TRC
Environmental Solutions through Technology

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January 18, 1993

Mr. Franco LaGreca, P.E.
Remedial Project Manager
Northern Division, Code 1823
Naval Facilities Engineering Command
10 Industrial Highway
Mail Stop No. 82
Lester, PA 19113

Re: Construction of CERCLA Final Cover
McAllister Point Landfill - NETC-Newport
TRC Project No. 6760-N81-00

Dear Mr. LaGreca:

Enclosed please find a Summary Report presenting background information and suggested approach to develop and design an "Interim Remedial Action" at McAllister Point Landfill.

As was discussed at the Project Managers Meeting conducted in Newport on December 10, 1992, this information will be incorporated into a letter to USEPA - Region I and RIDEM requesting a meeting to discuss how best to proceed.

It is considered advantageous to remediate soil/waste contamination at McAllister Point Landfill on a "fast-track" basis by the construction of a cap to isolate the waste and providing slope protection to prevent erosion. This action could be implemented prior to getting the results of additional studies (Phase II - Remedial Investigation) and development of the Final Clean-Up Plan for all media.

Thank you for the opportunity to be of assistance.

Very truly yours,

TRC ENVIRONMENTAL CORPORATION

Robert C. Smith

Robert C. Smith, P.E.
Program Manager

w/Enclosure

INTERIM REMEDIAL ACTION
MCALLISTER POINT LANDFILL - SITE 01

OVERVIEW

The McAllister Point Landfill is located adjacent to Narragansett Bay. Erosion is evident along the shore and it is apparent that the landfill is a potential source of contamination to the Bay. Therefore, it is considered prudent to remediate soil/water at the landfill on a "fast-track" basis pending design of a Comprehensive Final Clean-Up program for all affected media. The purpose of this summary report is to provide a framework and plan for developing an Interim Remedial Action for the site.

The report presents background information on existing conditions, history, environmental assessment and geologic/hydrogeologic conditions that would impact discussions regarding potential Interim Remedial Measures for the site. The summary report include brief sections on:

- Site Location/Description
- Site History
- Previous Site Investigations, Soil Assessment, and Ground Water Assessment
- Site Geology
- Site Hydrology
- Focus Feasibilty Study
- Interim Remedial Action (Capping and Slope Protection)

SITE LOCATION AND DESCRIPTION

The McAllister Point Landfill is located along the shoreline of Narragansett Bay and encompasses approximately 11.5 acres. The site is situated between Defense Highway and Narragansett Bay.

The site is characterized by a mounded area in the central to north-central portion of the site and flat areas at the northern and southern ends. Ground elevations across the main portion of the site vary between approximately 15 to 35 feet above mean low water level (mlw). Along the western edge of the site the surface slopes steeply to the shoreline. Erosion of the slope has been noted.

The surface of the site is vegetated with grass, weeds, and some small diameter trees. A small, lightly wooded area is present at the northern end of the mounded area. Several depressions are present in the central portion of the site where standing water collects during heavy precipitation events.

SITE HISTORY

From 1955 through the mid-1970's, this site was used as a landfill which received industrial and domestic-type wastes such as domestic refuse, spent acids, paints, solvents, waste oils, and PCB-contaminated oil. Wastes from the operational areas (machine shops, electroplating operations, etc.), navy housing areas, and from the ships homeported at Newport prior to 1973 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 1970-1971, some 98 percent of all the wastes were burned before being disposed of in the landfill. The incinerator was closed about 1970. During the remaining years that the site was operational, all wastes were again disposed of directly into the landfill. The landfill was closed during 1973.

Aerial photos and facility maps were reviewed covering the years from 1938 to 1988. Activity on the site dates back to 1938, with a railroad spur entering the site near the current site entrance, and running north into the center of the site. Throughout the 1940's and 1950's, large open depressions are visible on the site, along with material storage areas and what appeared to be above-ground tanks. From 1958 through 1970, an incinerator was visible in the north-central portion of the site. From 1965 through 1975, the shoreline of the central portion of the site changed shape, indicating the filling of Narragansett Bay in this area. In the 1981 and 1988 aerial photos, the site appeared to be generally inactive.

PREVIOUS INVESTIGATIONS

An Initial Assessment Study (Envirodyne Engineers, 1983) and Confirmation Study (Lourero, 1985) indicated that the site was used historically for disposal of hazardous materials and the presence of contamination was confirmed. The Phase I - Remedial Investigation was conducted by TRC Environmental Corporation (TRC-EC) during late-1989 through 1990.

The findings and results of the Phase I RI for the McAllister Point Landfill are summarized below.

