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SITE CHARACTERIZATION AND PLAN OF ACTION FOR UNDERGROUND STORAGE TANKS

AT

BUILDING R-6/R-7

WATERFRONT AREA

NWS EARLE, COLTS NECK, NEW JERSEY

PREPARED FOR

NORTHERN DIVISION, NAVFAC

NAVAL BASE

PHILADELPHIA, PENNSYLVANIA

K&D PROJECT #E1-3078-004

MAY 29, 1991
REVISED - OCTOBER 1991
REVISED - JULY 1992

PREPARED BY

KASELAAN & D'ANGELO ASSOCIATES, INC.

A HILL GROUP COMPANY

ENVIRONMENTAL SCIENCE AND ENGINEERING

HADDON HEIGHTS, NEW JERSEY

BOSTON O LOS ANGELES O NEW ORLEANS O NEW YORK O WASHINGTON

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VALDUR KASELAAN
PROJECT MANAGER

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1.0 INTRODUCTION

Underground Storage Tank (UST) owners are required by NJDEP&E to complete a Discharge Investigation and Corrective Action Report (DICAR) when a discharge occurs from an underground storage tank or piping system. An underground storage tank (UST) system at NWS Earle has discharged gasoline to the environment, and is subject to this requirement. This UST system is located at Buildings R-6, R-7. The UST registration number is 0151003 and the tank is a nine year old and constructed of fiberglass reinforced plastic clad steel. It stored gasoline.

The objective of this report is to characterize the site and define a sampling plan, specific to the tank discharge, which will determine if gasoline has impacted the groundwater, soil, surface water bodies or other environmental pathways which could have a potential adverse effect on the public health or the environment.

2.0 PROCEDURE

Naval Weapons Station Earle operates a number of buildings at the Waterfront area, approximately 15 miles North of the main Station. On 10 September 1990, during installation of a vapor recovery system at the Waterfront service station, gasoline was discovered in the soil on the site and was noted to be mixing with water as a result of tidal action. The source of contamination was found to be a dripping compromised joint between a fiberglass pipe from a 12,000 gallon gasoline storage tank and an iron pipe leading to gasoline pumps. Contaminated soil in the path of construction was removed from the site, and repairs to the compromise were made. The leak had been estimated at one drop every 45 seconds when it was discovered.

The gasoline tank lies in an underground storage tank farm with a 12,000 gallon diesel tank and a 12,000 gallon bulk fuel tank. The gasoline tank is labeled R-7/3. The diesel tank is R-7/1 and the fuel oil tank is R-7/2. A site diagram of the tank layout and piping is shown in Figure 1.

Kaselaan & D'Angelo Associates has investigated the site. Mr. Frank Hunsberger, Hydrogeologist and Mr. Andrew Rola, P.E. of K&D visited the site on May 16, 1991. Subsequent to the field investigation, a record search of available historical drawings and geological data was obtained from the Public Works Office with the assistance of Mr. John Pawlus of NWS Earle.

Geological and Hydrogeological background information was obtained from a Site Investigation Work Plan of November 1989 prepared by Roy F. Weston, Inc. for the Navy Installation Restoration program.

Design drawings of the vapor recovery system revealed the detail of the tank piping systems, however, the drawings were not "as-built" so actual layout is unknown. Older drawings of the tank farm revealed that originally four concrete tanks were used and then later replaced by the existing three fiberglass reinforced plastic clad steel tanks.

At R-7, the surrounding grade is gently sloping north and northwest toward the Marshland between the base and Sandy Hook Bay. Gasoline leaks will likely travel in the direction of groundwater flow or follow migration routes along subsurface utilities, storm drains or the septic system. Figure 2 shows surrounding storm and sanitary drainage lines.

3.0 SITE CHARACTERIZATION

3.1 Physical Geography

NWS Earle is located in the Coastal Lowlands of Monmouth County in eastern New Jersey. This area falls within the Atlantic Coastal Plains Physiographic Province, approximately 6 miles inland from the Atlantic Ocean.

The station is divided into three physically separate areas, the largest being the Main Base (10,428 acres), the smaller being the Waterfront and Chapel Hill areas (706 acres, combined).

The Waterfront area is on the southern coast of Sandy Hook Bay, an inlet on New Jersey's Atlantic coastline. This area is known as the Bayshore Lowlands. The Waterfront property occupies a long strip of land perpendicular to the shore. Much of the area is swamp or tidal marsh, with areas of manmade land (fill). Average elevation is approximately 10 feet above MSL. A pier extends 2 miles offshore into the bay to where the water is approximately 20 feet deep.

