable ability of the eastern oyster, *Crassostrea virginica*, to concentrate lead was demonstrated (Pringle, et al. 1968) by exposing them to flowing seawater containing lead concentrations of 25 ug/l, 50 ug/l, 100 ug/l and 200 ug/l; after 49 days, the total accumulation of lead amounted to 17, 35, 75 and 200 ppm (wet weight), respectively, and those oysters exposed to the two highest lead levels, upon gross examination, showed considerable atrophy and diffusion of the gonadal tissue, edema, and less distinction of hepatopancreas and mantle edge.

North and Clendenning (1958) reported that lead nitrate at 4.1 mg/l of lead showed no deleterious effect on the photosynthesis rate in kelp, *Macrosystis pyrifera*, exposed for 4 days. The EPA has suggested marine aquatic criterion for acute and chronic toxicity of 668 ug/l and 25

.../1, respectively. These levels would be lower for more sensitive species which have not been tested.

Based on the above discussions on toxic effects, the contaminants of greatest concern in the marine environment are (1) lead, because of the known harmful effects on marine biota and humans, and (2) copper, because of toxic effects on marine biota. There is very little data available on "unacceptable" or "harmful" concentrations of copper or lead in mussels and sediments. One example of such data is by Eisler (1979), who summarized data on copper accumulations in marine biota; survival of *M. edulis* was satisfactory in waters containing 0.025 - 0.027 ppm copper with 29 - 60 ppm copper in the mussels (dry weight basis). The concentrations of lead and copper in mussels used for food are not regulated so there are no standards for judging suitability of mussels for food except to say that ingestion of lead from any source is to be avoided.

Lead and copper in sediments are also of concern because the metals could be transferred to the food chain by various paths. However, the mobilization of contaminants from sediments to marine biota or to the food chain is not well understood or documented. The release of contaminants from sediments is widely variable depending on site conditions and on a multiplicity of physical, chemical and biological factors. Most data on these questions have evolved from studies of mining operations and dredging of rivers and harbors. In evaluating sediments, the Rhode Island Department of Environmental Management uses guidelines developed by the New England River Basins Commission in the "Interim Plan for the Disposal of Dredged Material From Long Island Sound" (1980). This document presents the following data:

Metal	Observed Concentrations in Central Long Island Sediments(ug/gm dry basis)		Level of Contamination(ug/gm)		
	Average	Range	Low	Moderate	High
Lead	27.8	6-63	<100	100-200	>200
Copper	69.6	2-269	<200	200-400	>400

The average values and ranges are from data developed by the Corps of Engineers from numerous ports and harbors and from non-spoil sediments in the vicinity of open water disposal areas.

The last three columns are used to make qualitative judgments on the class of sediment for the purpose of determining how dredged material should be disposed of. A "high" level of contamination is generally taken to mean that the sediment may have a high probability of being "toxic" to marine bottom fauna.

13. Recommendations

Hazardous waste are known to have been deposited in the Gould Island Disposal Area and there is evidence that contaminants have migrated out of the landfill and into the environment (mussels and sediments). The sediments found at the near-shore stations (02, 03, 05) are considered to have a moderate to high level of contamination (lead 15-310 ug/gm and copper 14-292 ug/gm) and to have a high probability of being toxic to biota under the New England River Basins Commission "Interim Plan for the Disposal of Dredged Material From Long Island Sound", which defines lead >200 ug/gm and copper >400 ug/gm as high level contamination.

Mussels near stations 02 to 05 showed evidence of elevated lead and copper accumulations to levels about two to four times that of the controls, the lead being <1.0-17.9 ug/gm and copper 9.5-13.2 ug/gm compared to controls of 3.8-5.2 and 5.4 to 8.2 ug/gm, respectively. These may have been derived from the sediments or from leachate from the landfill, although, as discussed later insufficient data was obtained to define the migration pathways.

Stations 04 and 05 were selected as the northernmost and southernmost sampling stations because they are beyond the reported limits of deposition of hazardous wastes. The laboratory data showed elevated lead and copper

concentrations in both the sediments and the mussels at these stations. It is possible, therefore, that sediment and mussels could be contaminated north of station 04 and south of station 05. Sediment samples from stations 06 to 10 (off-shore of stations 01-05) showed metals concentrations comparable to those at the control stations and at levels considered to be low in toxicity by the New England River Basins Commission. The highest sediment contamination is limited to a narrow strip about 400 feet along the shore, although the limits of potential contamination were not defined by the sampling program (north of Station 04 and south of Station 05).

With respect to the landfill itself, no groundwater level observations were made nor were any monitoring wells installed because of logistical problems. Consequently, no data are available to indicate whether or not the underlying groundwater is a continuing major source of environmental contamination. No soil samples were collected and there was no visible evidence of leachate discharges. This means that no migration pathway was defined by the study to account for the environmental contamination found.

However, the proximity of the contaminated mussels and sediments to the landfill strongly points to the landfill as the source of the contamination. Surface runoff discharges into the Bay and the steep surface topography indicates that the ground water is moving into the Bay along with any subsurface leachate which may be generated. The following scenarios need to be considered, therefore, in developing recommendations for the Gould Island Disposal Area:

- I - The landfill is continuing to contribute contaminants into the Bay and the pathway(s) are at a location(s) not sampled in this study, and
 - (A) The rate of contaminant dispersion out into the Bay proper is faster than the rate of release from the landfill so that localized environmental effects (Stations 02 to 05) are decreasing with time, or
 - (B) The rate of contaminant dispersion out into the Bay is slower than the rate of release from the landfill so that localized environmental effects are increasing with time.

- II - The landfill is no longer contributing contaminants into the Bay and the existing localized contamination will decrease with time as dispersion out into the Bay proper occurs.

A determination of which scenario is representative of actual conditions would require additional detailed investigations and environmental sampling over an extended period of time to determine if environmental conditions are improving. A question which arises in connection with extended additional studies is - "Are there any serious imminent health or safety hazards associated with the landfill?" On the basis of the existing limited knowledge on mobilization of contaminants from sediments, there is no justification for an action such as removal of contaminated sediments to a disposal area. The elevated levels of metals in mussels are an obvious concern and the data should be reported to the State of Rhode Island. Any action with respect to the taking of mussels for food from the area would be at the discretion of the State of Rhode Island.

Additional studies are recommended to determine which of the above scenarios applies and to conduct a feasibility study for selection of remedial actions. The format of these studies should be governed by the requirements of 40 CFR 300.68 which covers Remedial Investigation/Feasibility Study (RI/FS) activities for a hazardous waste site. Guidance for such studies is covered by EPA/540/G-85/002 and 003, June 1985. The purpose of the investigations would be:

- Determine if there are any migration pathways such as groundwater, leachate or surface runoff by monitoring well installations and sampling of groundwater, soil and surface water.
- Repeat sediment and mussel sampling periodically to determine if the contaminant levels are changing.

Since the contaminant levels in the environment are relatively low, remedial actions such as groundwater or seawater cutoff walls, or interception and

treatment of leachate do not seem justifiable, because the environmental benefit would not be commensurate with the cost. If the additional studies show that leachate and/or groundwater are, in fact, contributing to the environmental contamination, then a response action such as a clay cap would reduce percolation through the fill and reduce, but not completely eliminate, leachate generation. Another response might be "no action" with periodic monitoring of the sediment and mussels to determine if environmental contaminant levels are changing; if the levels show a decrease with time a minimal response such as regrading and covering the surface and rip-rapping the face might be sufficient.

To determine an order of magnitude cost for a remedial measure, a cost estimate was made for a clay cap (3 feet thick) which would have, in general, the same goals as the closure and post-closure care requirements of 40 CFR 265.310. This regulation is, of course, not applicable to the NETC nor is it applicable to any landfills not receiving hazardous waste after November 19, 1980. The regulation does, however, present those actions which would be expected to minimize releases from the landfill, namely, provision and maintenance of adequate cover and operation of a groundwater monitoring system.

The surface of the disposal area is subject to percolation from rainfall and also from runoff from areas to the east of the site. This percolation could generate leachate with the potential for carrying contaminants into the Bay. To minimize this percolation, a surface water intercepting system and a clay cap over the entire landfill (about 1-2 acres) would be required. Some sections of the landfill are subject to erosion due to wave action and there are some sections where waste materials are exposed. All such wastes would be buried (including the scattered metallic debris along the shoreline) and the seaward face provided with rip-rap to minimize erosion of the face. This would provide a closure consistent with 40 CFR 265.310.

The site monitoring program would continue for a five-year period to determine groundwater quality and to determine if sediment and mussel contaminants are increasing or decreasing.

The estimated cost for this work is \$650,000 exclusive of sampling and analysis. As mentioned above, an RI/FS program should be instituted before proceeding with any remedial measures.

K. FINDINGS AT SITE NO. 17 GOULD ISLAND ELECTROPLATING SHOP

1. History of Waste Disposal

The history of waste disposal at this site was thoroughly covered in the IAS. The following discussion summarizes the background information contained in the IAS.

Extensive electroplating and degreasing operations occurred on Gould Island (Building 32) during World War II. These operations existed only during the war. The wastes generated included muriatic acid, chromic acid, copper cyanide, sodium cyanide, sodium hydroxide, nickel sulfate, Anodex cleaner, and degreasing solvents. The method of disposal could not be verified. However, rinse water was most likely discharged into the bay while concentrated spent plating solutions were probably bled slowly into the wastewater stream. Plating sludges, on the other hand, were probably disposed of in the landfill (Site No. 14).

2. Existing Site Conditions

This site is located at Building 32 and the two wastewater lines discharge into Narragansett Bay on the east side of Gould Island. The electroplating shop is not in use and the property is on land to be retained by the Navy. There are no wastewater discharges from the two discharge pipes with the possible exception of roof drainage. The end of the discharge pipe at Station 01 (Figure No. 16) was located at the time of verification step sample collection. The end of the other pipe could not be located because of silt and vegetation accumulations over the pipe.

Hydrogeological data was not obtained on this site since it is not pertinent to the study.

3. Gould Island Electroplating Shop Samples - Verification Step

The samples collected in the verification step at the Gould Island Electroplating Shop (Site No. 17) are listed in Table 45. The locations of the sample collection points are shown on Figure No. 16. The principal areas of interest for purposes of the sampling program in the verification step were in the marine environment at and near the shoreline.

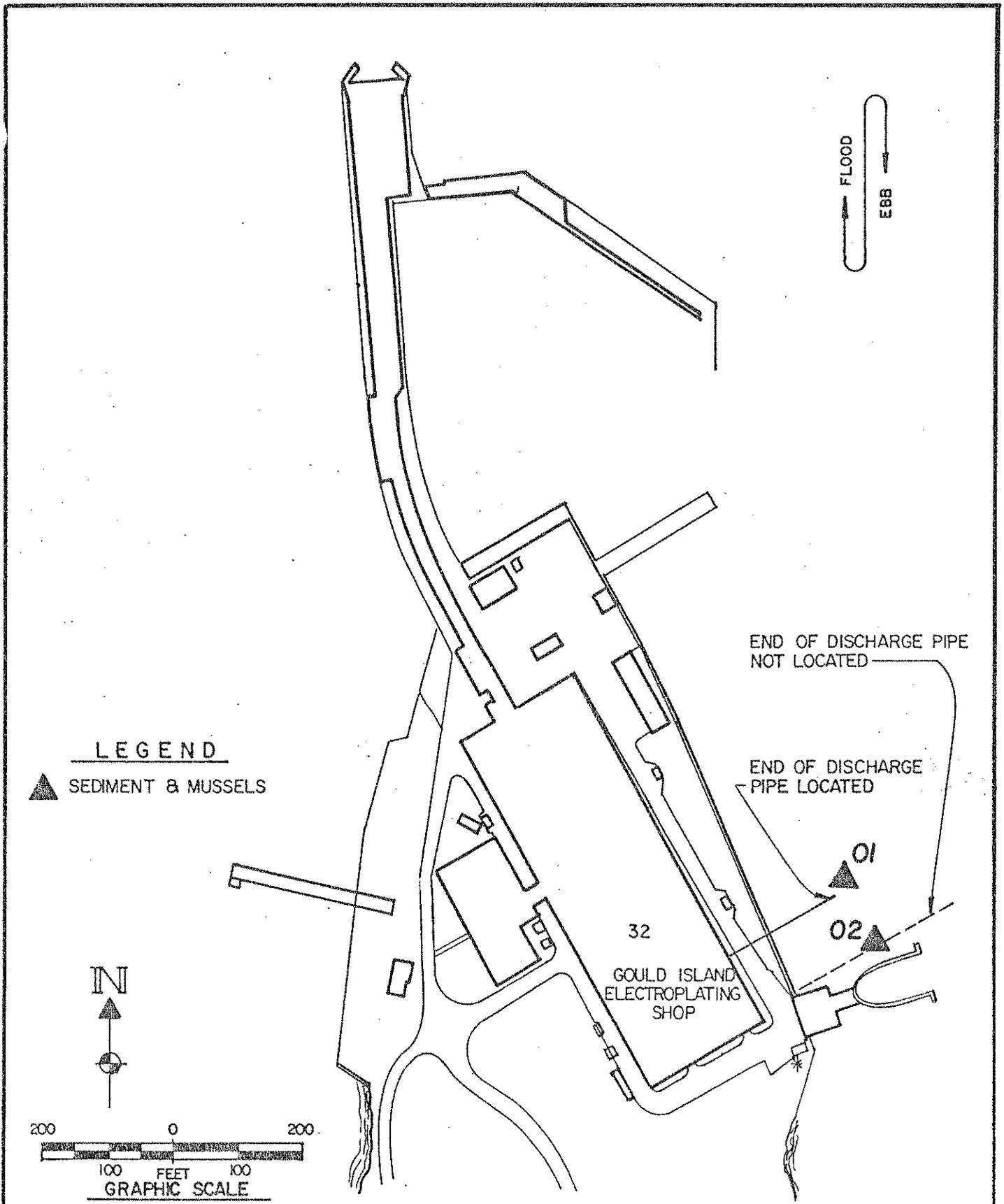
The sediment samples were collected from Station Nos. 01 and 02 about 25 feet off-shore in one to three feet of water. The deposits were predominantly stony silt and sand and were penetrated with the hand coring equipment with great difficulty. The two surface sediment samples (0-4 inches) were analyzed as indicated in Table 45, but the other sample (at a depth of 6-12 inches) was reserved for future use if required.

All mussel samples were collected in the intertidal zone shoreward of the sediment sampling stations (Nos. 01 and 02).

Station No. 01 was located beyond the end of a pipe which may have carried electroplating wastewater discharges when the facility was active. The end of a similar pipe near Station No. 02 could not be located since the pipe was covered with weeds and silt.

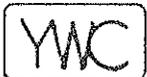
4. Analytical Data on Samples Collected - Verification Step

The samples collected at the Gould Island Electroplating Shop site are summarized in Table 45 as previously discussed. The analyses were conducted for the parameters indicated in Table 45 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results is presented in Table 46.



CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

GOULD ISLAND ELECTROPLATING SHOP
SITE NO 17
VERIFICATION SAMPLING POINTS



York Wastewater Consultants, Inc.
Stamford, Connecticut



LOUREIRO ENGINEERING ASSOCIATES
a professional corporation
CONSULTING ENGINEERS
AVON, CT.