Soil Assessment - Volatile organic compounds (VOCs), base neutral extractable organic compounds (BNAs) including polynuclear aromatic hydrocarbons (PAHs), pesticides, PCBs, and inorganics were all detected in on-site soils. Figures 1 through 4 are attached for reference. The major areas of the site where contaminants were detected in the soil at elevated levels include the following:

- Northern area - carcinogenic PAHs;
- North-central area - BNAs, carcinogenic PAHs, and inorganics;

- Central landfill area - VOCs, BNAs, PCBs, and inorganics;
- South of access road - BNAs, carcinogenic PAHs, and inorganics; and
- Shoreline - BNAs, carcinogenic PAHs, and inorganics.

The extent of soil contamination is shown on Figures 1 through 4 (attached).

Significant VOC contamination (i.e., greater than 1 ppm total VOCs) was detected in soils and fill in the central portion of the landfill area, but VOC levels were not consistently high throughout the depth of the soil horizons sampled.

BNAs were detected at elevated levels (i.e., greater than 10 ppm total BNAs), throughout the site, with the highest levels (i.e., greater than 100 ppm total BNAs) detected at spot locations in the central and southern portions of the site. Elevated levels of total carcinogenic PAHs (i.e., greater than 1 ppm) were also detected at locations where total BNA concentrations were less than 10 ppm. These locations were generally in the northern portion of the site, with smaller areas identified in the southern portion of the site and along the shoreline.

Pesticides were detected at low levels (i.e., 10s of ppb) in surface soil samples across the site, while PCBs were detected in surface and subsurface soils. PCBs were detected in surface soils along the shoreline and in subsurface soils in the north-central and southern portions of the site.

Concentrations of inorganics in the soils and fill were compared to off-site background surface soil levels. Inorganics were detected in soil and fill samples collected from across the site at levels exceeding background levels. The highest inorganic levels were detected in soils from the central and south-central portions of the landfill, in the northern potion of the site (ash area), in the southern portion of the site, and along the shoreline.

Ground Water Assessment - VOCs, BNAs, PCBs, and inorganics were all detected in site ground water samples. The major areas of the site where contaminants were detected at concentrations exceeding potential action levels include the following:

- Northern area - inorganics;
- North-central area - inorganics;
- Central landfill area - VOCs, and inorganics; and
- South of access road - VOCs, PCBs, and inorganics.

VOC detections, consisting mostly of petroleum-related VOCs (e.g., xylene, benzene) were limited to wells located in the central and southern portions of the site. VOCs were also detected in soil boring samples collected at the depth of the water table from the north-central to southern portions of the site, indicating the potential for ground water contamination throughout this area. Oil was observed in one well located in the southern portion of the site five months after it was originally sampled. No BNAs were detected above ground water action levels and no pesticides were detected in ground water samples. A PCB concentration of 150 ppb was detected in the same well (southern portion of the site) in which oil was also observed. The highest levels of inorganic analytes were detected in wells form the north-central to southern portions of the site.

SITE GEOLOGY

The soil boring activities performed at the site under the Phase I site RI, as well as under previous subsurface investigations, provided information on the site geology.

The overburden soils on this site consist of fill and glacial till deposits. All of the soil borings except for off-site borings (off-site and upgradient) and all of the monitoring well borings, encountered fill material. The thickness of the fill material ranged from 3 feet near the periphery of the site, to 24 feet in the central portion of the landfill. The central portion of the landfill may contain up to 38 feet of fill material. The fill material encountered consisted of a wide variety of municipal and industrial wastes (e.g., plastic, wood, paper, garbage, construction debris, paints), as well as what appears to be ash from the incinerator which reportedly operated on the site. The fill material appears to have been deposited directly upon the bedrock surface across a majority of the site.

Overlying the fill material, at several locations across the landfill, is a clay-silt layer ranging in thickness from 0 to 4 feet. This layer is presumably the cover material or "cap" which was reportedly placed on site when the landfill was closed in 1973. The cover material is discontinuous across the site, and was found primarily in the central portion of the landfill. A clay-silt layer was also encountered overlying the fill material at the southern end of the landfill, and in the northern portion of the landfill; however, this material did not appear to be the same "cap" material encountered in the central landfill area.

Glacial till deposits were observed directly beneath the fill and overlying the bedrock at the periphery of the site. Till was encountered in borings in the central landfill area and in the southern portion of the site. These borings were completed within the till layer. The till encountered consisted primarily of a dense fine to coarse sand and silt, with some horizons containing weathered shale fragments. The till when encountered varied in thickness from 4.5 feet to 11.5 feet.

The bedrock encountered at the McAllister Point Landfill consists of a gray-green to black, highly weathered to competent, carboniferous shale. Cores of the shale exhibited a high degree of fracturing with quartz and iron-oxide deposits common along fractures. The depth to bedrock at the site varied from 4 feet to 24 feet. The bedrock surface exhibits a uniform, westward slope, towards Narragansett Bay.

SITE HYDROLOGY

The following are discussions on the site surface water hydrology and ground water hydrology.