3.2 Climate

The Main Base and the waterfront area are characterized by a predominantly continental climate with significant seasonal and daily temperature fluctuations. High humidity occurs frequently along the coast and less frequently inland. Freezing temperatures occur intermittently from October to April. The average first frost occurs on October 17, and the average last frost occurs on April 24, allowing for an average growing season of 198 days. The average annual precipitation is 44.67 inches at Long Branch and 41.82 inches at Newark. The annual peak daily rainfall (1-year, 24-hour) is greater than 2.5 inches. The mean annual temperatures at the Long Branch and Newark meteorological stations are 56.2°F and 45.2°F, respectively.

3.3 Surface Drainage

All rivers and streams draining NWS Earle Waterfront area ultimately discharge to the Sandy Hook Bay. Runoff follows the topographic gradient to storm sewers or overland flow which discharges to the Sandy Hook Bay. The hydrogeology in the waterfront area is under tidal influence.

Buildings R-6 and R-7 lie within the drainage basin which feeds Sandy Hook Bay. Figure 3 shows the locations of buildings R-6 and R-7 in relation to surface hydrology and USGS contours.

3.4 Soils

The soils at NWS Earle are generally distributed in northeast/southwest-trending belts that parallel the outcrop patterns of the underlying geologic units. More than half of the identified soil types in Monmouth County are found on the NWS Earle facility.

The dominant soil in this area is sandy and well drained. The soils typically have high iron and sulfur contents and many are acidic.

Acidic soils are formed from the weathering of pyrite (iron sulfide) or lignite (low-grade coal) contained in the sedimentary deposits. When exposed to air and water these materials form corrosive sulfuric acid. Severely acidic soils with pH values as low as 3.5 can be developed naturally in some of the soils found at NWS Earle.

Tidal marsh soils and beach sands predominate in the waterfront area. The natural conditions have also been substantially altered by manmade filled land reclaimed from the marsh (i.e., the railroad trestle area near the shore) and by the presence of several (now closed) sanitary landfills. Sandy areas, such as along the shore of the bay and south and east of the pier, range from loamy sand to silt loam and are typically well drained. The tidal marsh soils, soft organic-rich silts, sands, and clays, and poorly drained and are typically flooded twice daily by the tides and occasionally by storms. The boundaries of the raised landfill areas are subject to minor erosion. Acidity problems due to black soils have not been documented in the waterfront area.

Buildings R-6 and R-7 lie on the tidal marsh soils and beach sands of the waterfront area.

3.5 Surficial Geology

The geological setting at NWS Earle consists of a thick wedge of layered unconsolidated sediments that dip seaward (southeast). The sedimentary formations of the Coastal Plain are exposed at the surface in a banded outcrop pattern roughly parallel to the shore.

The Kirkwood Formation of the Miocene age is an important aquifer both regionally and locally. It crops out at the surface over two-thirds of the Main Base (the central and southern portions) as well as across the southern tier of Monmouth County.

In fact, most of the southern part of New Jersey consists of surface exposure of the Kirkwood Formation (grouped with the Cohansey Sand). Textually, the Kirkwood consists of fine to medium grained quartz sand with some mica, some lignite, and some diatomaceous clay. A lower member is finer-grained, darker, and pebbly and contains some glauconite. The total thickness ranges from approximately 30 feet at the outcrop area on the station to 800 feet near the coast. The texture grades from fine-grained sand and silt inland (updip) to clay beds with finer strings of sand along the coast.

The Kirkwood is used locally for domestic wells and in other areas of the Coastal Plain for municipal supplies. Yields range from 15 to over 1,000 gpm, but the water is generally acidic and contains iron and sulfide.

The overlying Cohansey Sand is a light-colored medium to coarse-grained sand, occasionally pebbly, with local clay beds. In combination with the Kirkwood, it forms a major unconfined aquifer throughout the New Jersey Coastal Plain. It produces brackish or salty water in some coastal areas. In the Waterfront area, the surficial geology consists of very young quaternary sediments. These sediments are made up of highly organic silt plus clay in marshy or swampy areas, and beach sands along the shore. The area also has some very recent stream sands and gravels. Soil borings conducted in 1982 depict actual conditions at R-7 and are shown in Figure 2.

3.6 Hydrogeology

3.6.1 Regional Hydrogeology

The Atlantic Coastal Plain sediments are the most important source of potable water in the region. More than 75 percent of the fresh water supply in the New Jersey Coastal Plain is from groundwater.