FEB. 28, 1984

FIG. NO. 16

TABLE 45
SAMPLES COLLECTED - VERIFICATION STEP

SITE NO. 17 - GOULD ISLAND ELECTROPLATING SHOP

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>TIME</u>	<u>ANALYSIS FOR</u>
			12-1-83	
8750	02	Sediment (0-4)	10:00 A.M.	Cyanide, Metals*
8751	01	Sediment (0-4)	10:30	Cyanide, Metals
8752*	01	Sediment (6-12)	10:30	**
8753	02	Mussels	10:00	Metals
8754	01	Mussels	10:30	Metals

*Metals = Cr, Cd, Pb, Hg, Ag, Cu, Ni

**Sample not analyzed in the verification stage

TABLE 46
SUMMARY OF SEDIMENT AND MUSSEL SAMPLE ANALYTICAL DATA
SITE NO. 17 - GOULD ISLAND ELECTROPLATING SHOP (DEC., 1983)
 (All results in ug/gm - dry weight basis)

<u>Substrates and Parameters</u>	<u>Site Specific Station Numbers</u>		<u>Control Station Numbers</u>	
	<u>01</u>	<u>02</u>	<u>N1</u>	<u>N2</u>
<u>SEDIMENT*:</u>				
Cyanide	0.121	0.111	0.031	0.027
Chromium	<0.25	<0.25	11.5	8.0
Cadmium	<0.05	<0.05	<0.05	<0.05
Lead	<0.5	6.5	27.5	6.8
Mercury	<0.02	<0.02	<0.02	<0.02
Silver	<0.5	<0.5	<0.5	<0.5
Copper	26.0	17.4	18.3	10.3
Nickel	<0.25	<0.25	21.3	11.3
<u>MUSSELS:</u>				
Chromium	<2.5	<2.5	<2.5	<2.5
Cadmium	<0.5	<0.5	<0.5	<0.5
Lead	<1.0	<1.0	<1.0	<1.0
Mercury	<0.04	<0.04	<0.04	<0.04
Silver	<1.0	<1.0	<1.0	<1.0
Copper	6.0	26.3	7.2	4.3
Nickel	<2.5	<2.5	<2.5	<2.5

*All sediment data is for the surface sediments at 0 to 4-inch depth

5. Evaluation of Available Data - Verification Step

The analytical data on samples collected indicate that slightly elevated concentrations of cyanide and copper are present in sediments and an elevated concentration of copper is present in mussels collected from the vicinity of one of the discharge pipes at the Gould Island Electroplating Shop. This judgment is based on comparison of the verification step sampling and analytical data with the control station data (see Table 46). See Section D for additional evaluation of analytical data on mussels.

6. Samples Collected - Characterization Step

The sample collected in the characterization step at the Gould Island Electroplating Shop (Site No. 17) is listed in Table 47. The location of the sample collection point is shown on Figure No. 17. The principal area of interest for purposes of the sampling program in the characterization step was in re-checking the contamination level at one mussel sampling station.

The mussel sample was collected in the intertidal zone at Station No. 02 located near the end of a pipe which may have carried electroplating wastewater discharges when the facility was active.

7. Analytical Data on Samples Collected - Characterization Step

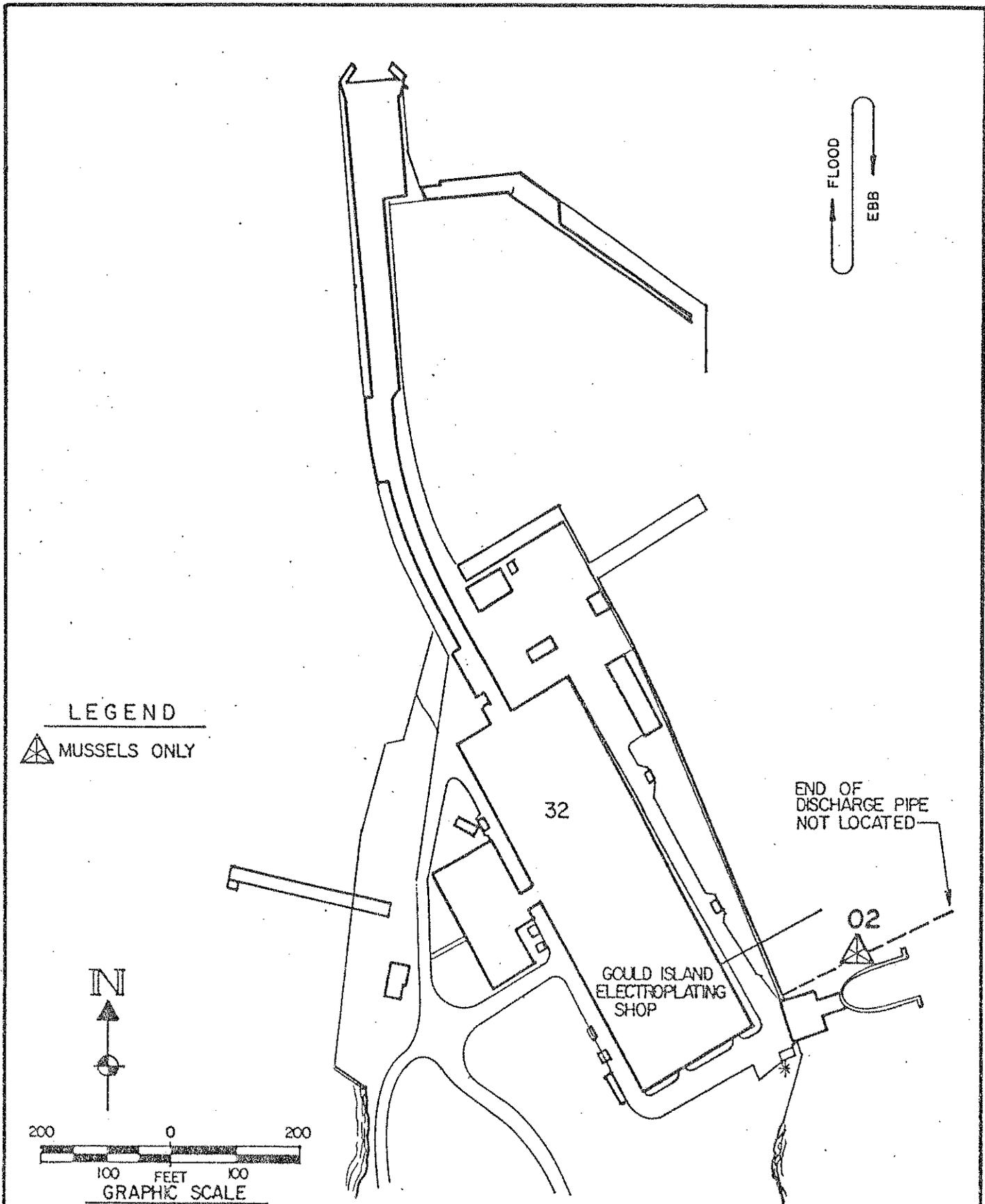
The sample collected in the characterization step at the Gould Island Electroplating Shop site was analyzed for the parameters indicated in Table 47 and the detailed laboratory reports on the analyses are included in Appendix C. A summary of these results is presented in Table 48.

8. Evaluation of Available Data - Characterization Step

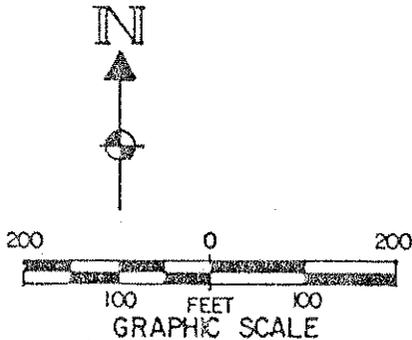
The analytical data on samples collected indicate that metals in mussels are comparable to the controls.

9. Recommendations

No further studies or remedial actions are needed at this site because the levels of contaminants found are not significantly high.

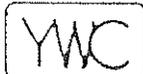


LEGEND
 ▲ MUSSELS ONLY



CONFIRMATION STUDY
 ON HAZARDOUS WASTE SITES
 NEWPORT NAVAL EDUCATION &
 TRAINING CENTER

GOULD ISLAND ELECTROPLATING SHOP
 SITE NO 17
 CHARACTERIZATION SAMPLING POINTS



York Wastewater Consultants, Inc.
 Stamford, Connecticut



LOUREIRO ENGINEERING ASSOCIATES
 a professional corporation
 CONSULTING ENGINEERS AVON, CT.

MAR. 13, 1985

FIG. NO. 17

TABLE 47
SAMPLES COLLECTED - CHARACTERIZATION STEP
SITE NO. 17 - GOULD ISLAND ELECTROPLATING SHOP

<u>NO.</u>	<u>STA</u>	<u>TYPE</u>	<u>TIME</u>	<u>ANALYSIS FOR*</u>
			9-11-84	
2975	02	Mussels	4:00 PM	Metals

* Metals = Lead, Copper, Chromium, Nickel

TABLE 48
SUMMARY OF MUSSEL SAMPLE ANALYTICAL DATA
SITE NO. 17 - GOULD ISLAND ELECTROPLATING SHOP (Sept., 1984)

(All results in ug/gm - dry weight basis)

<u>Station No.</u>	<u>Lead</u>	<u>Copper</u>	<u>Chromium</u>	<u>Nickel</u>
02	5.0	6.6	1.0	3.9
N-1	4.9	6.8	1.1	4.9
N-2	3.8	8.2	2.8	5.1
N-2(Dup1)	5.2	5.4	1.4	4.9

APPENDIX A

YWC SAMPLE LABEL

Affix to sample



YORK WASTEWATER CONSULTANTS

Job Number: [] - [] Client: []

4167 DATE: [] SAVE
SAMPLE NUMBER DISPOSE

[]

SAMPLE ID: 4167 []

4167



*Affix to sample
custody sheet*

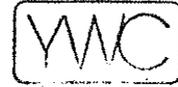
Affix to request sheet



APPENDIX B

QA/QC SUMMARY

QA/QC - VERIFICATION



York Wastewater Consultants, Inc.

One Research Drive
Stamford, Connecticut 06903

QA/QC SUMMARY

Note: x = Arithmetic Mean
S = Standard Deviation

Metal Recoveries

Cadmium:

Target Value 4.00 mg/l
Standard Values A. 3.96
B. 3.92
C. 3.88
D. 4.20

$x \pm S = 3.99 \pm 0.14$ mg/l
Recovery = 99.8%

Chromium:

Target Value 4.00 mg/l
Standard Values A. 3.96
B. 4.04
C. 3.84
D. 3.48

$x \pm S = 3.83 \pm 0.25$ mg/l
Recovery = 95.8%

Lead:

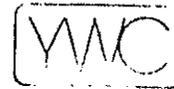
Target Value 4.0 mg/l
Standard Values A. 4.0
B. 4.0
C. 4.0
D. 4.0

$x \pm S = 4.0 \pm 0.0$
Recovery = 100%

Nickel:

Target Value 4.00 mg/l
Standard Values A. 4.60
B. 4.52
C. 4.56
D. 5.12

$x \pm S = 4.70 \pm 0.28$
Recovery = 117.5%



York Wastewater Consultants, Inc.
One Research Drive
Stamford, Connecticut 06906

Trace Metals in Fish

U.S. EPA Sample No. 1, Serial No. 0639

<u>Metal</u>	<u>Target Value (mg/kg)</u>	<u>95% Confidence Level</u>	<u>Experimental Value</u>
Mercury	2.52	1.24 - 3.80	2.22
Selenium	0.37	MDL - 0.75	0.21
Cadmium	0.16	MDL - 0.32	0.09
Chromium	0.58	MDL - 1.34	0.58
Copper	2.21	0.93 - 3.49	1.90
Lead	0.26	MDL - 0.62	0.32
Nickel	0.54	MDL - 1.10	0.87
Zinc	43.6	35.5 - 57.7	39.2

PCB's in Fish

U.S. EPA Concentrates No. 1 and No. 2

Concentrate No. 1, Serial No. 659

<u>Parameter</u>	<u>Target Value (mg/kg)</u>	<u>Actual Value (mg/kg)</u>	<u>95% Confidence Intervals(mg/kg)</u>
Total PCB's	5.17	4.86	*D.L. - 11.4

Concentrate No. 2, Serial No. 595

<u>Parameter</u>	<u>Target Value (mg/kg)</u>	<u>95% Confidence Intervals (mg/kg)</u>
PCB 1242	0.24	*D.L. - 0.8
PCB 1260	0.11	D.L. - 0.4
Total PCB's	0.35	D.L. - 1.2

*D.L. - Detection Limit

GC/ECD analysis indicated 0.42 mg/kg PCB 1242 and 0.09 mg/kg PCB 1260 or a total PCB concentration of 0.51 mg/kg.



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One Research Drive
Stamford, Connecticut 06906

Pesticide Analysis

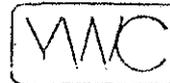
The following are the results of the Pesticide Proficiency Test Series maintained by the Connecticut State Department of Health. (These samples were run at the same time as this projects samples.)



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Stamford, Connecticut 06906

PESTICIDES

<u>Compound</u>	<u>Sample Number</u>	<u>Target Value (ug/l)</u>	<u>Acceptable Range for Quantitation of Parameter (ug/l)</u>	<u>YWC Result (ug/l)</u>
Endrin	1	4.7	0.7-8.7	3.94
	2	0.8	0.2-2.0	0.389
Lindane	1	0	0	0
	2	5.2	2.6-7.8	4.3
Methoxychlor	1	9.0	3.1-15.3	5.11
	2	110.4	90.2-130.6	110.2
Toxaphene	1	12.6	7.2-18.0	9.94
	2	7.3	5.2-9.3	8.56



York Wastewater Consultants, Inc.

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Stamford, Connecticut 06903

CHEMICALS AND STANDARDS

<u>Compounds</u>	<u>Grade</u>	<u>Manufacturer</u>
Inorganic Acids and Chemicals	Reagent	J. T. Baker
Atomic Absorption Standards	---	Scientific Products Division of American Hospital Supply
Solvents (hexane, metanol, diethyl ether, etc.)	Reagent	Burdick and Jackson Laboratories
Pesticide, PCB, Volatile Organics	---	Supelco
Helium	5.5	CryoDyne Specialty Gases
Nitrogen	5	CryoDyne Specialty Gases

QA/QC - CHARACTERIZATION

QA/QC SUMMARY

Note: \bar{x} = Arithmetic Mean
S = Standard Deviation

Metal Recoveries - Soils and Sediments

Cadmium:

Target Value	0.50 mg/l
Standard Values	1. 0.52
	2. 0.53
	3. 0.48
	4. 0.47
	5. 0.50
	6. 0.51
	7. 0.47
	8. 0.52
	9. 0.49
	10. 0.47

$\bar{x} + S = 0.49 \pm 0.02$
Recovery = 98.0%

Chromium:

Target Value	1.00
Standard Values	1. 1.01
	2. 0.96
	3. 0.96
	4. 0.90
	5. 0.92
	6. 0.94
	7. 0.91
	8. 0.92
	9. 0.97
	10. 0.94

$\bar{x} + S = 0.94 \pm 0.03$
Recovery = 94.0%

Lead:

Target Value	1.0
Standard Values	1. 1.5
	2. 1.1
	3. 0.9
	4. 0.9
	5. 0.9
	6. 1.0
	7. 1.0
	8. 0.9
	9. 0.9
	10. 1.0

$\bar{x} + S = 1.01 \pm 0.18$
Recovery = 101.0%

Nickel:

Target Value	1.00
Standard Values	1. 0.98
	2. 0.97
	3. 0.93
	4. 0.94
	5. 0.94
	6. 0.92
	7. 0.96
	8. 0.91
	9. 0.86
	10. 0.88

$\bar{x} + S = 0.93 \pm 0.04$
Recovery = 93%

Trace Metals In Fish

U.S. EPA Sample No. 1, Serial No. 0639

<u>Metal</u>	<u>Target Value (mg/kg)</u>	<u>95% Confidence Level</u>	<u>Experimental Value</u>
Lead	0.26	MDL - 0.62	0.30
Chromium	0.58	MDL - 1.34	0.56
Cadmium	0.16	MDL - 0.32	0.19
Nickel	0.54	MDL - 1.10	0.67

QA/QC SUMMARY

Note: \bar{x} = Arithmetic Mean
S = Standard Deviation

Inorganic Analyses: Aqueous Samples

pH:

Target Value 6.87
Standard Values 1. 6.95
2. 6.93
3. 6.89

$\bar{x} + S = 6.92 + 0.03$
Recovery = 100.7%

Chloride:

Target Value 110 mg/l
Standard Values 1. 108
2. 120
3. 118

$\bar{x} + S = 115 + 6.43$
Recovery = 104.5%

Cyanide:

Target Value 0.05 mg/l
Standard Values 1. 0.046
2. 0.040
3. 0.052

$\bar{x} + S = 0.046 + 0.006$
Recovery = 92.0%

Petroleum Based Hydrocarbons:

Target Value 15.0 mg/l
Standard Values 1. 12.3
2. 11.4
3. 17.3

$\bar{x} + S = 13.7 + 3.18$
Recovery = 91.3%

Ammonia-Nitrogen:

Target Value 2.00 mg/l
Standard Values 1. 1.85
2. 1.97
3. 2.05

$\bar{x} + S = 1.96 + 0.10$
Recovery = 98.0%

Total Suspended Solids:

Target Value 25.0 mg/l
Standard Values 1. 17.3
2. 22.8
3. 19.9

$\bar{x} + S = 20.0 + 2.75$
Recovery = 80.0%

Biochemical Oxygen Demand:
(5-Day)