Surface Water Hydrology

There are no surface water bodies present on the McAllister Point Landfill site. The general site topography slopes in an east to west direction. Surface water on the site (precipitation or runoff from surrounding higher elevations) either evaporates, infiltrates into the site soils, or flows overland to surrounding lower elevation areas or the adjacent Narragansett Bay. During periods of heavy rainfall, ponded water forms in a small depressions located in the north-central portion of the site. The western edge of the site (bordering Narragansett Bay), is at an elevation approximately 10 feet higher than the beach shoreline along the bay. A slightly mounded area along the top of slope may limit direct surface runoff (overland flow) into the bay. Springs (leachate) have been observed discharging from the bottom of the landfill bank along the western edge of the site, into the bay.

Ground Water Hydrology

Ground water levels were measured in the nine monitoring wells installed during the Phase I site RI in April, July, and September of 1990, and in January of 1991. The ground water contour maps developed for this site (April, July, September 1990, and January 1991) indicate that the site ground water is flowing from east to west, towards the Narragansett Bay.

Single well hydraulic conductivity tests (slug tests) were performed in four of the monitoring wells at the site. All of these wells are screened within the bedrock at the site. The hydraulic conductivities determined from the slug tests range from 0.07 ft/day to 0.20 ft/day. These hydraulic conductivity value are much higher than values normally attributed to shale (10^{-4} to 10^{-8} ft/day) and probably reflect the highly weathered and fractured nature of the upper portion of the bedrock at the site. Slug tests were not conducted in monitoring wells screened in the fill material at the site, due to the shallow ground water levels (i.e., insufficient water) in the shallow wells.

Vertical Hydraulic Gradients

Vertical hydraulic gradients were determined at the two sets of nested monitoring wells installed during Phase I. Vertical hydraulic gradients were used to evaluate whether contamination will potentially migrate downward.

A downward (negative) hydraulic gradient was observed in both of the well pairs. This indicates that ground water from above the bedrock surface (in the fill or overburden) would tend to flow downward into the bedrock at these locations.

Horizontal Hydraulic Gradients

Horizontal hydraulic gradients were also determined from the water level measurements at the site. Horizontal gradients were used, along with the aquifer hydraulic conductivity and effective porosity, in determining horizontal ground water flow velocities. This allows an estimate of and hence the rate at which an aquifer may transport dissolved contaminants.

Horizontal gradients were calculated from the shallow wells (screened in the fill and overburden materials), and the three deep wells at the site (screened in bedrock) on the basis of the average of the four sets of ground water level measurements taken at the site. The horizontal gradient represents the change in head, measured in feet, per horizontal foot of travel through the medium.

Calculated shallow average horizontal hydraulic gradients ranged from 0.0056 ft/ft to 0.038 ft/ft. Deep average horizontal gradients were calculated as 0.0077 ft/ft and 0.0049 ft/ft.

Average Linear Velocities

The calculated average horizontal hydraulic gradients, along with hydraulic conductivity and effective porosity values, were used to calculate average linear ground water velocity values at the site.

Calculated average linear velocities for the shallow ground water ranged from 0.0061 ft/day to 0.04137 ft/day. The average linear velocities of the deep ground water were calculated as 0.0091 ft/day and 0.0057 ft/day. It is important to note that the calculated average linear velocity values are lower than the "true microscopic velocities" because water particles must travel along irregular paths that are longer than the linearized paths represented by the calculated average linear velocities (Freeze and Cherry, 1979).

Tidal Influence

Continuous ground water level measurements were recorded in five of the monitoring wells during the Phase I RI for three days (August 21 to August 24, 1990). Ground water levels were recorded every 15 minutes during the three-day time period. At the same time, continuous surface water levels were recorded at a gauging station located in Narragansett Bay, adjacent to the site.

Tidal influences were observed in most of the on-site monitoring wells. However, the influence on some wells was small and considered negligible. The strongest tidal influence was encountered in the deep wells. The water level fluctuations in the wells closely matched the six-hour tidal period observed in the Narragansett Bay tidal station adjacent to the site. The amount of tidal fluctuation was determined to be is a function of proximity to Narragansett Bay and whether the well screen intercepts the bedrock.

When the landfill was active, the surface was extended into the Bay apparently using the wastes as fill material. The site historically was subject to periodic flooding until the elevation of the site was increased above flood levels.

EVALUATION

Based on the results of investigations conducted to date, remediation of the McAllister Point Landfill is required. An Interim Remedial Action to isolate soil/waste material is recommended. In designing a cap, the objective is to limit the infiltration of water to the waste to minimize leachate generation and prevent contamination that could possibly discharge to surface water (Narragansett Bay) and ground water sources.

Where the waste is above the ground water zone, a properly designed and maintained cover can prevent (for practical purposes) water from entering the landfill, minimizing the formation of leachate. Any existing leachate must be collected and removed.

Based on a preliminary evaluation of existing data; the Remedial Action Objectives are as follows:

- Prevent migration of contaminated ground water to Narragansett Bay
- Minimize off-site migration of surface soil contaminants and subsurface fill material

In order to meet these objectives an approach to prevent continued formation of leachate (capping) and minimize erosion (slope protection); is suggested as a realistic approach. This would involve grading, capping, and erosion protection as in Interim Remedial Action.