The Coastal Plain province is composed of a wedge-shaped deposit of alternating layers of sand and clay that thickens to the southeast and overlies a crystalline basement. These deposits store and transmit water through interconnected pore spaces.

Recharge to the groundwater system is derived from precipitation, which averages 44 inches per year. Approximately 15 to 39 inches of this precipitation recharges the groundwater reservoir annually. In addition to precipitation in the outcrop areas, recharge is also provided by vertical leakage through confining beds and by seepage from surface water bodies.

The five principal Coastal Plain aquifers are the:

- Kirkwood-Cohansey aquifer system
- Atlantic City "800-foot sand."
- Wenonah-Mount Laurel aquifer
- Englishtown aquifer
- Potomac-Raritan-Magothy aquifer system

All but the Kirkwood-Cohansey are confined, except where they crop out or are overlain by permeable surficial deposits. NWS Earle is situated over the recharge area of many of these formations.

Water quality is generally satisfactory for drinking. Minor problems due to locally high iron concentrations occur in several aquifers, including the Potomac-Raritan-Magothy. Saline water is a problem in some coastal areas with unconfined aquifers and in deep portions of some confined aquifers.

In general, in the New Jersey Coastal Plain, the deeper aquifers are used for public water supplies, while near-surface aquifers are used for shallow domestic wells.

3.6.2 Local Hydrogeology at NWS Earle

Groundwater flow from the Waterfront area is generally to the north towards the Sandy Hook Bay. The surface water table flow directions follow the local topography.

Wells on private or public property that are within one-half (1/2) mile of the subject site are reported in Appendix F. Public water supply, industrial supply and other wells with water allocation permits and within one (1) mile of the subject site are being researched by the NJDEPE Water Allocation Bureau. As soon as this information is available it will be reported to Naval Facilities Engineering Command.

A one-half (1/2) mile radius of Building R-6/R-7 on a USGS quadrangle map is depicted in Figure 3. A one (1) mile radius of Building R-6/R-7 on a USGS quadrangle map is depicted in Figure 4.

3.7 Population

NWS Earle has an active duty population equivalent to 600 Navy personnel. In addition, there are seven hundred (700) civilians employed within NWS Earle. Approximately ninety percent (90%) of these civilian employees are located on the Main Station. The remaining 10% are at the Waterfront/Chapel Hill area.

As of 31 December 1990, an estimate of 1800 Navy personnel and dependents live on the base. Thus, the total daytime population on the base is estimated at between 2,500 and 3,000.

A number of small communities are located along or close to NWS Earle Waterfront boundaries. The closet ones are Leonardo to the east and Belford to the west.

3.8 Land Use

The following land use categories are within one (1) mile of the Waterfront area:

- Institutional (approximately 30%)
- Residential (approximately 50%)
- Marshland (approximately 20%)

Current land uses at the Waterfront include:

- Buildings/Offices
- Transportation (roads and parking)
- Recreational Area
- Open Space
- Undeveloped

4.0 SUMMARY SITE CHARACTERIZATION

Building R-6/R-7, Waterfront

The three 12,000 gallon underground storage tanks located at building R-7 were installed in 1982. Tank #3 contains gasoline while the other two contain fuel oil and diesel oil respectively. In 1990 a leak was discovered at the connection of a new vapor recovery line on top of the gasoline tank. It is unclear if the leak was pre-existing or if it was created by the connection of the new vapor recovery line. In either case the leak was spilling out from a vapor recovery line which should be normally empty.

Contaminated soil was removed and stockpiled when the leak was discovered, and the piping was repaired. Currently, there are no known leaks, however due to the age and history of the fuel dispensing system, there may be historical soil or groundwater contamination in the area.

Soil borings from 1982 show that a fairly impermeable clay layer lies beneath the tanks at about 16 feet from grade. The overburden consists of mostly brown, fine to medium sand with traces of silt and gravel. The water table was at 8'3" from grade in 1982 however the water table may be influenced by tidal action because it is so close to the Sandy Hook Bay. The presence of a clay layer at 16 feet indicates that this water table is not likely in direct contact with any significant water bearing aquifers in the area such as the Kirkwood-Cohansey formations. More likely, this water table is presumably perched atop a clay confining layer and may be strongly influenced by saline bay water and tidals.

Exact local groundwater flow direction can be influenced by localized substructures such as stormwater utilities, road beds and other man-made or natural obstructions. The water table appears to flow to the North, but the exact direction can only be determined by the installation of at least three piezometers.