Target Value 150 mg/l
Standard Values 1. 136
2. 148
3. 155

$\bar{x} + S = 146 + 1.73$
Recovery = 97.3%

QA/QC SUMMARY

Note: x = Arithmetic Mean
S = Standard Deviation

Metal Analyses - Aqueous Samples

<u>Parameter</u>	<u>Target Values</u> (ug/l)	<u>Replicate Values</u> (ug/l)			<u>x</u> + <u>s</u>	<u>Recovery</u>
		<u>#1</u>	<u>#2</u>	<u>#3</u>		
Antimony	625	528	562	---	545 + 24.0	87.2%
Arsenic	25	20	18	---	19 + 1.4	76.0%
Beryllium	500	480	470	---	475 + 7.1	95.0%
Cadmium	625	560	570	---	565 + 7.1	90.4%
Chromium	500	506	450	---	478 + 39.6	95.6%
Copper	500	480	470	---	475 + 7.1	95.0%
Lead	500	480	500	500	493 + 11.5	98.6%
Nickel	500	498	560	546	535 + 32.5	107.0%
Selenium	25	25	23	---	24 + 1.4	96.0%
Thallium	500	560	540	500	533 + 30.6	106.6%
Zinc	500	520	536	494	517 + 21.2	103.4%

QA/QC SUMMARY

Volatile Priority Pollutants - Aqueous Samples

<u>Compound</u>	<u>Target Value</u>	<u>Result</u>	<u>% Recovery</u>
Methylene Chloride	399 ug/l	360 ug/l	90.2
1,1,1-Trichlorethane	405 ug/l	381 ug/l	94.1
Tetrachloroethene	486 ug/l	482 ug/l	99.2
Toluene	261 ug/l	266 ug/l	101.9
Benzene	250 ug/l	244 ug/l	97.6%
Xylene	400 ug/l	387 ug/l	96.8%

BASE/NEUTRAL/ACIDIC ORGANICS RECOVERY
DATA ON LABELED QC SAMPLES

<u>Compound</u>	<u>Actual Mean Percent Recovery</u>	<u>Theoretical Mean Recovery</u>
naphthalene	77	73
hexachlorobutadiene	56	64
diethyl phthalate	100	118
chrysene	88	102
phenol	63	42
2,4-dimethylphenol	68	70
Aroclor 1248	75	88

Theoretical mean percent recovery values were taken from "Precision and Accuracy in the Determination of Organics in Water by Fused Silica Capillary Column Gas Chromatography/Mass Spectrometry and Packed Column Gas Chromatography/Mass/Spectrometry". J. W. Elchelberger, E. G. Kerns, P. Olynyk, and W. L. Budde, Anal. Chem., 1983, 55, 1471-1479.

TOXIC LABORATORIES DIVISION

July 24, 1985

Mr. Charlie Jaworski
Loureiro Engineering Associates
10 Tower Lane
Avon, CT 06001

Dear Charlie:

In regards to our recent telephone conversations regarding the USN/NETC Characterization Step, the results for the trace metals in mussels duplicate sample are good. The variances in the concentrations are typical for this type of sample matrix and sample preparation method. The USEPA quality control sample (No. 0639) gives 95% confidence limits of approximately ± 50 to $\pm 100\%$ (e.g. copper and lead). The reported values fit into this range and represent good analytical techniques. Also the concentrations will vary from one given specimen to the next (as in the CEAS Program)¹, and the concentrations found are generally in line with the published data.

The trace metal concentrations reported in the duplicate sediment sample analyses are again in line with good analytical technique. The QA/QC data shows good recovery and precision for the sediment analyses in general. We feel the duplicate values reported are good and the variation is due to non-uniform distribution in the sediments and limitations in the methodology itself.

The percent relative standard deviations for sample 01-17-SD are in the 20-25% range for lead, copper, and chromium while in the 15% range for nickel. The results for the other soil duplicate, 14-06-SD, range from 8-20% RSD.

The range of the values again, is what is considered typical for the type of sample matrix and the method itself.

In regards to the fingerprinting of the hydrocarbons by GC/FID, the solvent extraction and concentration technique allows us to obtain data for samples containing approximately 20 ppm petroleum hydrocarbons at best. Factors such as weathering of the oil, moisture content, etc. can all affect the sensitivity of the technique.

The method for petroleum hydrocarbons itself is a Freon™ extraction of a sample followed by removal of polar compounds via silica gel, and final weighing of the residue after evaporation of the solvent. This method is by no means specific for

petroleum hydrocarbons as other types of oils interfere. The petroleum hydrocarbon values cannot be compared to the fingerprinting data without keeping this in mind. Certain trends may be evident, but in general no specific conclusions should be drawn from the two sets of data.

Very truly yours,


Jeffrey C. Curran
Chief Chemist

JCC/pw

¹Gallow, WB & Phelps, D.K., "A Report on the Coastal Environment Assessment Stations (CEAS) Program," U.S. E.P.A.

APPENDIX C
YWC LABORATORY REPORTS

01-6191-00
 LEA/USN NEWPORT RI LABORATORY RESULTS
 SITE N1 AND N2
ALL RESULTS IN PPB UNLESS OTHERWISE NOTED

<u>Sample ID</u>	<u>PCB's ppm</u>	<u>Cyanide</u>	<u>Cr</u>	<u>Cd</u>	<u>Pb</u>	<u>As</u>	<u>Hg</u>	<u>Se</u>	<u>Ag</u>
N1-01-SDA	<0.5	31	11,500	<50	27,497	<200	<20	<200	<500
N1-01-MS	0.36		<2500	<500	<1000	<400	<40	<400	<1000
N2-01-MS	0.37		<2500	<500	<1000	<400	<40	<400	<1000
N2-01-SDA	<0.5	27	8,000	<50	6,750	<200	<20	<200	<500

01-6191-00
LEA/USN NEWPORT RI LABORATORY RESULTS
SITE N1 AND N2
ALL RESULTS IN PPB UNLESS OTHERWISE NOTED

<u>Sample ID</u>	<u>Cu</u>	<u>Ba</u>	<u>Ni</u>	<u>Be</u>	<u>Sb</u>	<u>Sn</u>
N1-01-SDA	18,250	<400	21,250	<50	<500	<5000
N1-01-MS	7,232	<1000	<2500	<500	<1000	<10,000
N2-01-MS	4,257	<1000	<2500	<500	<1000	<10,000
N2-01-SDA	10,250	<400	11,250	<50	<500	<5000

01-6191-00
 LEA/USN NEWPORT RI LABORATORY RESULTS
 SITE 01
ALL RESULTS IN PPB UNLESS OTHERWISE NOTED

<u>Sample ID</u>	<u>PCB's ppm</u>	<u>Cr</u>	<u>Cd</u>	<u>Pb</u>	<u>As</u>	<u>Hg</u>	<u>Se</u>	<u>Ag</u>
01-09-MS	0.38	<2500	<500	<1000	<400	<40	<400	<1000
01-10-MS	<0.01	<2500	<500	<1000	<400	<40	<400	<1000
01-11-MS	0.29	<2500	<500	<1000	<400	<40	<400	<1000
01-12-MS	0.33	<2500	<500	<1000	<400	<40	<400	<1000
Composite of: 01-13 and 01-13-MS	0.29	<2500	<500	<1000	<400	<40	<400	<1000
01-09-SDA	<0.5	7,500	<50	70,008	<200	<20	<200	<500
01-10-SDA	<0.5	7,000	<50	77,491	<200	<20	<200	<500
01-11-SDA	<0.5	6,250	<50	57,463	<200	<20	<200	<500
01-12-SDA	<0.5	17,500	<50	900,104	<200	<20	<200	<500
01-13-SDA	<0.5	14,750	<50	327,447	<200	<20	<200	<500

01-6191-00
 LEA/USN NEWPORT RI LABORATORY RESULTS
 SITE 01
ALL RESULTS IN PPB UNLESS OTHERWISE NOTED

<u>Sample ID</u>	<u>Cu</u>	<u>Ba</u>	<u>Ni</u>	<u>Be</u>	<u>Sb</u>	<u>Sn</u>
01-09-MS	6,041	<1000	<2500	<500	<1000	<10,000
01-10-MS	6,432	<1000	<2500	<500	<1000	<10,000
01-11-MS	9,231	<1000	<2500	<500	<1000	<10,000
01-12-MS	12,214	<1000	<2500	<500	<1000	<10,000
Composite of: 01-13 and 01-13-MS	28,263	<1000	<2500	<500	<1000	<10,000
01-09-SDA	28,250	<400	19,250	<50	<500	<5000
01-10-SDA	133,230	<400	22,000	<50	<500	<5000
01-11-SDA	153,400	<400	32,750	<50	<500	<5000
01-12-SDA	1,455,170	<400	64,010	<50	<500	<5000
01-13-SDA	654,890	<400	55,490	<50	<500	<5000

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES
DIV. OF YWC, INC.

METHODOLOGY: EPA624 AND 625

CLIENT: LEA/USNAVY

DATE: 1/84

HP 5955B GC/MS/DS

JOB NO: 01-8191

DESCRIPTION: 01-01THRU 01-06 SLA COMPOSITE

VOLATILE ORGANICS YWC, INC.	CONCENTRATION (UG/KG)	DETECTION LIMIT (UG/KG)
ACROLEIN	BDL	10
ACRYLONITRILE	BDL	10
BENZENE	BDL	5
BIS(CHLOROMETHYL)ETHER	BDL	5
BROMOFORM	BDL	5
CARBON TETRACHLORIDE	BDL	5
CHLOROBENZENE	BDL	5
CHLORODIBROMOMETHANE	BDL	5
CHLOROETHANE	BDL	5
CHLOROETHYL VINYL ETHER	BDL	5
CHLOROFORM	BDL	5
DICHLOROBROMOMETHANE	BDL	5
DICHLORODIFLUOROMETHANE	BDL	5
DICHLOROETHANE (1,1)	BDL	5
DICHLOROETHANE (1,2)	BDL	5
DICHLOROETHYLENE (1,1)	BDL	5
DICHLOROPROPANE (1,2)	BDL	5
DICHLOROPROPYLENE (1,3)	BDL	5
ETHYLBENZENE	BDL	5
METHYL BROMIDE	BDL	5
METHYL CHLORIDE	BDL	5
METHYLENE CHLORIDE	BDL	5
1,1,1,2-TETRACHLOROETHANE	BDL	5
TETRACHLOROETHYLENE	BDL	5
TOLUENE	BDL	5
1,2-TRANS-DICHLOROETHYLENE	BDL	5
1,1,1-TRICHLOROETHANE	BDL	5
1,1,2-TRICHLOROETHANE	BDL	5
TRICHLOROETHYLENE	BDL	5
TRICHLOROFLUOROMETHANE	BDL	5
VINYL CHLORIDE	BDL	5

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES
DIV. OF Y.W.C. INC.

METHODOLOGY: EPA 624 AND 625

CLIENT: LEA/USNAVY NEWPORT
JOB NO.: G-6191 NETC
BASE/NEUTRAL EXTRACTABLE
ORGANICS

DATE: 1/84

DESCRIPTION: COMPOSITE OF NOS. 01-01-SLATHROUGH 01-06-SLA (VOLATILES)
AND 01-01-SLB THROUGH 01-06-SLB
FOR OTHERS

CONCENTRATION (UC/G (PPM))	DETECTION LIMIT UC/G OR PPM
FLUORENE	BDL 0.5
HEXACHLOROBENZENE	BDL 0.5
HEXACHLOROBUTADIENE	BDL 0.5
HEXACHLOROCYCLOPENTADIENE	BDL 0.5
HEXACHLOROCYCLOHEPTANE	BDL 0.5
INDENO(1,2,3-CD)PIRENE	BDL 1.25
NAPHTHALENE	BDL 0.5
NITROBENZENE	BDL 0.5
N-NITROSDIMETHYLAMINE	BDL 0.5
N-NITROSDI-N-PROPYLAMINE	BDL 0.5
N-NITROSDIPHENYLAMINE	BDL 0.5
PHENANTHRENE	BDL 0.5
PYRENE	BDL 0.5
1,2,4-TRICHLOROBENZENE	BDL 0.5

ACID EXTRACTABLE ORGANICS CONCENTRATION (UC/G OR PPM)	DETECTION LIMIT UC/G (PPM)
2-CHLOROPHENOL	BDL 1.25
2,4-DICHLOROPHENOL	BDL 1.25
2,4-DIMETHYLPHENOL	BDL 1.25
4,6-DINITRO-O-CRESOL	BDL 12.5
2,4-DINITROPHENOL	BDL 12.5
2-NITROPHENOL	BDL 1.25
4-NITROPHENOL	BDL 1.25
P-CHLORO-M-CRESOL	BDL 1.25
PENTACHLOROPHENOL	BDL 1.25
PHENOL	BDL 1.25
2,4,6-TRICHLOROPHENOL	BDL 1.25

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES
DIV. OF YWC, INC.

METHODOLOGY: EPA 824 AND 625

CLIENT: LEA/USNAVY NEWPORT
JOB NO.: 01-6191 NETC

DATE: 1/84

DESCRIPTION: COMPOSITE OF NOS. 01-01-SLATHROUGH 01-06-SLA (VOLATILES)
AND 01-01-SLB THROUGH 01-06-SLB
FOR OTHERS

PESTICIDES/PCB'S *****	CONCENTRATION (UG/G OR PPM)	DETECTION LIMIT UG/G (PPM)
ALDRIN	BDL	0.5
A-BHC	BDL	0.5
B-BHC	BDL	0.5
C-BHC	BDL	0.5
D-BHC	BDL	0.5
CHLORDANE	BDL	0.5
4,4'-DDT	BDL	0.5
4,4'-DDE	BDL	0.5
4,4'-DDD	BDL	0.5
DIELDRIN	BDL	0.5
A-ENDOSULFAN	BDL	0.5
B-ENDOSULFAN	BDL	0.5
ENDOSULFAN SULFATE	BDL	0.5
ENDRIN	BDL	0.5
ENDRIN ALDEHYDE	BDL	0.5
HEPTACHLOR	BDL	0.5
HEPTACHLOR EPOXIDE	BDL	0.5
PCB-1240	BDL	0.5
PCB-1284	BDL	0.5
PCB-1221	BDL	0.5
PCB-1282	BDL	0.5
PCB-1248	BDL	0.5
PCB-1260	BDL	0.5
PCB-1016	BDL	0.5
TOXAPHENE	BDL	0.5

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES
DIV. OF YWC, INC.

METHODOLOGY: EPA 824 AND 625

CLIENT: LEA/USNAVY NEWPORT
JOB NO.: 01-8191 NETC

DATE: 1/84

DESCRIPTION: COMPOSITE OF NOS. 01-01-SL THROUGH 01-06-SLA (VOLATILES)

AND 01-01-SLB THROUGH 01-06-SLB
FOR OTHERS

METAL PRIORITY POLLUTANTS	CONCENTRATION UG/KG OR PPB)	DETECTION LIMIT (PPB) (P)
ANTIMONY	BDL	500
ARSENIC	BDL	200
BERYLLIUM	BDL	50
CADMIUM	BDL	50
CHROMIUM	7250	250
COPPER	13500	250
LEAD	2000	500
MERCURY	BDL	20
NICKEL	20500	500
SELENIUM	BDL	200
SILVER	BDL	500
THALLIUM	BDL	100
ZINC	385	100

MISCELLANEOUS

CYANIDES	47	5
PHENOLS	27	5

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES
DIV. OF YMC, INC.