It is understood that a Focused Feasibility Study and development of a Proposed Plan are necessary steps to implement this program. The Final Proposed Plan is released for public comment prior to the preparation and submission of the draft ROD/Responsiveness Summary for EPA and State of Rhode Island review and comment.

The Scope of Work would be tailored to this specific effort and be performed on a "fast-track" basis. The steps that are necessary to implement the remediation are outlined below:

Step 1 - Discuss with EPA and RIDEM an approach to expedite the remedial action at McAllister Point Landfill (January 28, 1993)

Step 2 - Prepare Focus Feasibility Study and Proposed Plan

Step 3 - EPA/RIDEM Submits Letter of Concurrence

Step 4 - Public Meeting and Public Comment Period

Step 5 - Record of Decision/Responsiveness Summary

Step 6 - EPA/RIDEM Submits Letter of Concurrence

Step 7 - Design Development and Preparation of Plans and Specifications

Step 8 - Construction Activities

Focus Feasibility Study (FFS)/Proposed Plan

The FFS will provide the framework for the development of the proposed plan and support an Interim Remedial Action for soil/waste contamination at McAllister Point Landfill. Clearly the work effort will be tailored to evaluate process-options necessary to prevent infiltration (cap) and erosion (slope protection). The FFS will provide the information necessary to develop a ROD that will meet CERCLA requirements. The objective of the FFS is to evaluate alternatives for implementing an interim remedy for soil/waste contamination. This Interim Remedial Action will prevent contact, minimize leachate generation and control erosion of the landfill slopes.

A Phase II Remedial Investigation to further define the nature and extent of contamination at the site and a Feasibility Study examining all media including air, ground water and soils and sediment not addressed by the interim remedy to evaluate alternatives for a comprehensive plan for site remediation will be conducted.

Focus Feasibility Study (Phase I) - Development and screening of alternatives:

- Identification of Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) requirements.
- Develop Remedial Action Objectives.
- Develop general response:
  - No Action
  - Treatment Alternatives
  - Excavation Alternatives
  - Disposal Alternatives
  - Hot Spot Removal/Treatment
  - Containment Alternatives:
    - Site Grading
    - Surface drainage

- -- Capping
- -- Vegetative Cover
- -- Fencing
- -- Deed Restrictions
- -- Combination of the Above

- Identification and Screening of Technologies
- Technology Process-Options Evaluation:
  - -- Effectiveness
  - -- Implementability
  - -- Cost Evaluation
- Assemble Alternatives/Screening

Focus Feasibility Study (Phase II) - Detailed Evaluation of Alternatives:

- Redefinition of Alternatives

- Individual Analysis of Alternatives Against Evaluation Criteria:

  - Overall Protection of Human Health and The Environment
  - Compliance with ARARs
  - Long-Term Effectiveness and Permanence:
    - -- Magnitude of Residual Risk
    - -- Adequacy and Reliability of Controls

- Reduction of Toxicity, Mobility on Volume Through Treatment

- Short-Term Effectiveness

Implementability

- Construction and operation
- Reliability
- Ease of Undertaking Additional Remedial Action (if necessary)
- Monitoring Consideration
- Administrative Feasibility
- Availability of Services and Materials

Cost

- Capital Costs (direct and indirect)
- Annual O&M Costs

Community Acceptance

INTERIM REMEDIAL ACTION SOIL/WASTE CONTAMINATION - OPERABLE UNIT

The capping of McAllister Point Landfill will isolate the buried waste and fill to avoid surface infiltration, thereby minimizing the generation of leachate. Capping may also control the emission of gases and odors, reduce erosion and improve aesthetics. Capping will probably be selected since the extensive subsurface contamination will preclude complete excavation and removal of wastes due to potential hazards and/or unrealistic costs.

Data Collection Requirements

Phase I Remedial Investigations have provided the database to allow the preparation of a Focus Feasibility Study and Proposed Plan for soil remediation operable unit (Interim Remedial Action - Soil/Waste Contamination). Data collection requirements for capping are presented on Table 1-A majority of required data has already been collected during the Phase I - RI. Additional data can be obtained during the Design Phase.

Engineering Considerations for Implementation

Design specifications will describe in detail the type of cap material including synthetic membranes and construction requirements (compaction, sequence, etc.).

The final cover minimum thicknesses recommended by EPA for a multilayered cap (U.S. EPA, 1989) from final grade are as follows:

- Vegetative and protective layer - A 24-inch thick layer of topsoil or soil fill
- Drainage layer - 12 inches of sand (permeability 1 x 10^{-2} cm/sec)
- First barrier layer component - Synthetic membrane (20 mil thickness minimum)

- Second barrier layer component - 24 inches of low permeability compacted soil with a maximum in-place permeability of 1 x 10^{-7} cm/sec

- Gas vent layer (optional based upon site-specific conditions) - 12 inches of native soil or sand to act as a foundation for the cap or to vent/control gas

- Waste.