Before 1982, four concrete gasoline and diesel fuel tanks existed at the filling station. Three of the four were abandoned in place by removing the top, emptying and filling and compacting with clean sand. No soil or groundwater was tested at that time so there is no knowledge of historical spills. The concrete tanks were in service for a long time, possibly as far back as World War II. One remaining concrete tank is in use as a spill containment and overflow tank for spills occurring in the tank truck unloading area.

Figure 1 and 2 depicts all existing piping and tanks in the immediate area. Much of the piping is abandoned, however most of it was in use until the installation of the new tanks in 1982.

5.0 PLAN OF ACTION

NWS Earle will install three (3) piezometers triangularly placed around the tank farm as shown in Figure 1, to verify the local direction of groundwater flow. After surveying the piezometers and developing a local groundwater contour map of the area, a monitoring well will be installed directly downgradient from the tank and within ten (10) feet of the tank. The well will be installed to a depth of approximately twenty-five (25) feet. Piezometers and the well shall be installed in accordance with the specifications in Appendix A. Groundwater sample collection and analytical methods shall be as described in Appendix B. Sampling and analytical procedures shall follow the Quality Control/Quality Assurance in Appendix C. At the present time only one monitoring well is proposed since the discharge was related to an isolated section of piping and not the tank field.

Additional soil samples shall be collected by hand angering to a depth of six (6) feet at nine (9) locations around the tank and along the existing piping runs. Soil samples, along the piping runs, will be collected every fifteen (15) feet in accordance with Appendix 10 of the NJDEP&E's Interium Closure Requirements. The sampling will be biased towards elbows and joints of the piping.

The soil samples will be continuously field screended using instruments such as a Photo Ionization Detector (PID) or Flame Ionization Detector (FID). One soil sample from each boring will be sent to a state certified laboratory for analysis. Analysis shall be for volatile organics plus a library search for 15 additional compounds, xylene and lead. The sample sent to the lab will typically be from the soil indicating contamination, if any, with the field screening instrument. If the field screening instrument does not indicate contamination a soil sample will still be sent to the laboratory for confirmation purposes. As drilling progresses for each piezometer and the monitoring well, continuous split spoon sampling will be conducted to characterize stratigraphy. An illustrative and descriptive written log will be submitted. The log will use either the Burmeister or USDA textural classification methods. The depth to the saturated zone and the split spoon sampler blow counts will be recorded.

One soil sample from the monitoring well boring shall be submitted to a state certified laboratory for analysis. Analysis shall be for volatile organics plus a library search for 15 additional compounds, xylene and lead. The sample sent to the lab will typically be from the soil indicating contamination, if any, with the field screening instrument. If the field screening instrument does not indicate contamination a soil sample will still be sent to the laboratory for confirmation purposes.

Presented below is a summary of the soil and groundwater testing to be performed.

SUMMARY OF SOIL TESTING

Sample #	Matrix	Sample Location	Analytical Parameter	Analytical Method	Justification
1A	Soil	South Side of Tank R7/3	Volatile Organics +15, includes xylene	SW-846-8240	as per NJDEP&E requirements
1B	Soil	South Side of Tank R7/3	Lead	SW-846-7421	as per NJDEP&E requirements
2A	Soil	East Side of Tank R7/3	Volatile Organics +15, includes xylene	SW-846-8240	as per NJDEP&E requirements
2B	Soil	East Side of Tank R7/3	Lead	SW-846-7421	as per NJDEP&E requirements
3A	Soil	North Side of Tank R7/3	Volatile Organics +15, includes xylene	SW-846-8240	as per NJDEP&E requirements
3B	Soil	North Side of Tank R7/3	Lead	SW-846-7421	as per NJDEP&E requirements
4A	Soil	West Side of Tank R7/3 at Piping	Volatile Organics +15, includes xylene	SW-846-8240	as per NJDEP&E requirements
4B	Soil	West Side of Tank R7/3 at Piping	Lead	SW-846-7421	as per NJDEP&E requirements
5A	Soil	West Side of Tank R7/3 at Piping	Volatile Organics +15, includes xylene	SW-846-8240	as per NJDEP&E requirements