METHODOLOGY: EPA 604 AND 625

CLIENT: LEA/USNAVY NEWPORT

DATE: 1/84

DESCRIPTION: 01-07-LWA THROUGH LWE

JOB: NEWPORT-6191 NETA

VOLATILE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
ACROLEIN	BDL	100
ACRYLONITRILE	BDL	100
BENZENE	BDL	10
BIS(CHLOROMETHYL)ETHER	BDL	10
BROMOFORM	BDL	10
CARBON TETRACHLORIDE	BDL	10
CHLOROBENZENE	BDL	10
CHLORODIBROMOMETHANE	BDL	10
CHLORODETHANE	BDL	10
CHLOROETHYL VINYL ETHER	BDL	10
CHLOROFORM	BDL	10
DICHLOROBROMOMETHANE	BDL	10
DICHLORODIFLUOROMETHANE	BDL	10
DICHLOROETHANE (1,1)	BDL	10
DICHLOROETHANE (1,2)	BDL	10
DICHLOROETHYLENE (1,1)	BDL	10
DICHLOROPROPANE (1,2)	BDL	10
DICHLOROPROPYLENE (1,3)	BDL	10
ETHYLBENZENE	BC	10
METHYL BROMIDE	BDL	10
METHYL CHLORIDE	BDL	10
METHYLENE CHLORIDE	BDL	10
1,1,2,2-TETRACHLOROETHANE	BDL	10
TETRACHLOROETHYLENE	BDL	10
TOLUENE	DE	10
1,2-TRANS-DICHLOROETHYLENE	BDL	10
1,1,1-TRICHLOROETHANE	BDL	10
1,1,2-TRICHLOROETHANE	BDL	10
TRICHLOROETHYLENE	BDL	10
TRICHLOROFLUOROMETHANE	BDL	10
VINYL CHLORIDE	BDL	10

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES

DIV. OF Y.W. INC.

METHODOLOGY: EPA 824 AND 825

CLIENT: LEA/USNAVY NEWPORT

DATE: 1/84

DESCRIPTION: 01-07-LWA THROUGH LWE

JOB NO: 616191 NETA

BASE/NEUTRAL EXTRACTABLE
ORGANICS

CONCENTRATION (UG/L)

DETECTION LIMIT (UG/L)

BASE/NEUTRAL EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
ACENAPHTHENE	BDL	10
ACENAPHTHYLENE	BDL	10
ANTHRACENE	BDL	10
BENZIDINE	BDL	10
BENZ(a)ANTHRACENE	BDL	10
BENZ(a)FLUORENE	BDL	10
3,4-BENZOFLUORANTHENE	BDL	10
BENZ(b)FLUORENE	BDL	25
BENZ(b)FLUORANTHENE	BDL	10
BIS (2-CHLOROETHOXY)METHANE	BDL	10
BIS (2-CHLOROETHYL)ETHER	BDL	10
BIS (2-CHLOROISOPROPYL)ETHER	BDL	10
BIS (2-ETHYLHEXYL)PHTHALATE	BDL	10
4-BROMOPHENYL PHENYL ETHER	BDL	10
BUTYL BENZYL PHTHALATE	BDL	10
2-CHLOROPHTHALENE	BDL	10
4-CHLOROPHENYL PHENYL ETHER	BDL	10
CHRYSENE	BDL	10
DIBENZO(a,h)ANTHRACENE	BDL	25
1,2-DICHLOROBENZENE	BDL	10
1,3-DICHLOROBENZENE	BDL	10
1,4-DICHLOROBENZENE	BDL	10
3,3'-DICHLOROBENZIDINE	BDL	10
DIETHYL PHTHALATE	BDL	10
DIMETHYL PHTHALATE	BDL	10
DI-N-BUTYL PHTHALATE	BDL	10
2,4-DINITROTOLUENE	BDL	10
2,6-DINITROTOLUENE	BDL	10
DI-N-BUTYL PHTHALATE	BDL	10
1,2-DIPHENYLHYDRAZINE	BDL	10
FLUORANTHENE	BDL	10

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES

DIV. OF Y.W. INC.

METHODOLOGY: EPA 824 AND 825

CLIENT: LEA/USNAVY NEWPORT . DATE: 1/84 DESCRIPTION: 01-07-LWA THROUGH LWE

JOB NO: 61-6191 WETC

BASE/NEUTRAL EXTRACTABLE

ORGANICS

CONCENTRATION (UG/L)

DETECTION LIMIT (UG/L)

ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
FLUORENE	BDL	10
HEXACHLOROBENZENE	BDL	10
HEXACHLOROBUTADIENE	BDL	10
HEXACHLOROCYCLOPENTADIENE	BDL	10
HEXACHLOROETHANE	BDL	10
INDENO (1,2,3-CD) PYRENE	BDL	25
ISOPHORONE	BDL	10
NAPHTHALENE	BDL	10
NITROBENZENE	BDL	10
N-NITROSODIMETHYLAMINE	BDL	10
N-NITROSODI-N-PROPYLAMINE	BDL	10
N-NITROSODIPHENYLAMINE	BDL	10
PHENANTHRENE	BDL	10
PYRENE	BDL	10
1,2,4-TRICHLOROBENZENE	BDL	10

ACID EXTRACTABLE ORGANICS

CONCENTRATION (UG/L)

DETECTION LIMIT (UG/L)

ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
2-CHLOROPHENOL	BDL	25
2,4-DICHLOROPHENOL	BDL	25
2,4-DIMETHYLPHENOL	BDL	25
4,6-DINITRO-O-CRESOL	BDL	25
2,4-DINITROPHENOL	BDL	250
2-NITROPHENOL	BDL	250
4-NITROPHENOL	BDL	25
P-CHLORO-M-CRESOL	BDL	25
PENTACHLOROPHENOL	BDL	25
PHENOL	BDL	25
2,4,6-TRICHLOROPHENOL	BDL	25

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES

DIV. OF Y&E, INC.

METHODOLOGY: EPA 624 AND 625

CLIENT: LEA/USNAVY NEWPORT

DATE: 1/84

DESCRIPTION: 01-07-LWA THROUGH LWE

JOB NO.: 61-6191 NETC

PESTICIDES/PCB'S *****	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
ALDRIN	BDL	10
A-B-C	EDL	10
B-B-C	EDL	10
C-B-C	EDL	10
D-B-C	EDL	10
CHLORDANE	EDL	10
4,4'-DDT	EDL	10
4,4'-DDE	EDL	10
4,4'-DDD	EDL	10
DIELDRIN	EDL	10
γ-ENDOSULFAN	EDL	10
β-ENDOSULFAN	EDL	10
ENDOSULFAN SULFATE	EDL	10
ENDRIN	EDL	10
ENDRIN ALDEHYDE	EDL	10
HEPTACHLOR	EDL	10
HEPTACHLOR EPOXIDE	EDL	10
PCB-1242	EDL	10
PCB-1254	EDL	10
PCB-1221	EDL	10
PCB-1282	EDL	10
PCB-1248	EDL	10
PCB-1260	EDL	10
PCB-1218	EDL	10
TOXAP-ENE	EDL	10
		10

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES
DIV. OF YJE. INC.

METHODOLOGY: EPA624 AND 625

CLIENT: LEA/USNAVY NEWPORT . DATE: 1/84 DESCRIPTION: 01-07-LWA THROUGH LWE
JOB NO.: G1-6191 NETA

METAL PRIORITY POLLUTANTS CONCENTRATION (UG/L) DETECTION LIMIT (UG/L)

METAL PRIORITY POLLUTANTS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
ANTIMONY	BDL	50
ARSENIC	BDL	2
BERYLLIUM	BDL	4
CADMIUM	28	4
CHROMIUM	BDL	20
COPPER	BDL	20
LEAD	BDL	40
MERCURY	BDL	.2
NICKEL	BDL	20
SELENIUM	BDL	2
SILVER	BDL	50
THALLIUM	BDL	10
ZINC	BDL	10

MISCELLANEOUS CDE

CYANIDES	15.7	1
PHENOLS	6	1

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES
DIV. OF Y.W.C. INC.

METHODOLOGY: EPA 824

CLIENT: LEA/USNAVY NEWPORT . DATE: 1/84 DESCRIPTION: 01-08-LWA THROUGH LWE

JOB NO.: 61-6191 NETC

VOLATILE ORGANICS *****	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
ACROLEIN	BDL	100
ACRYLONITRILE	BDL	100
BENZENE	BDL	10
BIS(CHLOROMETHYL)ETHER	BDL	10
BROMOFORM	BDL	10
CARBON TETRACHLORIDE	BDL	10
CHLOROBENZENE	BDL	10
CHLORODIBROMOMETHANE	BDL	10
CHLOROETHANE	BDL	10
CHLOROETHYL VINYL ETHER	BDL	10
CHLOROFORM	BDL	10
DICHLOROBROMOMETHANE	BDL	10
DICHLOROFLUOROMETHANE	BDL	10
DICHLOROETHANE (1,1)	BDL	10
DICHLOROETHANE (1,2)	BDL	10
DICHLOROETHYLENE (1,1)	BDL	10
DICHLOROPROPANE (1,2)	BDL	10
DICHLOROPROPYLENE (1,3)	BDL	10
ETHYLBENZENE	BDL	10
METHYL BROMIDE	BDL	10
METHYL CHLORIDE	BDL	10
METHYLENE CHLORIDE	BDL	10
1,1,1,2-TETRACHLOROETHANE	BDL	10
TETRACHLOROETHYLENE	BDL	10
TOLUENE	BDL	10
1,2-TRANS-DICHLOROETHYLENE	BDL	10
1,1,1-TRICHLOROETHANE	BDL	10
1,1,2-TRICHLOROETHANE	BDL	10
TRICHLOROETHYLENE	BDL	10
TRICHLOROFLUOROMETHANE	BDL	10
VINYL CHLORIDE	BDL	10

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES
DIV. OF YWC, INC.

METHODOLOGY: EPA824

CLIENT: LEA/USNAVY NEWPORT
JOB NO.: 101-6191 NETC

DATE: 1/84

DESCRIPTION: 01-08-LWA THROUGH LWE

BASE CATAL EXTRACTABLE ORGANICS *****	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
ACENAPHTHENE	BDL	10
ACENAPHTHYLENE	BDL	10
ANTHRACENE	BDL	10
BENZIDINE	BDL	10
BENZO(A)ANTHRACENE	BDL	10
BENZO(A)PYRENE	BDL	10
3,4-BENZOFLUORANTHENE	BDL	10
BENZO(G,H)PERYLENE	BDL	25
BENZO(K)FLUORANTHENE	BDL	10
BIS(2-CHLOROETHOXY)METHANE	BDL	10
BIS(2-CHLOROETHYL)ETHER	BDL	10
BIS(2-CHLOROISOPROPYL)ETHER	BDL	10
BIS(2-ETHYLHEXYL)PHTHALATE	BDL	10
4-BROMOPHENYL PHENYL ETHER	BDL	10
BUTYL BENZYL PHTHALATE	BDL	10
2-CHLORONAPHTHALENE	BDL	10
4-CHLOROPHENYL PHENYL ETHER	BDL	10
CHRYSENE	BDL	10
DIBENZO(A,H)ANTHRACENE	BDL	25
1,2-DICHLOROBENZENE	BDL	10
1,3-DICHLOROBENZENE	BDL	10
1,4-DICHLOROBENZENE	BDL	10
3,3'-DICHLOROBENZIDINE	BDL	10
DIETHYL PHTHALATE	BDL	10
DIMETHYL PHTHALATE	BDL	10
DI-N-BUTYL PHTHALATE	BDL	10
2,4-DINITROTOLUENE	BDL	10
2,5-DINITROTOLUENE	BDL	10
DI-N-OCTYL PHTHALATE	BDL	10
1,2-DIPHENYLHYDRAZINE	BDL	10

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES
DIV. OF Y&C, INC.

METHODOLOGY: EPA824

CLIENT: LEA/USNAVY NEWPORT . DATE: 1/84 DESCRIPTION: 01-08-LWA THROUGH LWE
JOB NO.: 61-5191 NETA

BASE/NEUTRAL EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
FLUORANTHENE	BDL	10
FLUCRENE	BDL	10
HEXACHLOROBENZENE	BDL	10
HEXACHLOROBUTADIENE	BDL	10
HEXACHLOROCYCLOPENTADIENE	BDL	10
HEXACHLOROETHANE	BDL	10
INDENO(1,2,3-CD)PYRENE	BDL	25
ISOPHORONE	BDL	10
NAPHTHALENE	BDL	10
NITROBENZENE	BDL	10
N-NITROSDIMETHYLAMINE	BDL	10
N-NITROSDI-N-PROPYLAMINE	BDL	10
N-NITROSDIPHENYLAMINE	BDL	10
PERANTHRENE	BDL	10
PYRENE	BDL	10
1,2,4 TRICHLOROBENZENE	BDL	10

ACID EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
2-CHLOROPHENOL	BDL	25
2,4-DICHLOROPHENOL	BDL	25
2,4-DIMETHYLPHENOL	BDL	25
4,6-DINITRO-O-CRESOL	BDL	250
2,4-DINITROPHENOL	BDL	250
2-NITROPHENOL	BDL	25
4-NITROPHENOL	BDL	25
2-C-LORO-M-CRESOL	BDL	25
PENTACHLOROPHENOL	BDL	25
PHENOL	BDL	25
2,4,6-TRICHLOROPHENOL	BDL	25

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES
DIV. OF YWC. INC.

METHODOLOGY: EPA824

CLIENT: LEA/USNAVY NEWPORT . DATE: 1/84 DESCRIPTION: 01-02-LWA THROUGH LWE
JOB NO.: 01-6191 NETC =====

PESTICIDES/PCB'S =====	CONCENTRATION(UO/L)	DETECTION LIMIT (UG/L)
ALDRIN	BDL	10
A-BHC	BDL	10
B-BHC	BDL	10
G-BHC	BDL	10
D-BHC	BDL	10
CHLORDANE	BDL	10
4,4'-DDT	BDL	10
4,4'-DEE	BDL	10
4,4'-DOD	BDL	10
DIELDRIN	BDL	10
A-ENDOSULFAN	BDL	10
B-ENDOSULFAN	BDL	10
ENDOSULFAN SULFATE	BDL	10
ENDFIN	BDL	10
ENDIN ALEPHIDE	BDL	10
HEPTACHLOR	BDL	10
HEPTACHLOR EPIXIDE	BDL	10
P1B-1140	BDL	10
P1B-1144	BDL	10
P1B-1121	BDL	10
P1B-1132	BDL	10
P1B-1142	BDL	10
P1B-1150	BDL	10
P1B-1116	BDL	10
TOXAPHENE	BDL	10

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES
DIV. OF YWE, INC.

METHODOLOGY: EPA 824 AND 825

CLIENT: LEA/USNAVY NEWPORT . DATE: 1/84 DESCRIPTION: 01-08-LDA THROUGH LDE
JOB NO.: 61-6191 .NETC

VOLATILE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
ACROLEIN	BDL	100
ACRYLONITRILE	EDL	100
BENZENE	BDL	10
BIS(CHLOROMETHYL)ETHER	EDL	10
BROMOFORM	BDL	10
CARBON TETRACHLORIDE	EDL	10
CHLOROBENZENE	BDL	10
CHLORODIBROMOMETHANE	EDL	10
CHLORoETHANE	BDL	10
CHLOROETHYL VINYL ETHER	EDL	10
CHLOROFORM	BDL	10
DICHLOROBROMOMETHANE	EDL	10
DICHLORODIFLUOROMETHANE	BDL	10
DICHLOROETHANE (1,1)	EDL	10
DICHLOROETHANE (1,2)	BDL	10
DICHLOROETHYLENE (1,1)	EDL	10
DICHLOROPROPANE (1,2)	BDL	10
DICHLOROPROPYLENE (1,3)	EDL	10
ETHYLBENZENE	BDL	10
METHYL BROMIDE	EDL	10
METHYL CHLORIDE	BDL	10
METHYLENE CHLORIDE	EDL	10
1,1,2,2-TETRACHLOROETHANE	BDL	10
TETRACHLOROETHYLENE	EDL	10
TOLUENE	BDL	10
1,2-TRANS-DICHLOROETHYLENE	EDL	10
1,1,1-TRICHLOROETHANE	BDL	10
1,1,2-TRICHLOROETHANE	EDL	10
TRICHLOROETHYLENE	BDL	10
TRICHLOROFLUOROMETHANE	EDL	10
VINYL CHLORIDE	BDL	

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES

DIV. OF YMC. INC.