The following are key design considerations for a cap:

- The slope of the low-permeability layer should be between 3 and 5 percent to prevent erosion and ponding of rain water on the top of the cap. The perimeter side slopes are final grades and should be no steeper than three (horizontal) to one (vertical). For each 20-foot increase in vertical heights, a bench should be constructed in the slope to control surface water runoff and subsequent erosion.

- The impermeable barrier portion of the cap should be located beneath the average depth of frost penetration for the site.

- The vegetative layer should be thick enough to contain the effective root depth or irrigation depth for the type of vegetation planted.

- The drainage layer should be designed and constructed to discharge flow freely in the lateral direction to exit the cap.

- Surface seals required long-term maintenance. Periodic inspections should be made for settlement, ponding of liquids, erosion, and invasion of deep-rooted vegetation. Concrete barriers and bituminous membranes are vulnerable to cracking, but the cracks can be relatively easily repaired.

- Several materials and design are available for capping. Factors influencing the proper selection of materials and design include desired functions of cover materials, waste characteristics, climate, hydrogeology, projected land use, and availability and costs of cover materials.

Surface Water Controls

Grading of the McAllister Point Landfill will probably be required prior to construction of the Cap. This will reduce infiltration and erosion while re-directing runoff from the site.

The grading will be designed to reduce ponding and control runoff velocity and soil erosion. Where an impermeable cap is constructed, surface waters should be directed away from the surface to prevent ponding.

Gas Venting

Gas venting (active or passive) is applicable to the containment (control of migration) of VOCs in soil. The vents may be required in conjunction with a cap to control methane gas. However, this requirement for venting will depend on identification of potential receptors and associated risks.

Slope Protection

Slope protection may be required adjacent to Narragansett Bay. This will prevent erosion from tidal action and surface runoff. This will reduce the threat of introducing contaminated material to the Bay.

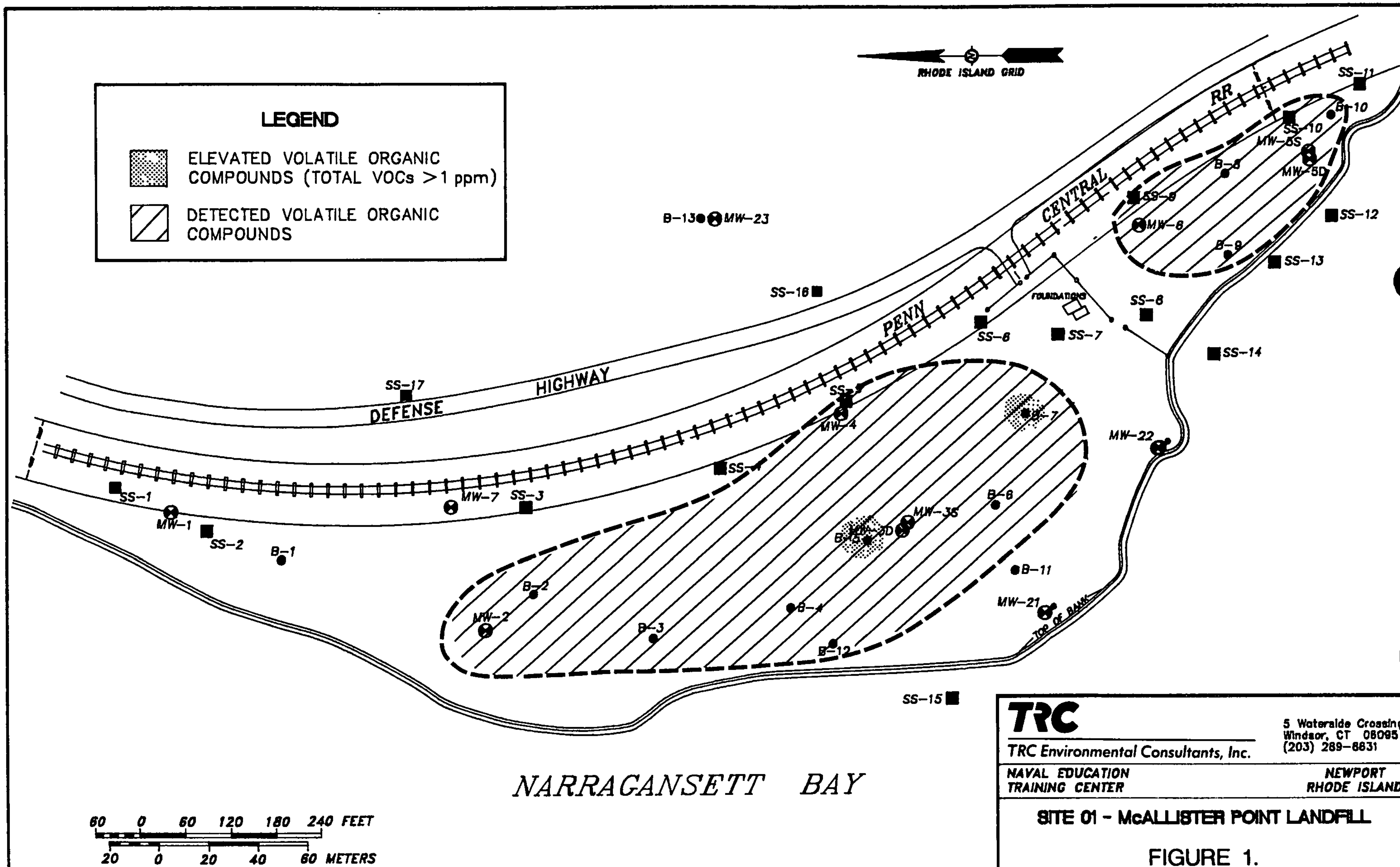
Various methods will be investigated:

- Surface water diversion trenches/berms (top of slope)
- Rip-rap
- Gabion walls
- Sheet pile wall (backfill)

TABLE 1

DATA REQUIREMENTS FOR CAPPING

Data Description	Purpose(s)	Source(s)/Method(s)
Extent of contamination	Determine cost-effectiveness of cap vs. excavation/removal	Surficial soil and borehole sampling and analysis to determine depth and lateral extent of contamination -- Phase I - RI
Depth to ground water table	May not be effective in areas with a high ground water table	Hydrogeologic maps, observations wells, and borehole logs -- Phase I - RI
Availability of cover/ capping materials	Implementability and cost	Local borrow pits/quarries, surficial geology maps -- Design
Soil characteristics	Suitability for: - Drainage layers - Impermeable soil layer - Mixing with bentonite	Laboratory testing of soil samples -- Design
• Gradation		Sieve analysis, Atterberg Limits -- Design
• Permeability (percent compaction, moisture content)		Moisture/density relationships, permeability testing in triaxial cell per Army Corps of Engineers procedure -- Design
• Strength	Slope stability	Triaxial shear, direct shear testing -- Design
Climate (precipitation)	Expected infiltration rate; design criteria	NOAA records; local rainfall records -- Phase I - RI
Final land use	Selection of proper cap design	



60 0 60 120 180 240 FEET
20 0 20 40 60 METERS

NOTE: LOW LEVEL VOCS DETECTED IN REANALYSIS OF SURFACE SOIL SAMPLES SS-01, SS-04 AND SS-06

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FIGURE 1.