Sample #	Matrix	Sample Location	Analytical Parameter	Analytical Method	Justification
5B	Soil	West Side of Tank R7/3 at Piping	Lead	SW-846-7421	as per NJDEP&E requirements
6A	Soil	West Side of Tank R7/3 at Piping	Volatile Organics +15, includes xylene	SW-846-8240	as per NJDEP&E requirements
6B	Soil	West Side of Tank R7/3 at Piping	Lead	SW-846-7421	as per NJDEP&E requirements
7A	Soil	At Piping	Volatile Organics +15, includes xylene	SW-846-8240	as per NJDEP&E requirements
7B	Soil	At Piping	Lead	SW-846-7421	as per NJDEP&E requirements
8A	Soil	At Piping	Volatile Organics +15, includes xylene	SW-846-8240	as per NJDEP&E requirements
8B	Soil	At Piping	Lead	SW-846-7421	as per NJDEP&E requirements
9A	Soil	At Piping	Volatile Organics +15, includes xylene	SW-846-8240	as per NJDEP&E requirements
9B	Soil	At Piping	Lead	SW-846-7421	as per NJDEP&E requirements
10A	Soil	Monitoring Well	Volatile Organics +15, includes xylene	SW-846-8240	as per NJDEP&E requirements

Sample #	Matrix	Sample Location	Analytical Parameter	Analytical Method	Justification
10B	Soil	Monitoring Well	Lead	SW-846-7421	as per NJDEP&E requirements

SUMMARY OF GROUNDWATER TESTING

Sample #	Matrix	Sample Location	Analytical Parameter	Analytical Method	Justification
11	Groundwater 1st round	Monitoring Well	Volatile Organics compounds of the Priority Pollutant parameters plus xylene, methyl tertiary butyl ether (MTBE) and tertiary butyl alcohol (TBA)	EPA 624	as per NJDEP&E requirements
12	Groundwater 2nd Round	Monitoring Well	Volatile Organics compounds of the Priority Pollutant parameters plus xylene, methyl tertiary butyl ether (MTBE) and tertiary butyl alcohol (TBA)	EPA 624	as per NJDEP&E requirements

All sampling at Building R-7 will follow the Health and Safety Plan attached in Appendix D. Vapor hazards will be assessed in accordance with the procedures described in the Health and Safety Plan.

A summary of the sampling and analytical protocol for Building R-7 is contained in Table 1 for soils and Table 2 for groundwater. These tables are found in the Appendix.

NJDEP&E procedures for determining the presence of free product in soil will be used on the drill cuttings for all piezometers and monitoring wells. These procedures are described in Appendix E.

All monitoring wells will be installed by a New Jersey licensed well driller. New Jersey well permits will be obtained prior to each monitoring well installation. Well permits will be obtained from the Bureau of Water Allocation, Well Permit Section. The well permit numbers will be reported.

Split spoon sampling will be conducted, every three feet on the well(s) closest to the source(s) of contamination to characterize stratigraphy. An illustrative and descriptive written log will be submitted for the well using the Burmeister textural classification method. The depth to the saturated zone and the blow counts will be reported. PID/OVA readings shall be taken and recorded in the logs every 5 feet and at changes in stratigraphy.

Any boring not completed as a well will be sealed using cement or bentonite/ grout as per N.J.A.C. 7:9-9.1 et seq.

Upon completion of sampling and analysis, the data will be compiled, evaluated and incorporated into a DICAR report and submitted to the NJDEP&E.