METHODOLOGY: EPA 624 AND 625

CLIENT: LEA/USNAVY NEWPORT . DATE: 1/84 DESCRIPTION: 01-08-LDA THROUGH LDE

JOB NO.: 61-6191 NETC

BASE/NEUTRAL EXTRACTABLE

ORGANICS CONCENTRATION (UG/L) DETECTION LIMIT (UG/L)

ACENAPHTHENE	BDL	10
ACENAPHTHYLENE	BDL	10
ANTHRACENE	BDL	10
BENZIDINE	BDL	10
BENZO(A)ANTHRACENE	BDL	10
BENZO(A)PYRENE	BDL	10
3,4-BENZOFLUORANTHENE	BDL	10
BENZO(G,H)PERYLENE	BDL	25
BENZO(K)FLUORANTHENE	BDL	10
BIS(2-CHLOROETHOXY)METHANE	BDL	10
BIS(2-CHLOROETHYL)ETHER	BDL	10
BIS(2-CHLOROISOPROPYL)ETHER	BDL	10
BIS(2-ETHYLHEXYL)PHTHALATE	BDL	10
4-BROMOPHENYL PHENYL ETHER	BDL	10
BUTYL BENZYL PHTHALATE	BDL	10
2-CHLORONAPHTHALENE	BDL	10
4-CHLOROPHENYL PHENYL ETHER	BDL	10
CHRYSENE	BDL	10
DIBENZO(G,H)ANTHRACENE	BDL	25
1,2-DICHLOROBENZENE	BDL	10
1,3-DICHLOROBENZENE	BDL	10
1,4-DICHLOROBENZENE	BDL	10
3,5-DICHLOROBENZIDINE	BDL	10
DIETHYL PHTHALATE	BDL	10
DIMETHYL PHTHALATE	BDL	10
DI-N-BUTYL PHTHALATE	BDL	10
2,4-DINITROTOLUENE	BDL	10
2,6-DINITROTOLUENE	BDL	10
DI-N-OCTYL PHTHALATE	BDL	10
1,2-DIPHENYLHYDRAZINE	BDL	10
FLUORANTHENE	BDL	10

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES
DIV. OF Y&C, INC.

METHODOLOGY: EPA 624 AND 625

CLIENT: LEA/USNAVY NEWPORT . DATE: 1/84 DESCRIPTION: 01-08-LDA THROUGH LDE
JOB NO.: 01-6191-NETC

BASE/NEUTRAL EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
FLUORENE	BDL	10
HEXACHLOROBENZENE	BDL	10
HEXACHLOROBUTADIENE	BDL	10
HEXACHLOROCYCLOPENTADIENE	BDL	10
HEXACHLOROETHANE	BDL	10
INDENO(1,2,3-CD)PYRENE	BDL	25
ISOPHORONE	BDL	10
NAPHTHALENE	BDL	10
NITROBENZENE	BDL	10
NITROBENZENE	BDL	10
N-NITRODIMETHYLAMINE	BDL	10
N-NITRODI-N-PROPYLAMINE	BDL	10
N-NITRODI-PHENYLAMINE	BDL	10
PHENANTHRENE	BDL	10
PYRENE	BDL	10
1,2,4-TRICHLOROBENZENE	BDL	10

ACID EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
2-CHLOROPHENOL	BDL	25
2,4-DICHLOROPHENOL	BDL	25
2,4-DIMETHYLPHENOL	BDL	25
4,6-DINITRO-O-CRESOL	BDL	25
2,4-DINITROPHENOL	BDL	250
2-NITROPHENOL	BDL	250
4-NITROPHENOL	BDL	25
P-CHLORO-M-CRESOL	BDL	25
PENTACHLOROPHENOL	BDL	25
PHENOL	BDL	25
2,4,6-TRICHLOROPHENOL	BDL	25

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES

DIV. OF Y&E, INC.

METHODOLOGY: EPA 824 AND 825

CLIENT: LEA/USNAVY NEWPORT . DATE: 1/84 DESCRIPTION: 01-08-LDA THROUGH LDE
 JOB NO.: 01-6191-NETC

PESTICIDES/PCB'S	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
ALDRIN	EDL	10
A-BHC	EDL	10
B-BHC	EDL	10
C-BHC	EDL	10
D-BHC	EDL	10
CHLORDANE	EDL	10
4,4'-DDT	EDL	10
4,4'-DDE	EDL	10
4,4'-DDD	EDL	10
DIELDRIN	EDL	10
A-ENDOSULFAN	EDL	10
B-ENDOSULFAN	EDL	10
ENDOSULFAN SULFATE	EDL	10
ENDRIN	EDL	10
ENDRIN ALDEHYDE	EDL	10
HEPTACHLOR	EDL	10
HEPTACHLOR EPOXIDE	EDL	10
PCB-105	EDL	10
PCB-109	EDL	10
PCB-113	EDL	10
PCB-117	EDL	10
PCB-121	EDL	10
PCB-125	EDL	10
PCB-129	EDL	10
PCB-133	EDL	10
PCB-137	EDL	10
PCB-141	EDL	10
PCB-145	EDL	10
PCB-149	EDL	10
PCB-153	EDL	10
PCB-157	EDL	10
PCB-161	EDL	10
PCB-165	EDL	10
PCB-169	EDL	10
PCB-173	EDL	10
PCB-177	EDL	10
PCB-181	EDL	10
PCB-185	EDL	10
PCB-189	EDL	10
PCB-193	EDL	10
PCB-197	EDL	10
PCB-201	EDL	10
PCB-205	EDL	10
PCB-209	EDL	10
PCB-213	EDL	10
PCB-217	EDL	10
PCB-221	EDL	10
PCB-225	EDL	10
PCB-229	EDL	10
PCB-233	EDL	10
PCB-237	EDL	10
PCB-241	EDL	10
PCB-245	EDL	10
PCB-249	EDL	10
PCB-253	EDL	10
PCB-257	EDL	10
PCB-261	EDL	10
PCB-265	EDL	10
PCB-269	EDL	10
PCB-273	EDL	10
PCB-277	EDL	10
PCB-281	EDL	10
PCB-285	EDL	10
PCB-289	EDL	10
PCB-293	EDL	10
PCB-297	EDL	10
PCB-301	EDL	10
PCB-305	EDL	10
PCB-309	EDL	10
PCB-313	EDL	10
PCB-317	EDL	10
PCB-321	EDL	10
PCB-325	EDL	10
PCB-329	EDL	10
PCB-333	EDL	10
PCB-337	EDL	10
PCB-341	EDL	10
PCB-345	EDL	10
PCB-349	EDL	10
PCB-353	EDL	10
PCB-357	EDL	10
PCB-361	EDL	10
PCB-365	EDL	10
PCB-369	EDL	10
PCB-373	EDL	10
PCB-377	EDL	10
PCB-381	EDL	10
PCB-385	EDL	10
PCB-389	EDL	10
PCB-393	EDL	10
PCB-397	EDL	10
PCB-401	EDL	10
PCB-405	EDL	10
PCB-409	EDL	10
PCB-413	EDL	10
PCB-417	EDL	10
PCB-421	EDL	10
PCB-425	EDL	10
PCB-429	EDL	10
PCB-433	EDL	10
PCB-437	EDL	10
PCB-441	EDL	10
PCB-445	EDL	10
PCB-449	EDL	10
PCB-453	EDL	10
PCB-457	EDL	10
PCB-461	EDL	10
PCB-465	EDL	10
PCB-469	EDL	10
PCB-473	EDL	10
PCB-477	EDL	10
PCB-481	EDL	10
PCB-485	EDL	10
PCB-489	EDL	10
PCB-493	EDL	10
PCB-497	EDL	10
PCB-501	EDL	10
PCB-505	EDL	10
PCB-509	EDL	10
PCB-513	EDL	10
PCB-517	EDL	10
PCB-521	EDL	10
PCB-525	EDL	10
PCB-529	EDL	10
PCB-533	EDL	10
PCB-537	EDL	10
PCB-541	EDL	10
PCB-545	EDL	10
PCB-549	EDL	10
PCB-553	EDL	10
PCB-557	EDL	10
PCB-561	EDL	10
PCB-565	EDL	10
PCB-569	EDL	10
PCB-573	EDL	10
PCB-577	EDL	10
PCB-581	EDL	10
PCB-585	EDL	10
PCB-589	EDL	10
PCB-593	EDL	10
PCB-597	EDL	10
PCB-601	EDL	10
PCB-605	EDL	10
PCB-609	EDL	10
PCB-613	EDL	10
PCB-617	EDL	10
PCB-621	EDL	10
PCB-625	EDL	10
PCB-629	EDL	10
PCB-633	EDL	10
PCB-637	EDL	10
PCB-641	EDL	10
PCB-645	EDL	10
PCB-649	EDL	10
PCB-653	EDL	10
PCB-657	EDL	10
PCB-661	EDL	10
PCB-665	EDL	10
PCB-669	EDL	10
PCB-673	EDL	10
PCB-677	EDL	10
PCB-681	EDL	10
PCB-685	EDL	10
PCB-689	EDL	10
PCB-693	EDL	10
PCB-697	EDL	10
PCB-701	EDL	10
PCB-705	EDL	10
PCB-709	EDL	10
PCB-713	EDL	10
PCB-717	EDL	10
PCB-721	EDL	10
PCB-725	EDL	10
PCB-729	EDL	10
PCB-733	EDL	10
PCB-737	EDL	10
PCB-741	EDL	10
PCB-745	EDL	10
PCB-749	EDL	10
PCB-753	EDL	10
PCB-757	EDL	10
PCB-761	EDL	10
PCB-765	EDL	10
PCB-769	EDL	10
PCB-773	EDL	10
PCB-777	EDL	10
PCB-781	EDL	10
PCB-785	EDL	10
PCB-789	EDL	10
PCB-793	EDL	10
PCB-797	EDL	10
PCB-801	EDL	10
PCB-805	EDL	10
PCB-809	EDL	10
PCB-813	EDL	10
PCB-817	EDL	10
PCB-821	EDL	10
PCB-825	EDL	10
PCB-829	EDL	10
PCB-833	EDL	10
PCB-837	EDL	10
PCB-841	EDL	10
PCB-845	EDL	10
PCB-849	EDL	10
PCB-853	EDL	10
PCB-857	EDL	10
PCB-861	EDL	10
PCB-865	EDL	10
PCB-869	EDL	10
PCB-873	EDL	10
PCB-877	EDL	10
PCB-881	EDL	10
PCB-885	EDL	10
PCB-889	EDL	10
PCB-893	EDL	10
PCB-897	EDL	10
PCB-901	EDL	10
PCB-905	EDL	10
PCB-909	EDL	10
PCB-913	EDL	10
PCB-917	EDL	10
PCB-921	EDL	10
PCB-925	EDL	10
PCB-929	EDL	10
PCB-933	EDL	10
PCB-937	EDL	10
PCB-941	EDL	10
PCB-945	EDL	10
PCB-949	EDL	10
PCB-953	EDL	10
PCB-957	EDL	10
PCB-961	EDL	10
PCB-965	EDL	10
PCB-969	EDL	10
PCB-973	EDL	10
PCB-977	EDL	10
PCB-981	EDL	10
PCB-985	EDL	10
PCB-989	EDL	10
PCB-993	EDL	10
PCB-997	EDL	10
PCB-1001	EDL	10

EDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK-LABORATORIES

DIV. OF Y.W. INC.

METHODOLOGY: EPA 824 AND 625

CLIENT: LEA/USNAVY NEWPORT .

DATE: 1/84

DESCRIPTION: 01-08-LDA THROUGH LDE

JOB NO.: G1-6191 NETA

METAL PRIORITY POLLUTANTS CONCENTRATION(UG/L) DETECTION LIMIT (UG/L)

METAL PRIORITY POLLUTANTS	CONCENTRATION(UG/L)	DETECTION LIMIT (UG/L)
ANTIMONY	BDL	50
ARSENIC	BDL	2
BERYLLIUM	BDL	4
CADMIUM	54	4
CHROMIUM	32	20
COPPER	BDL	20
LEAD	350	40
MERCURY	BDL	.2
NICKEL	30	20
SELENIUM	BDL	3
SILVER	BDL	50
THALLIUM	BDL	10
ZINC	BDL	10

MISCELLANEOUS

CYANIDES	55.7	1
PHENOLS	7	1

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES

DIV. OF YJC, INC.

METHODOLOGY: EPA 824 AND 625

CLIENT: LEA/USNAVY NEWPORT

DATE: 1/84

DESCRIPTION: 01-08-LDA THROUGH LDE

JOB NO.: 01-6191 NETA

METAL PRIORITY POLLUTANTS CONCENTRATION (UG/L) DETECTION LIMIT (UG/L)

METAL PRIORITY POLLUTANTS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
ANTIMONY	BDL	50
ARSENIC	BDL	2
BERYLLIUM	BDL	4
CADMIUM	54	4
CHROMIUM	32	20
COPPER	BDL	20
LEAD	380	40
MERCURY	BDL	.2
NICKEL	30	20
SELENIUM	BDL	2
SILVER	BDL	50
THALLIUM	BDL	10
ZINC	BDL	10

MISCELLANEOUS

CYANIDES	58.7	1
PHENOLS	7	1

BDL=BELOW DETECTABLE LIMIT

EPA DESIGNATED PRIORITY POLLUTANTS

YORK LABORATORIES
 DIV. OF Y.W.E. INC.

METHODOLOGY: EPA824

CLIENT: LEA/USNAVY NEWPORT . DATE: 1/84 DESCRIPTION: 01-08-LWA THROUGH LWE
 JOB NO.: 01-8191 NETA

METAL PRIORITY POLLUTANTS CONCENTRATION (UG/L) DETECTION LIMIT (UG/L)
 =====

ANTIMONY	BDL	50
ARSENIC	BDL	2
BERYLLIUM	BDL	4
CADMIUM	58	4
CHROMIUM	23	20
COPPER	BDL	20
LEAD	222	40
MERCURY	BDL	.2
NICKEL	72	20
SELENIUM	BDL	2
SILVER	BDL	50
THALLIUM	BDL	10
ZINC	BDL	10

MISCELLANEOUS

CYANIDES	376	1
PHENOLS	16	1

BDL=BELOW DETECTABLE LIMIT

01-6191-00
 LEA/USN NEWPORT RI LABORATORY RESULTS
 SITE 02 MELVILLE NORTH
ALL RESULTS IN PPB UNLESS OTHERWISE NOTED

<u>Sample ID</u>	<u>PCB's ppm</u>	<u>PET. BASED HC (ppm)</u>	<u>Cr</u>	<u>Cd</u>	<u>Pb</u>	<u>As</u>	<u>Hg</u>	<u>Se</u>	<u>Ag</u>
Composite of Nos.:									
02-01-SL	<0.5	32,508			60,003				
02-02-SL									
02-03-SL									
02-06-MS	0.03		<2500	<500	<1000	<400	<40	<400	<1000
02-05-MS	0.35		<2500	<500	<1000	<400	<40	<400	<1000
02-04-MS	0.08		<2500	<500	<1000	<400	<40	<400	<1000
02-04-SDA	<0.5		4,250	<50	2,250	<200	<20	<200	<500
02-05-SDA	<0.5		9,250	<50	7,499	<200	<20	<200	<500
02-06-SDA	<0.5		5,750	<50	5,750	<200	<20	<200	<500

01-6191-00
 LEA/USN NEWPORT RI LABORATORY RESULTS
 SITE 02 MELVILLE NORTH
ALL RESULTS IN PPB UNLESS OTHERWISE NOTED

<u>Sample ID</u>	<u>Cu</u>	<u>Ba</u>	<u>Ni</u>	<u>Be</u>	<u>Sb</u>	<u>Sn</u>
Composite of Nos.:						
02-01-SL						
02-02-SL						
02-03-SL						
02-06-MS	<2500	<1000	<2500	<500	<1000	<10,000
02-05-MS	<2500	<1000	<2500	<500	<1000	<10,000
02-04-MS	<2500	<1000	<2500	<500	<1000	<10,000
02-04-SDA	4,000	<400	8,250	<50	<500	<5000
02-05-SDA	16,000	<400	10,750	<50	<500	<5000
02-06-SDA	5,500	<400	10,250	<50	<500	<5000

01-6191-00
 LEA/USN NEWPORT RI LABORATORY RESULTS
 SITE 07 TANK FARM NO. 1
ALL RESULTS IN PPB UNLESS OTHERWISE NOTED

<u>Sample ID</u>	<u>Benzene</u>	<u>Toluene</u>	<u>Xylenes</u>	<u>Lead</u>	<u>Pet. Based HC (ppm)</u>	<u>Oil & Grease (ppm)</u>
0703GWDA	18	281	561			
0703GWDB					3.9	
0703GWDC				<40		
0704GWDA	479	735	226			
0704GWDB					2.8	
0704GWDC				<40		
0704GWWA	40	59	26			
0704GWWB					5.5	
0704GWWC				<40		
0703GWWA	160	203	91			
0703GWWB					1.6	
0703GWWC				<40		
0705SL				8,500		2,013
0702SL				27,499		1,321
0701SL				15,250		2,194