EXTENT OF VOLATILE ORGANIC SOIL CONTAMINATION

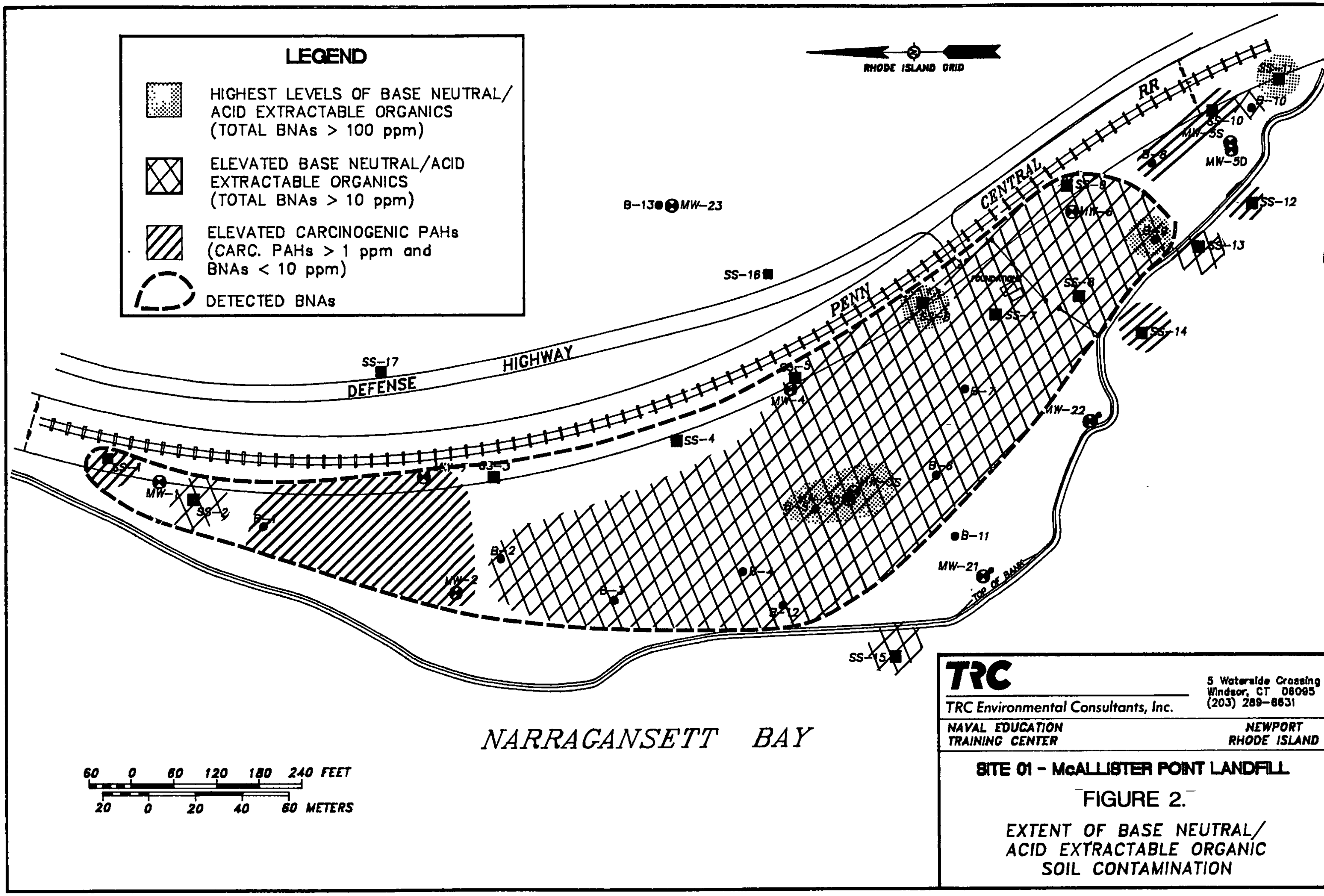

FIGURE 2.

EXTENT OF BASE NEUTRAL/ ACID EXTRACTABLE ORGANIC SOIL CONTAMINATION

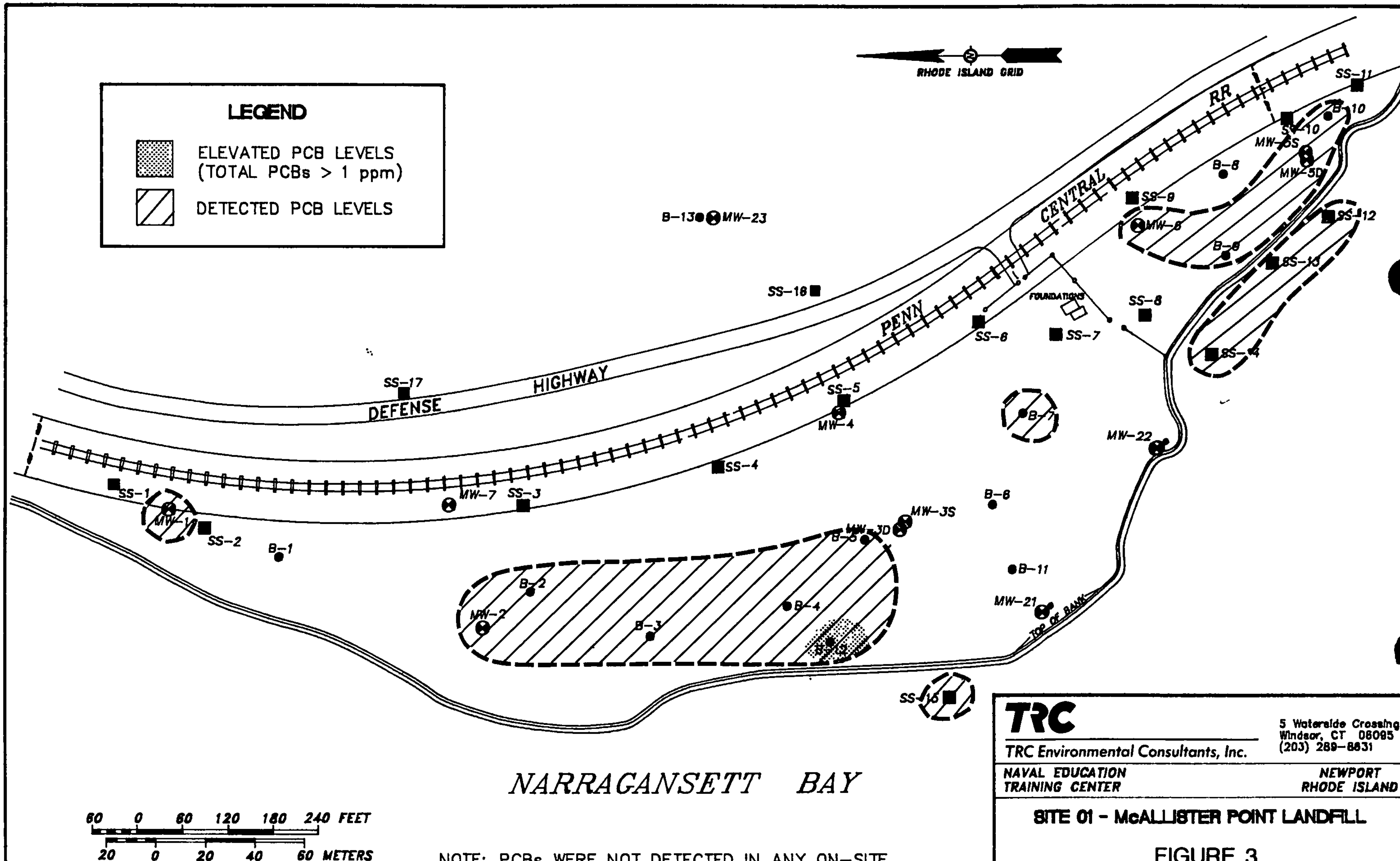

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FIGURE 3.