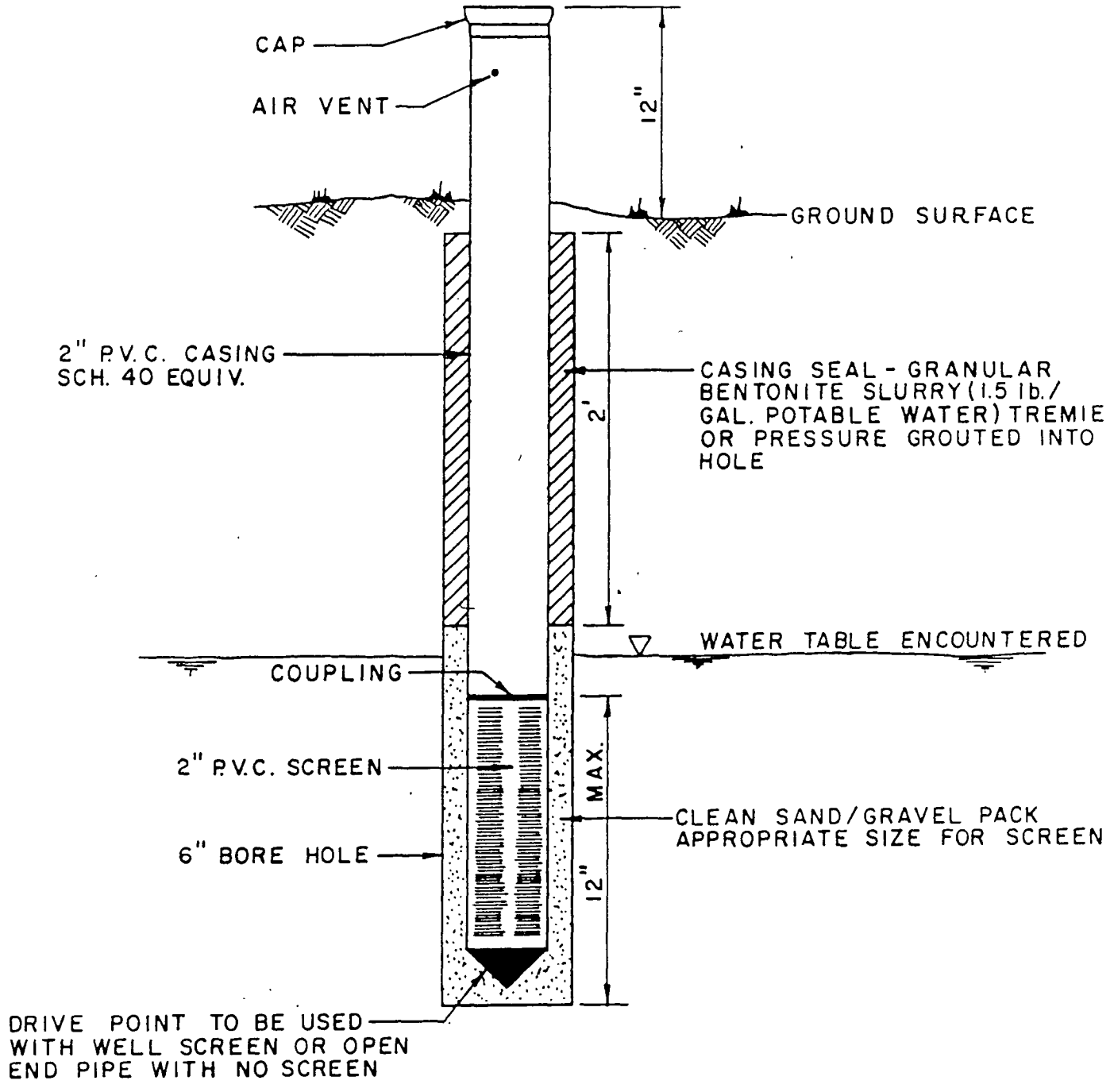
APPENDICES

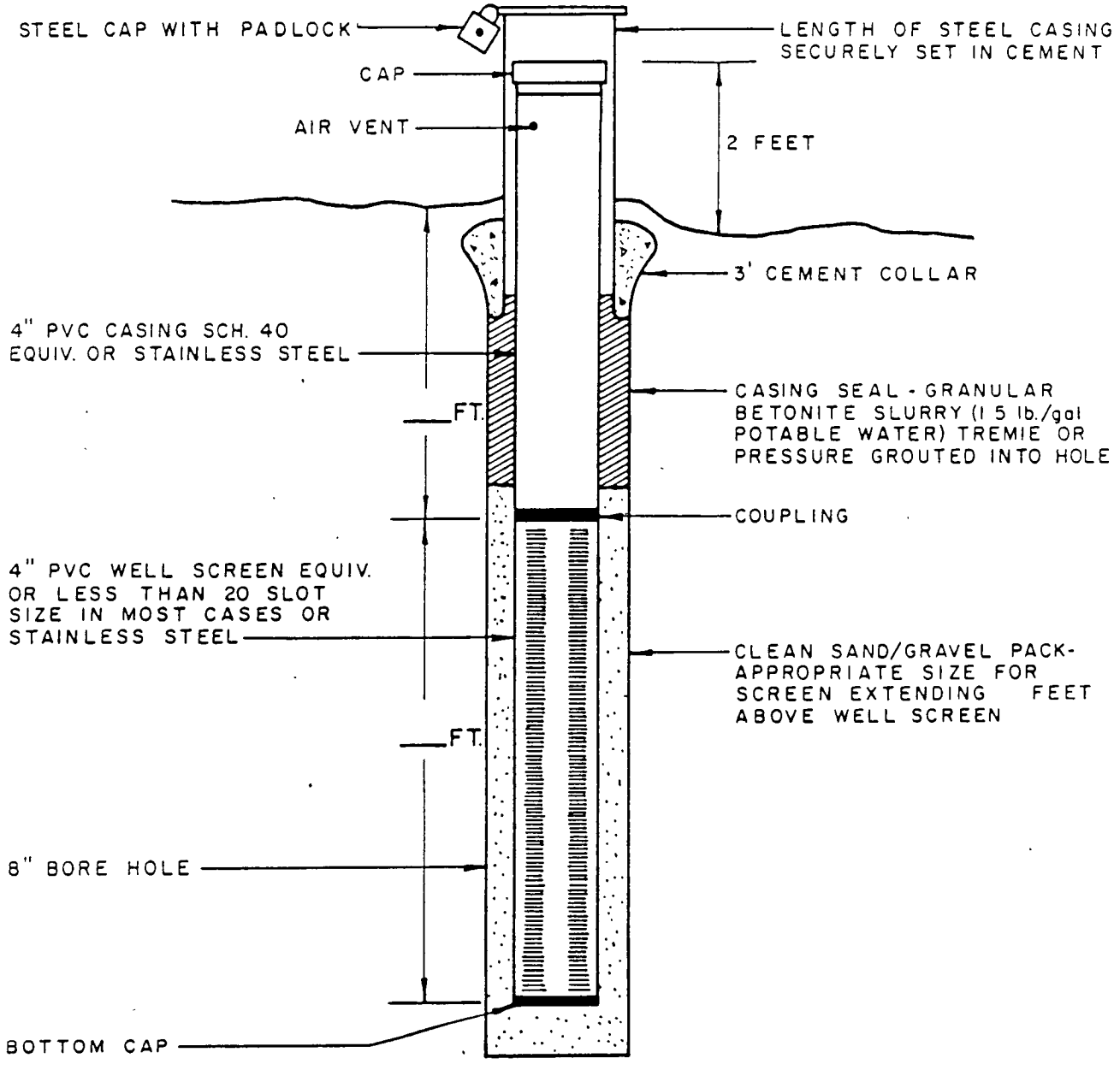
A. Piezometer and Monitoring Well Installation Specifications
B. Monitoring Well Sampling and Analytical Methods
C. Quality Control/Quality Assurance Program
D. Health and Safety Program
E. Field Method for Determining Free Product in Soil
F. Well Survey - NJDEP&E - Bureau of Water Allocation Records

APPENDIX A

Piezometer and Monitoring Well Installation Specifications

UNCONSOLIDATED TEMPORARY PIEZOMETER INSTALLATION SPECIFICATIONS





NEW JERSEY DEPARTMENT OF ENVIROMENTAL PROTECTION
UNCONSOLIDATED MONITOR WELL SPECIFICATIONS

APPENDIX B

Sampling and Analytical Methods for Gasoline in Water

APPENDIX B

SAMPLING AND ANALYTICAL METHODS FOR GASOLINE IN WATER

Sample Collection:

Water samples should be collected within two feet of the static water level in the well.

Check for free product and sheens on the water surface in the well.

Check for and note the presence of odors (these substances have an odor threshold limit that may be lower than the analytical detection limits).

Follow NJDEP&E's guidelines for collection, preservation and transport of water samples for volatile organics found in the Field Procedure Manual For Water Data Acquisition and in the Field Sampling Procedures Manual.

If the analytical results are negative (no contamination found) a second round of sampling of all monitoring wells must be conducted approximately 30 days following the first round of sampling to confirm the results.

Analytical Methods:

GROUNDWATER MONITORING WELLS

EPA Method 624 + 15 (GC/MS plus identification of non-targeted compounds) including calibration for xylenes, methyl tertiary butyl ether (MTBE), and tertiary butyl alcohol (TBA).

Once contamination has been identified, other methods found in 40 CFR Part 136 may be used for the second and subsequent rounds of sampling following submittal of the DICAR and upon the specific approval of the Department.

APPENDIX C

Quality Control/Quality Assurance Program

QUALITY ASSURANCE/QUALITY CONTROL

I. SAMPLING PROCEDURES

All sampling shall be in accordance with procedures and specifications set forth in the publication "Samplers and Sampling Procedures for Hazardous Waste Streams", EPA - 600/2-80-018, and the NJDEP Field Sampling Procedures Manual, February 1988. Samples shall be collected at 2' intervals from the surface to the required collection depth.