01-6191-00
LEA/USN NEWPORT RI LABORATORY RESULTS
SITE 12 TANK FARM 4
ALL RESULTS IN PPB UNLESS OTHERWISE NOTED

<u>Sample ID</u>	<u>Lead</u>	<u>Petroleum Based HC (ppm)</u>	<u>Oil & Grease (ppm)</u>
12-09-SDA	<500	478	
12-09-SWWA		3.6	
12-09-SWWB	<40		
Composite of Nos.:			
12-01-SL	3,250		
12-02-SL			216
12-03-SL			
12-04-SL			
12-05-SL			
12-06-SL			

01-6191-00
 LEA/USN NEWPORT RI LABORATORY RESULTS
 SITE 14 NETC
ALL RESULTS IN PPB UNLESS OTHERWISE NOTED

<u>Sample ID</u>	<u>PCB's ppm</u>	<u>Cr</u>	<u>Cd</u>	<u>Pb</u>	<u>As</u>	<u>Hg</u>	<u>Se</u>	<u>Ag</u>
14-03-SDA	<0.5	15,000	<50	269,971	<200	<20	<200	<500
14-02-SDA	<0.5	17,750	<50	309,950	<200	<20	<200	<500
14-01-SDA	<0.5	8,000	<50	69,982	<200	<20	<200	<500
14-01-MS	0.23	<2500	<500	<1000	<400	<40	<400	<1000
14-03-MS	0.16	<2500	<500	<1000	<400	<40	<400	<1000
14-02-MS	0.17	<2500	<500	<1000	<400	<40	<400	<1000

01-6191-00
LEA/USN NEWPORT RI LABORATORY RESULTS
SITE 14 NETC
ALL RESULTS IN PPB UNLESS OTHERWISE NOTED

<u>Sample ID</u>	<u>Cu</u>	<u>Ba</u>	<u>Ni</u>	<u>Be</u>	<u>Sb</u>	<u>Sn</u>
14-03-SDA	292,470	<400	29,000	<50	<500	<5000
14-02-SDA	241,970	<400	29,250	<50	<500	<5000
14-01-SDA	134,460	<400	14,250	<50	<500	<5000
14-01-MS	7,483	<1000	<2500	<500	<1000	<10,000
14-03-MS	9,462	<1000	<2500	<500	<1000	<10,000
14-02-MS	17,500	<1000	<2500	<500	<1000	<10,000

01-6191-00
LEA/USN NEWPORT RI LABORATORY RESULTS
SITE NO. 17
ALL RESULTS IN PPB UNLESS OTHERWISE NOTED

<u>Sample ID</u>	<u>Cyanide</u>	<u>Cadmium</u>	<u>Chromium</u>	<u>Copper</u>	<u>Lead</u>	<u>Mercury</u>	<u>Nickel</u>	<u>Silver</u>
1702SDA	111	<50	<250	17,373	6,500	<20	<250	<500
1701SDA	121	<50	<250	26,000	<500	<20	<250	<500
1702MS		<500	<2500	26,273	<1000	<40	<2500	<1000
1701MS		<500	<2500	6,022	<1000	<40	<2500	<1000



YORK LABORATORIES DIVISION

CERTIFIED REPORT TRANSMITTAL

REPORT NUMBER 61910-000
DATE December 3, 1984

CLIENT LOUREIRO ENGINEERING ASSOCIATES
 10 Tower Lane, Avon Park South
 Avon, Connecticut 06001

ATTENTION Mr. Charles Jaworski, P.E.

The above referenced report is enclosed. Copies of this report and supporting data will be retained in our files in the event they are required for future reference.

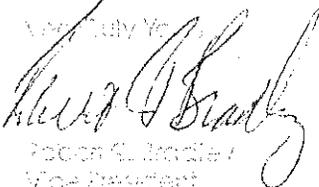
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- Microbiological Analyses
- Mass Spectrometry Services

Very Truly Yours,



Robert G. Bradley
Vice President

December 3, 1984

61910-000
LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane
Avon Park South
Avon, Connecticut 06001

Attention: Mr. Charles Jaworski, P.E.

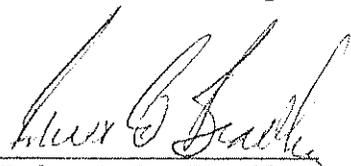
PURPOSE AND RESULTS

Various samples from the U.S. Navy Naval Education and Training Center in Newport, Rhode Island were submitted to York Laboratories Division of YWC, Inc. for analysis on September 13, 1984. The analyses involved heavy metals and other conventional parameters on various matrices.

The results of the analyses are shown in the following tables.

Attached as Appendix A are copies of the Field Custody Sheets.

Prepared By:


Robert Q. Bradley
Vice President

RQB:cg

TABLE 1
61910-000
LEA/U.S. NAVY
WATERS FROM TANK BOTTOMS
SEPTEMBER 12, 1984

(All Results Listed in mg/l)

<u>Sample Identification</u>	<u>pH</u>	<u>Lead</u>	<u>Total Suspended Solids</u>	<u>Ammonia- Nitrogen</u>	<u>Biochemical Oxygen Demand (5 Day)</u>	<u>Petroleum Based Hydrocarbons</u>
12-13-TK 12-13-TK	7.85	<0.04	7.2	0.74	3	7.3
12-15-TK 12-15-TK	7.60	<0.04	25.6	0.89	12	4.0
12-12-TK 12-12-TK	7.17	<0.04	79.2	0.76	46	7.5
12-14-TK 12-14-TK	7.40	<0.04	99.6	0.48	20	14.2
12-16-TK 12-16-TK	7.50	<0.04	29.2	0.67	17	21.9
12-17-TK 12-17-TK	7.60	<0.04	37.6	0.48	7	36.7

TABLE 2
61910-000
LEA/U.S. NAVY
SEDIMENTS (EP LEACHATES)
SEPTEMBER 11, 1984

E.P. Toxicity Leachate

(All Results in mg/l)

<u>Sample Identification</u>	<u>Lead</u>	<u>Copper</u>	<u>Chromium</u>	<u>Nickel</u>
01-20-SD	<0.2	<0.20	<0.10	<0.20
01-18-SD	<0.2	<0.20	<0.10	0.20
01-15-SD	<0.2	<0.20	<0.10	<0.20
01-16-SD	<0.2	<0.20	<0.10	0.35
01-19-SD	<0.2	<0.20	<0.10	0.35
01-17-SD	<0.2	<0.20	<0.10	0.71
01-17-SD (Duplicate)	<0.2	<0.20	<0.10	0.66
01-14-SD	<0.2	<0.20	<0.10	<0.20
14-08-SD	<0.2	<0.20	<0.10	<0.20
14-10-SD	<0.2	<0.20	<0.10	<0.20
14-07-SD	<0.2	<0.20	<0.10	<0.20
14-09-SD	<0.2	<0.20	<0.10	0.90
14-06-SD	<0.2	<0.20	<0.10	<0.20
14-06-SD (Duplicate)	<0.2	<0.20	<0.10	<0.20
14-04-SD	<0.2	<0.20	<0.10	0.30
14-05-SD	<0.2	<0.20	<0.10	<0.20

TABLE 3
61910-000
LEA/U.S. NAVY
SEDIMENTS
TOTAL METALS AND TOTAL CYANIDE
SEPTEMBER 11, 1984

Total Metals and Total Cyanide
Results in ug/g on Dried Basis

<u>Sample Identification</u>	<u>Lead</u>	<u>Copper</u>	<u>Chromium</u>	<u>Nickel</u>	<u>Cyanide</u>	<u>% Moisture</u>
01-20-SD	32.3	16.6	14.3	14.2	<0.005	72.70
01-18-SD	34.9	22.8	17.1	16.9	<0.005	69.96
01-15-SD	78.2	63.4	14.3	20.3	<0.005	67.62
01-16-SD	44.0	33.2	12.7	17.2	<0.005	62.27
01-19-SD	33.6	25.4	14.8	17.8	<0.005	68.46
01-17-SD	21.5	20.8	8.7	11.5	<0.005	70.24
01-17-SD (Duplicate)	30.8	27.9	12.5	14.2	--	--
01-14-SD	267	890	22.0	86.6	<0.005	74.98
01-14-SD (Duplicate)	--	--	--	--	<0.005	--
14-08-SD	27.2	19.8	11.1	10.1	<0.005	64.23
14-10-SD	20.9	13.4	15.4	9.7	<0.005	65.69
14-07-SD	14.8	8.8	9.2	7.7	<0.005	72.45
14-09-SD	17.3	11.9	9.7	7.9	<0.005	55.41
14-06-SD	28.4	19.8	10.8	10.4	<0.005	64.16
14-06-SD (Duplicate)	25.4	15.1	9.0	8.3	--	--
14-04-SD	15.2	14.1	5.3	8.3	<0.005	76.77
14-05-SD	163	136	11.7	29.2	<0.005	74.44
14-05-SD (Duplicate)	--	--	--	--	<0.005	--

TABLE 4
 61910-000
 LEA/U.S. NAVY
 METALS IN MUSSELS (DRY TISSUE BASIS)
 SEPTEMBER 11 - 12, 1984

All Results in ug/g (ppm)

<u>LEA Desig.</u>	<u>Lead</u>	<u>Copper</u>	<u>Chromium</u>	<u>Nickel</u>	<u>% Solids</u>
01-14-MS	19.7	14.1	1.4	4.4	19.2
01-13-MS	7.5	9.2	1.0	4.0	21.3
01-12-MS	19.9	20.6	3.5	6.6	23.6
14-04-MS	17.9	14.2	3.4	10.1	16.3
14-05-MS	13.2	11.7	1.7	4.7	20.8
17-02-MS	5.0	6.6	1.0	3.9	17.4
N1-01-MS	4.9	6.8	1.1	4.9	19.0
N2-01-MS	3.8	8.2	2.8	5.1	21.0
N2-01-MS*	5.2	5.4	1.4	4.9	21.0

*Duplicate

TABLE 5
61910-000
LEA/U.S. NAVY
FINGERPRINTING OF OILS
SEPTEMBER 12, 1984

Sample
Identification

Results

07-01-SLA

07-02-SLA

07-05-SLA

Gas chromatographic scans indicated that the samples contain a weathered petroleum based oil with a pattern similar to a No. 6 Bunker C Fuel.



YORK LABORATORIES DIVISION

CERTIFIED REPORT TRANSMITTAL

REPORT NUMBER 61910-000

DATE January 25, 1985

CLIENT LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane, Avon Park South
Avon, CT 06001

ATTENTION Mr. Charles Jaworski, P.E.

The above referenced report is enclosed. Copies of this report, including originals, will be retained in our files in the event they are required for future reference.

If there are any questions concerning this report, please do not hesitate to contact us.

Any samples submitted to our Laboratory will be retained for a maximum of ninety (90) days from receipt of this report, unless other arrangements are desired.

Naturally, as in the past, our staff will be pleased to make available to you any information you may have. In addition to the service provided, we also provide for you:

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- Metallurgical Analyses
- Microbiological Analyses
- Mass Spectrometry Services

Very truly yours,

Robert G. Bradley
Vice President

January 15, 1985

61910-000
LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane
Avon Park South
Avon, Connecticut 06001

Attention: Mr. Charles Jaworski, P.E.

PURPOSE AND RESULTS

Various samples from the U.S. Navy Naval Education and Training Center in Newport, Rhode Island were submitted to York Laboratories Division of YWC, Inc. for analysis on November 21, 1984. The analyses involved heavy metals and other conventional parameters on groundwater samples.

Attached as Appendix A are copies of the Field Custody Sheets.

Prepared by: *Daniel F. Ott*
Daniel F. Ott
Laboratory Manager

Approved by: *Jeffrey C. Curran*
Jeffrey C. Curran
Chief Chemist

DFO/JCC/mz
Attachments

Table 1.0
61910-000
LEA/U.S. NAVY-NEWPORT

Samples 11/21/84

Tank Farm One
Site 07

<u>Sample I.D.</u>	<u>Petroleum Hydrocarbons mg/l (ppm)</u>	<u>Benzene ug/l (ppb)</u>	<u>Toluene ug/l (ppb)</u>	<u>Xylene ug/l (ppb)</u>	<u>Finger-print</u>
07-07-GWA 1184	<1.0	--	--	--	--
07-07-GWB 1184	--	<10	<10	<10	*
07-06-GWB 1184	<1.0	--	--	--	--
07-06-GWB 1184	--	<10	<10	<10	*
07-08-SPA 1184	8.6	--	--	--	--
07-08-SPB 1184	--	20	120	80	**
07-04-GWA 1184	<1.0	--	--	--	--
07-04-GWB 1184		150	160	28	**

*Insufficient levels to fingerprint.

**Gas Chromatographic scans indicated that the sample contained a series of hydrocarbons with a pattern similar to weathered gasoline. The hydrocarbons present were in the C₈ to C₁₃ range which indicate a weathered gasoline product.

Table 2.0
61910-000
LEA/U.S. NAVY-NEWPORT

Samples 11/20/84

Tank Farm Four
Site 12

<u>Sample Identification</u>	<u>Petroelum Hydrocarbons mg/l (ppm)</u>	<u>Lead mg/l (ppm)</u>
12-11-GWA-1184	1.9	--
12-11 GWB 1184	--	0.06
12-10-GWA 1184	<1.0	--
12-10-GWB 1184	--	0.04

TABLE 3.0
61910-000
LEA/U.S. NAVY - NEWPORT

SAMPLES
11/20/84

McAllister Point Landfill
Site 01

<u>Sample Identification</u>	<u>Cyanide mg/l (ppm)</u>	<u>Lead mg/l (ppm)</u>	<u>Copper mg/l (ppm)</u>	<u>Chromium mg/l (ppm)</u>	<u>Nickel mg/l (ppm)</u>	<u>pH</u>	<u>Chloride mg/l (ppm)</u>
01-22-GWA 1184	0.006	--	--	--	--	--	--
01-22-GWB 1184	--	1.0	1.04	0.11	0.19	--	--
01-22-GWC 1184	--	--	--	--	--	6.43	2.2
01-21-GWA 1184	0.006	--	--	--	--	--	--
01-21-GWB 1184	--	0.8	0.73	0.17	0.25	--	--
01-21-GWC 1184	--	--	--	--	--	6.82	3.3
01-23-GWA 1184	0.005	--	--	--	--	--	--
01-23-GWB 1184	--	0.1	0.06	0.09	0.19	--	--
01-23-GWC 1184	--	--	--	--	--	5.95	3.8



YORK LABORATORIES DIVISION

CERTIFIED REPORT TRANSMITTAL

REPORT NUMBER 61910-000

DATE January 25, 1985

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10 Tower Lane, Avon Park South
Avon, CT 06001

ATTENTION Mr. Charles Jaworski, P.E.

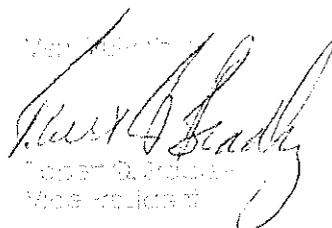
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- Mass Spectrometry Services

Very truly yours,

Peter G. Beady
Vice President

January 15, 1985

61910-000
LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane
Avon Park South
Avon, Connecticut 06001

Attention: Mr. Charles Jaworski, P.E.

PURPOSE AND RESULTS

Various samples from the U.S. Navy Naval Education and Training Center in Newport, Rhode Island were submitted to York Laboratories Division of YWC, Inc. for analysis on December 18, 1984.

The result of the analyses are shown in the following tables.

Attached as Appendix A are copies of the Field Custody Sheets.

Prepared by: Daniel F. Ott
Daniel F. Ott
Laboratory Manager

Approved by: Jeffrey C. Curran
Jeffrey C. Curran
Chief Chemist

DFO/JCC/mz
Attachments

TABLE 1.0
61910-000
LEA/U.S. NAVY

GROUNDWATER
12/17/84

Tank Farm One
Site 07

<u>Sample Identification</u>	<u>Benzene ug/l (ppb)</u>	<u>Toluene ug/l (ppb)</u>	<u>Xylenes ug/l (ppb)</u>	<u>Hydrocarbon Fingerprint</u>
07-06-GWB 1284	<10	<10	<10	Insufficient Levels to Fingerprint
07-06-GWC 1284				
07-07-GWB 1284	<10	<10	<10	Insufficient Levels to Fingerprint
07-07-GWC 1284				
07-08-SPB 1284	30	110	74	*
07-08-SPC 1284				
07-04-GWB 1284	140	190	39	*
07-04-GWC 1284				

*Gas Chromatographic Scans indicated these samples contain a weathered hydrocarbon with a pattern similar to gasoline.