EXTENT OF PCB SOIL CONTAMINATION

NOTE: PCBs WERE NOT DETECTED IN ANY ON-SITE SURFACE SOIL SAMPLES; ONLY IN THE SHORELINE SURFACE SOIL SAMPIES.

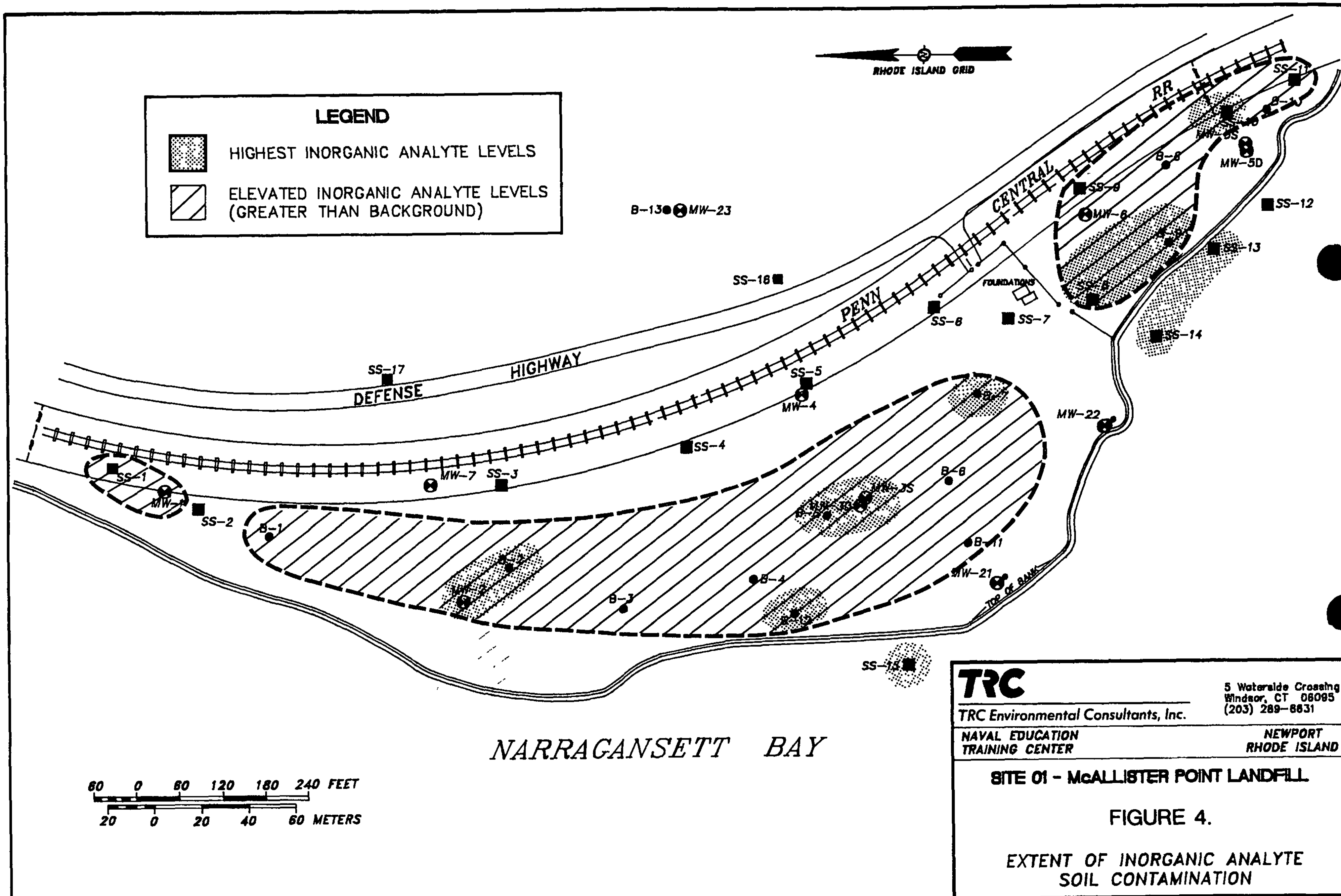

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FIGURE 4.

EXTENT OF INORGANIC ANALYTE SOIL CONTAMINATION