A preponderance of C₈ through C₁₃ hydrocarbons was present which is indicative of a weathered gasoline.

Samples labeled GWB and SPB were used for screening.

Samples labeled GWC and SPC were used for analysis of BTX and Hydrocarbon Fingerprint.

TABLE 2.0
61910-000
LEA/U.S. NAVY

GROUNDWATER
12/17/84

Tank Farm One
Site 07

<u>Sample</u> <u>Identification</u>	<u>Petroleum Based Hydrocarbons</u> <u>mg/l (ppm)</u>
07-06-GWA 1284	6.3
07-07-GWA 1284	3.8
07-08-SPA 1284	5.0
07-04-GWA 1284	2.6

TABLE 3.0
61910-000
LEA/U.S. NAVY

GROUNDWATER
12/17/84

Tank Farm Four
Site 12

<u>Sample Identification</u>	<u>Lead</u> <u>mg/l (ppm)</u>	<u>Petroleum Based</u> <u>Hydrocarbons mg/l (ppm)</u>
12-10-GWA-1284	--	3.3
12-10-GWB-1284	<0.04	--
12-11-GWA-1284	--	12.3
12-11-GWB-1284	<0.04	--

TABLE 4.0
61910-000
LEA/U.S. NAVY

GROUNDWATER
12/17/84 and 12/18/84

McAllister Point Landfill
Site 01

<u>Sample Identification</u>	<u>Cyanide mg/l (ppm)</u>	<u>Lead mg/l (ppm)</u>	<u>Copper mg/l (ppm)</u>	<u>Chromium mg/l (ppm)</u>	<u>Nickel mg/l (ppm)</u>	<u>pH</u>	<u>Chloride mg/l (ppm)</u>
01-23-GWA 1284	<0.005	--	--	--	--	--	--
01-23-GWB 1284	--	0.08	0.06	0.05	0.08	--	--
01-23-GWC 1284	--	--	--	--	--	5.84	1.6
01-22-GWA 1284	0.006	--	--	--	--	--	--
01-22-GWB 1284	--	0.76	0.59	0.07	0.10	--	--
01-22-GWC 1284	--	--	--	--	--	6.57	1.3
01-21-GWA 1284	<0.005	--	--	--	--	--	--
01-21-GWB 1284	--	0.34	0.22	0.04	0.06	--	--
01-21-GWC 1284	--	--	--	--	--	7.01	340



YORK LABORATORIES DIVISION

CERTIFIED REPORT TRANSMITTAL

REPORT NUMBER 61910-000

DATE February 13, 1985

CLIENT LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane, Avon Park South
Avon, CT 06001

ATTENTION Mr. Charles Jaworski, P.E.

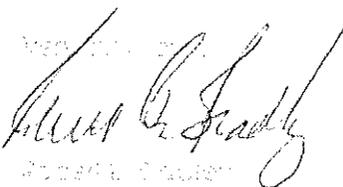
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- Water and Wastewater Analysis
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- Microbiological Analyses
- Mass Spectrometry Services

Very truly yours,

Robert G. Gandy
Vice President

February 13, 1985

61910-000
LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane
Avon Park South
Avon, Connecticut 06001

Attention: Mr. Charles Jaworski, P.E.

PURPOSE AND RESULTS

Various samples from the U.S. Navy Naval Education and Training Center in Newport, Rhode Island were submitted to York Laboratories Division of YWC, Inc. for analysis on January 9, 1985. The samples were prepared and analyzed in accordance with Standard Methods for the Examination of Water and Wastewater, 15th Edition, 1980, and EPA Methods 624, 625.1 and 608. The results are listed on the following tables.

Attached as Appendix A are copies of the Field Custody Sheets.

Prepared by: Daniel F. Ott
Daniel F. Ott
Laboratory Manager

Approved by: Jeffrey C. Curran
Jeffrey C. Curran
Chief Chemist

DFO/JCC/mz
Attachments

TABLE 1.0
61910-000
LEA/U.S. NAVY-NEWPORT

Samples 1/07/85

Tank Farm One
Site 07

<u>Sample I.D.</u>	<u>Petroleum Hydrocarbons</u> <u>mg/l (ppm)</u>	<u>Benzene</u> <u>ug/l (ppb)</u>	<u>Toluene</u> <u>ug/l (ppb)</u>	<u>Xylene</u> <u>ug/l (ppb)</u>	<u>Finger- print</u>
07-06-GWA 010785	2.1	--	--	--	--
07-06-GWB 010785	--	<10	<10	<10	*
07-07-GWA 010785	3.1	--	--	--	--
07-07-GWB 010785	--	<10	<10	<10	*
07-08-GWA 010785	3.3	--	--	--	--
07-08-GWB 010785	--	<10	<10	<10	*
07-04-GWA 010785	<1.0	--	--	--	--
07-04-GWB 010785	--	167	198	351	**

*Insufficient levels to fingerprint.

**Gas Chromatographic scans indicated that the sample contained a series of hydrocarbons with a pattern similar to weathered gasoline. The hydrocarbons present were in the C₈ to C₁₃ range which indicate a weathered gasoline product.

TABLE 2.0
61910-000
LEA/U.S. NAVY NEWPORT

Samples 1/07/85 and 1/08/85

McAllister Point Landfill
Site 01

All results are reported in ug/l (ppb).

Sample Identification

<u>Parameter</u>	<u>Station 23</u>	<u>Station 21</u>	<u>Station 22</u>
Antimony	<100	<100	<100
Arsenic	<2	<2	<2
Beryllium	<10	<10	<10
Cadmium	<4	<4	<4
Chromium	<20	<20	40
Copper	<40	72	158
Lead	<40	<40	140
Mercury	0.8	0.7	<0.2
Nickel	<40	<40	<40
Selenium	<2	<2	<2
Silver	<40	<40	<40
Thallium	<100	<100	<100
Zinc	82	200	500
Cyanide	<5	8	13
Phenols	7	21	13
Chloride	2,760	795,000	50,400
pH	5.87	6.98	6.49

TABLE 3.0
61910-000
LEA/U.S. NAVY-NEWPORT
VOLATILE PRIORITY POLLUTANTS

Samples 1/07/85 and 1/08/85

McAllister Point Landfill
Site 01

All results are reported in ug/l (ppb).

<u>Compound</u>	<u>Sample Identification</u>		
	<u>Station 23</u>	<u>Station 21</u>	<u>Station 22</u>
chloromethane	<10	<10	<10
bromomethane	<10	<10	<10
vinyl chloride	<10	<10	<10
chloroethane	<10	<10	<10
methylene chloride	<10	<10	<10
trichlorofluoromethane	<10	<10	<10
acrolein	<100	<100	<100
acrylonitrile	<100	<100	<100
1,1-dichloroethene	<10	<10	<10
1,1-dichloroethane	<10	<10	<10
trans-1,2-dichloroethene	<10	<10	<10
chloroform	<10	<10	<10
1,2-dichloroethane	<10	<10	<10
1,1,1-trichloroethane	<10	<10	<10
carbon tetrachloride	<10	<10	<10
bromodichloromethane	<10	<10	<10
2-chloroethylvinyl ether	<10	<10	<10
1,2-dichloropropane	<10	<10	<10
trans-1,3-dichloropropene	<10	<10	<10
trichloroethylene	<10	<10	<10
benzene	<10	<10	<10
cis-1,3-dichloropropene	<10	<10	<10
dibromochloromethane	<10	<10	<10
1,1,2-trichloroethane	<10	<10	<10
bromoform	<10	<10	<10
tetrachloroethylene	<10	<10	<10
1,1,2,2-tetrachloroethane	<10	<10	<10
toluene	<10	<10	<10
chlorobenzene	<10	<10	<10
ethyl benzene	<10	<10	<10

TABLE 4.0
61910-000
LEA/U.S. NAVY NEWPORT
BASE/NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS

Samples 1/07/85 and 1/08/85
McAllister Point Landfill
Site 01

All results are reported in ug/l (ppb).

<u>Compound</u>	<u>Sample Identification</u>		
	<u>Station 23</u>	<u>Station 21</u>	<u>Station 22</u>
n-nitrosodimethyl amine	<10	<10	<10
bis (2-chloroethyl) ether	<10	<10	<10
1,3-dichlorobenzene	<10	<10	<10
1,4-dichlorobenzene	<10	<10	<10
1,2-dichlorobenzene	<10	<10	<10
bis (2-chloroisopropyl) ether	<10	<10	<10
hexachloroethane	<10	<10	<10
n-nitroso-di-n propylamine	<10	<10	<10
nitrobenzene	<10	<10	<10
isophorone	<10	<10	<10
bis (2-chloroethoxy) methane	<10	<10	<10
1,2,4-trichlorobenzene	<10	<10	<10
naphthalene	<10	<10	<10
hexachlorobutadiene	<10	<10	<10
hexachlorocyclopentadiene	<10	<10	<10
2-chloronaphthalene	<10	<10	<10
dimethyl phthalate	<10	<10	<10
acenaphthylene	<10	<10	<10
2,6-dinitrotoluene	<10	<10	<10
acenaphthene	<10	<10	<10
2,4-dinitrotoluene	<10	<10	<10
diethyl phthalate	<10	<10	<10
fluorene	<10	<10	<10
4-chlorophenyl-phenyl ether	<10	<10	<10
4-bromophenyl phenyl ether	<10	<10	<10
hexachlorobenzene	<10	<10	<10
phenanthrene	<10	<10	<10
anthracene	<10	<10	<10
di-n-butyl phthalate	<10	<10	<10
fluoranthene	<10	<10	<10
benzidine	<10	<10	<10
pyrene	<10	<10	<10
butyl benzyl phthalate	366	<10	<10
3,3'dichlorobenzidine	<10	<10	<10
chrysene	<10	<10	<10
benzo (a) anthracene	<10	<10	<10
bis (2-ethyl hexyl) phthalate	931	17	64
di-n-octyl phthalate	553	19	62
benzo (b) fluoranthene	<10	<10	<10
benzo (k) fluoranthene	<10	<10	<10
benzo (a) pyrene	<10	<10	<10
benzo (g,h,i) perylene	<10	<10	<10
dibenzo (a,h) anthracene	<10	<10	<10
Indeno (1,2,3,c,d) pyrene	<10	<10	<10
n-nitrosodiphenylamine	<10	<10	<10

TABLE 5.0
61910-000
LEA/U.S. NAVY NEWPORT
ACID EXTRACTABLE PRIORITY POLLUTANTS

Samples 1/07/85 and 1/08/85

McAllister Point Landfill
Site 01

All results are reported in ug/l (ppb).

Sample Identification

<u>Compound</u>	<u>Station 23</u>	<u>Station 21</u>	<u>Station 22</u>
phenol	<25	<25	<25
2-chlorophenol	<25	<25	<25
2-nitrophenol	<25	<25	<25
2,4-dimethylphenol	<25	<25	<25
2,4-dichlorophenol	<25	<25	<25
4-chloro-3-methyl phenol	<25	<25	<25
2,4,6-trichlorophenol	<25	<25	<25
2,4-dinitrophenol	<250	<250	<250
4-nitrophenol	<25	<25	<25
2-methyl-4,6-dinitrophenol	<250	<250	<250
pentachlorophenol	<25	<25	<25

TABLE 6.0
61910-000
LEA/U.S. NAVY NEWPORT
PESTICIDES AND PCB'S

Samples 1/07/85 and 1/08/85

McAllister Point Landfill
Site 01

All results are reported in ug/l (ppb).

Sample Identification

<u>Compound</u>	<u>Station 23</u>	<u>Station 21</u>	<u>Station 22</u>
alpha BHC	<0.005	<0.005	<0.005
beta BHC	<0.005	<0.005	<0.005
gamma BHC	<0.005	<0.005	<0.005
delta BHC	<0.005	<0.005	<0.005
Heptachlor	<0.01	<0.005	<0.005
Aldrin	<0.005	0.015	0.015
4,4' DDE	<0.005	<0.005	<0.005
Dieldrin	<0.005	<0.005	<0.005
4,4' DDD	<0.025	<0.005	<0.005
Endrin Aldehyde	<0.01	<0.01	<0.01
4,4' DDT	<0.025	<0.025	<0.025
Chlordane	<0.02	<0.02	<0.02
Endosulfan I	<0.01	<0.01	<0.01
Endosulfan II	<0.005	<0.005	<0.005
Endosulfan Sulfate	<0.025	<0.025	<0.025
Endrin	<0.005	<0.005	<0.005
Heptachlor Epoxide	<0.025	<0.025	<0.025
Toxaphene	<0.2	<0.2	<0.2
PCB - 1016	<0.2	<0.2	<0.2
PCB - 1221	<0.2	<0.2	<0.2
PCB - 1232	<0.2	<0.2	<0.2
PCB - 1242	<0.2	<0.2	<0.2
PCB - 1248	<0.2	<0.2	<0.2
PCB - 1254	<0.2	<0.2	<0.2
PCB - 1260	<0.2	<0.2	<0.2

TABLE 7.0
61910-000
LEA/U.S. NAVY-NEWPORT

Samples - 01/07/85

Tank Farm Four
Site 12

<u>Sample</u> <u>Identification</u>	<u>Petroleum</u> <u>Hydrocarbons</u> <u>mg/l (ppm)</u>	<u>Lead</u> <u>mg/l (ppm)</u>
12-10-GWA-010785	2.7	---
12-10-GWB-010785	---	<0.04
12-11-GWA-010785	3.6	---
12-11-GWB-010785	---	0.10



YORK LABORATORIES DIVISION

CERTIFIED REPORT TRANSMITTAL

REPORT NUMBER 61910-000

DATE February 13, 1985

CLIENT LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane
Avon Park South
Avon, CT 06001

ATTENTION Mr. Charles Jaworski, P.E.

The above referenced report is enclosed. Copies of this report and supporting data will be retained in our files in the event they are required for future reference.

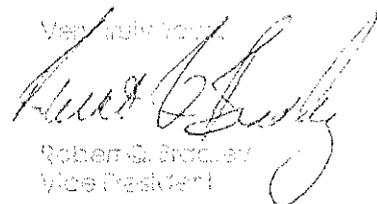
If there are any questions concerning this report, please do not hesitate to contact us.

Any samples submitted to our Laboratory will be retained for a maximum of thirty (30) days from receipt of this report, unless other arrangements are desired.

Naturally, as in the past, our staff will be pleased to quote on any other measurements you may have. In addition to the service provided, we also offer the following:

- Hazardous Waste Analyses
- Product Evaluation/R&D
- Water and Wastewater Analyses
- Air and Process Gas Analyses
- Industrial Hygiene Surveys
- Metallurgical Analyses
- Microbiological Analyses
- Mass Spectrometry Services

Very truly yours,



Robert G. Broderick
Vice President

February 13, 1985

61910-000
LOUREIRO ENGINEERING ASSOCIATES
10 Tower Lane
Avon Park South
Avon, Connecticut 06001

Attention: Mr. Charles Jaworski, P.E.

PURPOSE AND RESULTS

Various samples from the U.S. Navy Naval Education and Training Center in Newport, Rhode Island were submitted to York Laboratories Division of YWC, Inc. for analysis on January 30, 1985. The samples were prepared and analyzed in accordance with Standard Methods for the Examination of Water and Wastewater, 15th Edition, 1980 and EPA Method 624.

Attached as Appendix A are copies of the Field Custody Sheets.

Prepared by: Daniel F. Ott
Daniel F. Ott
Laboratory Manager

Approved by: Jeffrey C. Curran
Jeffrey C. Curran
Chief Chemist

DFO/JCC/mz
Attachments

Table 1.0
61910-000
LEA/U.S. NAVY-NEWPORT

Samples 1/28/85

Tank Farm One
Site 07

<u>Sample I.D.</u>	<u>Petroleum Hydrocarbons mg/l (ppm)</u>	<u>Benzene ug/l (ppb)</u>	<u>Toluene ug/l (ppb)</u>	<u>Xylene ug/l (ppb)</u>	<u>Finger-print</u>
07-08-SPA-0185B	<1.0	--	--	--	--
07-08-SPB-0185B	--	10	<10	22	*
07-04-GWA-0185B	<1.0	--	--	--	--
07-04-GWB-0185B	--	88	65	520	**
07-07-GWA-0185B	<1.0	--	--	--	--
07-07-GWB-0185B	--	<10	<10	<10	*
07-06-GWA-0185B	<1.0	--	--	--	--
07-06-GWB-0185B	--	<10	<10	<10	*

*Insufficient levels to fingerprint.

**Gas Chromatographic scans indicated that the sample contained a series of hydrocarbons with a pattern similar to weathered gasoline. The hydrocarbons present were in the C₈ to C₁₃ range which indicate a weathered gasoline product.

TABLE 2.0
61910-000
LEA/U.S. NAVY - NEWPORT

Samples 1/28/85

Tank Farm Four
Site 12

<u>Sample Identification</u>	<u>Lead</u> <u>mg/l (ppm)</u>	<u>Petroleum Based</u> <u>Hydrocarbons mg/l (ppm)</u>
12-10-GWA-0185B	--	<1.0
12-10-GWB-0185B	<0.04	--
12-11-GWA-0185B	--	2.3
12-11-GWB-0185B	<0.04	--

TABLE 3.0
61910-000
LEA/U.S. NAVY

Samples - 1/28/85

McAllister Point Landfill
Site 01

<u>Sample Identification</u>	<u>Cyanide mg/l (ppm)</u>	<u>Lead mg/l (ppm)</u>	<u>Copper mg/l (ppm)</u>	<u>Chromium mg/l (ppm)</u>	<u>Nickel mg/l (ppm)</u>	<u>pH</u>	<u>Chloride mg/l (ppm)</u>
01-23-GWA 0185B	0.009	--	--	--	--	--	--
01-23-GWB 0185B	--	<0.04	0.11	0.04	0.07	--	--
01-23-GWC 0185B	--	--	--	--	--	6.18	3.6
01-22-GWA 0185B	<0.005	--	--	--	--	--	--
01-22-GWB 0185B	--	0.7	0.55	0.07	0.12	--	--
01-22-GWC 0185B	--	--	--	--	--	6.54	108
01-21-GWA 0185B	<0.005	--	--	--	--	--	--
01-21-GWB 0185B	--	1.58	0.95	0.22	0.30	--	--
01-21-GWC 0185B	--	--	--	--	--	6.41	624

APPENDIX D

WELL DRILLER'S LOGS
and
MONITORING WELL DETAILS

"BORING LOG"

PROJ. Newport, RI Landfill

CLIENT LOUREIRO ENGINEERING

BORING NO. B-10 SITE NO. 12

LINE & STA. _____
OFFSET _____
GR. ELEV. _____

BORING NO. B-11 SITE NO. 12

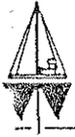
LINE & STA. _____
OFFSET _____
GR. ELEV. _____

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
0.5	TOP SOIL		
3.0	br. fine-crs. sand, some fine-crs. gravel		
	gr/br. silt, fine sand, some weathered shalestone, gr. fine-crs. sand layers	26-30-36	
		26-60/6"	
13.0			
	gr/br. silt, some fine-med. sand, some fine gravel	31-37-35	
17.0			
	gr. silt, some fine sand, some fine gravel		
25.0			
	BOTTOM OF BORING 25.0 WATER AT 11' @ 0 hrs.		
	2" WELL INSTALLED @	25'	
	10' wrapped screen 16' riser sandpack bentonite seal protector & cement		
	DATE: 9/12/84 DRILLER: FAULKNER		

A	STRATUM DESCRIPTION	BLOWS PER 6"	B
1.0	**		
	drk. br. fine-crs. sand silt, tr. fine-crs. gravel		
4.0			
	br. & gr. silt, with layers fine-med. sand tr. crs. gravel	27-60/6"	
		19-27-47	
		60/3"	
17.0			
	gr. silt, with very fine sand layers, tr. clay layers		
31.5		8-12-19*	
	**gr/br. fine-crs. sand, shalestone, boulders, fill	*300#	
	BOTTOM OF BORING 31.5' WATER AT LOW TIDE @ 15'		
	2" WELL INSTALLED @	30'	
	10' wrapped screen 20' riser sandpack bentonite seal protector & cement		

- COL. A strata depth
- COL. B _____
- HAMMER = 140#, FALL 30"
- SAMPLER = _____ O.D. SPLIT SPOON
- GWT = GROUND WATER

DATE: 9/12/84
DRILLER: FAULKNER
AND - 40 to 50%
SOME - 10 to 40%
TRACE - 0 to 10%



CLARENCE WELTY ASSOCIATES INC.

DRILLING TEST BORINGS * ROCK EXPLORATION
CONTRACTORS: WATER EXPLORATION * SOIL & ROCK ANCHORS



USN, NETC - Confirmation Study on Hazardous Waste Sites

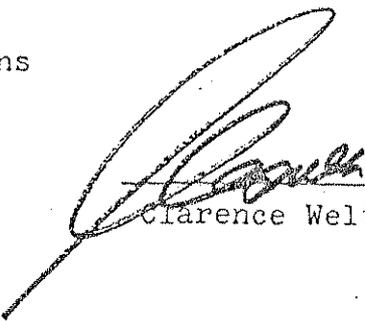
at Newport, R.I.

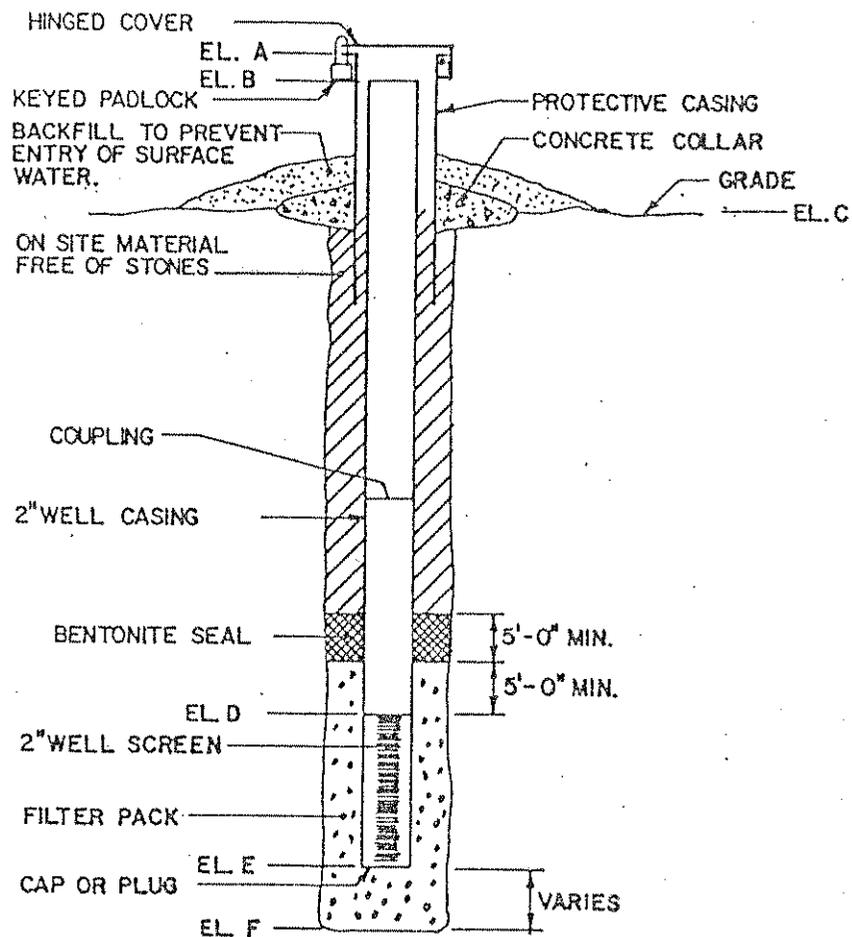
September 14, 1984

The development of the 7 wells was accomplished by ejecting water from the wells with a compressed air line to the bottom of the well. Well recoveries were approximately as follows:

<u>Site & Station</u>	<u>Recovery (2"± D. well)</u>
01 - B21	20
01 - B22	50
01 - B23	60
07 - B06	40
07 - B07	55
12 - B10	35
12 - B11	35

* 10' of pipe = 1.6 gallons


Clarence Welty, PhD, P.E.



SITE NO.	01			07		12	
	21	22	23	06	07	10	11
EL. A	28.43	18.30	40.57	27.55	23.25	22.32	19.63
EL. B	28.15	17.84	40.35	27.08	22.99	22.07	18.79
EL. C	26.9	15.8	39.9	27.0	22.1	20.8	19.1
EL. D	(-)1.05	0.84	10.35	(-)7.92	2.99	6.07	(-)1.21
EL. E	(-)10.85	(-)9.16	0.35	(-)17.92	(-) 7.01	(-) 3.93	(-)11.21
EL. F	(-)16.1	(-)14.5	(-)0.1	(-)18.	(-) 7.9	(-) 4.2	(-)12.4
DEPTH (FT)	43.0'	30.3'	40.0'	45.0'	30.0'	25.0'	31.5'
CASING (FT)	30.0'	17.0'	30.0'	35.0'	20.0'	16.0'	20.0'
SCREEN (FT)	*10.0'	10.0'	10.0'	* 10.0'	10.0'	*10.0'	*10.0'

NOTE: ELEVATIONS ARE MLW

* THE SCREENS IN THESE WELLS WERE ENVELOPED IN NON-WOVEN FILTER FABRIC

CONFIRMATION STUDY
ON HAZARDOUS WASTE SITES
NEWPORT NAVAL EDUCATION &
TRAINING CENTER

MONITORING WELL DETAILS



York Waste Water Consultants, Inc.
Stamford, Connecticut



LOUREIRO ENGINEERING ASSOCIATES

a professional corporation

CONSULTING ENGINEERS

AVON, CT.

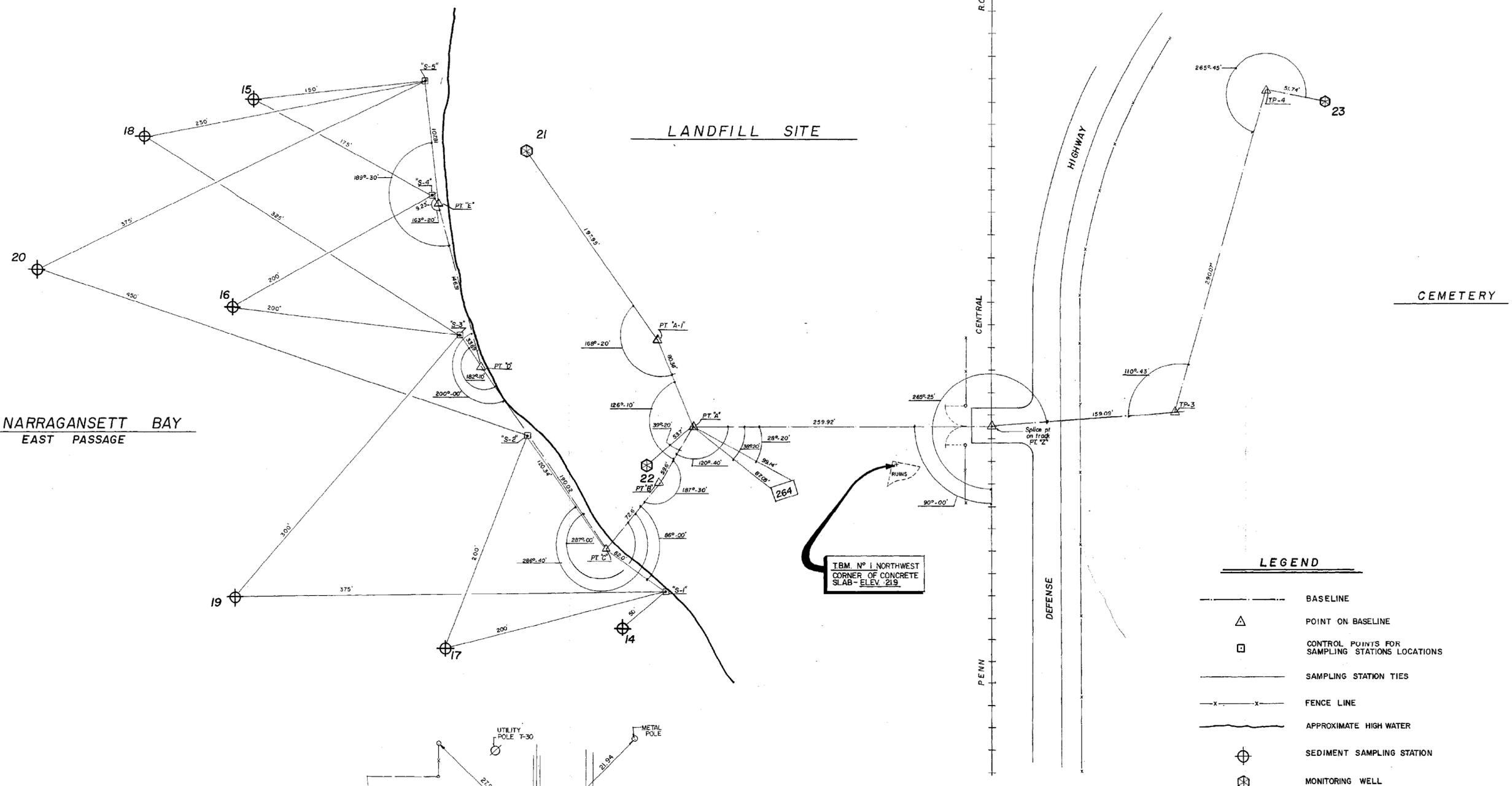
MARCH 13, 1985
REVISED - JULY 1985

DWG. NO. D-1

APPENDIX E

LOCATION PLAN - SAMPLING STATIONS

SITE 01 - McALLISTER POINT LANDFILL



NARRAGANSETT BAY
EAST PASSAGE

LANDFILL SITE

CEMETERY

ROW

CENTRAL

PENN

DEFENSE

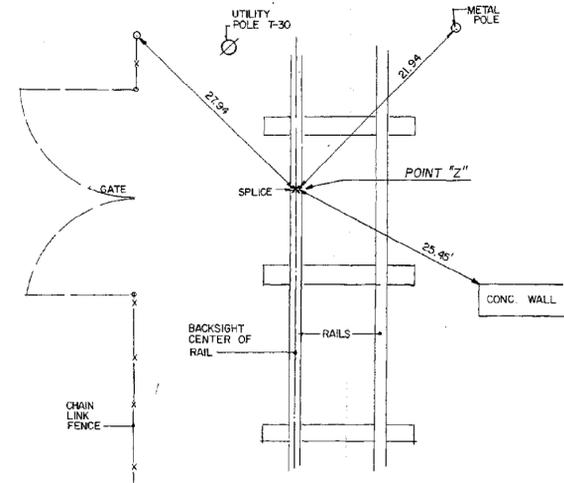
HIGHWAY

LEGEND

- — — — — BASELINE
- △ POINT ON BASELINE
- CONTROL POINTS FOR SAMPLING STATIONS LOCATIONS
- — — — — SAMPLING STATION TIES
- x-x-x-x- FENCE LINE
- ~ ~ ~ ~ ~ APPROXIMATE HIGH WATER
- ⊕ SEDIMENT SAMPLING STATION
- ⊗ MONITORING WELL

IBM NO 1 NORTHWEST
CORNER OF CONCRETE
SLAB - ELEV. 21.9

SITE 01 MONITORING WELL DATA			
	21	22	23
ELEVATIONS (MLW)			
TOP OF PROTECTIVE CASING	28.43	18.30	40.57
TOP OF WELL CASING	28.15	17.84	40.35
GROUND SURFACE	26.9	15.8	39.9
BOTTOM OF WELL	(-)16.1	(-)14.5	(-)0.1
DEPTH OF WELL (ft.)	43.0	30.3	40.0



LEA LOUREIRO ENGINEERING ASSOCIATES
a professional corporation
CONSULTING ENGINEERS AVON CT.

REVISIONS:

LOCATION PLAN
SAMPLING STATIONS
SITE 01 McALLISTER POINT LANDFILL
NAVAL EDUCATION AND TRAINING CENTER
NEWPORT, RHODE ISLAND

comm. no. 502-10
dwg. no. E-1
BY C.A.J., J.J.L. app. J.L. scale 1" = 40' date MAR. 13, 1985

APPENDIX F

LOCATION PLANS - SAMPLING STATIONS

SITES 07, 12, 14 - TANK FARMS ONE & FOUR
GOULD ISLAND DISPOSAL AREA