A. Soil Samples 3'-5', 8'-10', 13'-15' etc.

Soil borings and samples collected during drilling of piezometers and monitoring wells will be performed using a Machine-Operated Powered Auger. Field methodologies and procedures followed will be consistent with that described in ASTM Standards, Volume 04.08 Soil and Rock; Building Stones, Designation: D-1452-90 Standard Practice for Soil Investigation and Sampling by Auger Borings. They are as follows:

1. After the sampling point is selected, unnecessary rocks, twigs, and other non-soil materials will be removed.

2. The boring will be made by rotating and advancing the auger a desired distance into the soil

3. The sampling apparatus will be removed from the ground and the sample transferred into a suitable container. The process will be repeated until an adequate sample quantity is collected.

4. Each container will then be immediately capped. Before collecting the next sample all pertinent data will be recorded in the log book and the sample analysis request form and chain of custody record will be completed.

5. If required the sample will be preserved and/or placed on ice.

6. After decontamination of all equipment, the samples will be immediately delivered to the laboratory for analysis.

B. Groundwater Samples

Each monitoring well shall be bailed with a clean 4" PVC bottom filled bailer. Three volumes of well water volume shall be evacuated and stored in 55-gallon drums until analysis is received. After bailing three volumes, a representative sample will be collected with a clean teflon 2" bottom filled bailer. Sample jars, supplied by the laboratory for the specific analysis, shall be filled directly from the teflon bailer. All bailers shall be decontaminated between monitoring wells in accordance with the decontamination procedures described herein.

II. DECONTAMINATION PROCEDURES FOR SOIL SAMPLING EQUIPMENT

All sample equipment will be cleaned before and after each sample is collected. This is always necessary in order to prevent cross-contamination of samples.

All decontamination and cleaning procedures will be in accordance with procedures and specifications set forth in the publications: "Samplers and Sampling Procedures for Hazardous Waste Streams", EPA - 600/2-80-018 and in the New Jersey Department of Environmental Protection's Division of Waste Management Field Procedures Manual, February, 1988.

The following procedures are to be used in decontamination:

A. All sampling equipment will be hand-wiped to removed all visible residues or any caked-on materials.

B. The equipment will then be thoroughly washed with a detergent/tap water solution, then rinsed with tap water.

C. The equipment will then be rinsed with distilled/deionized water.

D. If the samples are to be analyzed for metals, the sampling equipment must be rinsed with a ten percent nitric acid solution. After this rinse it is necessary to re-rinse the equipment with distilled/deionized water.

E. All equipment will then be rinsed with a pesticide grade acetone and allowed to air dry.

F. A final rinse of all equipment using distilled/deionized water is required. The equipment should be allowed to air dry, unless conditions permit oven drying of sampling equipment.

III. SAMPLE DOCUMENTATION

A. All information pertinent to sampling will be recorded in a log book. The log book will be bound and will accompany sampling personnel to each sample location. All entries will be in ink. The following information will be recorded.

- Date and Time of Sampling
- Sample Location
- Field Measurements
- Weather Condition
- Additional Comments

B. The following sample records will be kept:

- Sample Description
- Volume

- Sample Source
- Sampler Identification
- Time and Date of Sampling
- Weather Conditions
- Sample Laboratory Number
- Sample Method
- Presence of Preservation
- Sample Container
- Reason for Sampling
- Appearance of Sample (color, turbidity, etc.)
- Name and Location of Laboratory Performing Analysis
- Thermal Preservations (method of transportation)

Once the sample is collected, the container is resealed. All pertinent information is recorded on the seal such as collector's name, date and time of sampling, and sample number. Sample seals are necessary to ensure the integrity of the sample until it is opened in the laboratory.

All samples will be submitted to Lancaster Laboratories Inc. of Lancaster, Pennsylvania for analysis.

IV. LABORATORY

Lancaster Laboratories, Inc. of Lancaster Pennsylvania shall perform all analytical work. Lancaster Labs is located at 2425 New Holland Pike, Lancaster, Pennsylvania 17601-5994. Lancaster Labs holds a NJDEP certification #77443 for potable and non-potable water analysis of metals, THMS, VOCs, BTEX pesticides and herbicides. Lancaster Labs shall deliver a final certificate of analysis which includes all requirements of Appendix 6 of the NJDEP "Scope of Work" document, September, 1990.

V. CHAIN OF CUSTODY

To establish the documentation necessary to trace sample possession from the time of collection, until storage after analysis, a chain of custody record will be filled out and will accompany every sample. An example of chain of custody record is attached. Kaselaan & D'Angelo Associates, Inc, utilizes the following chain of custody procedures:

- The sampler is to fill in Section 1 with the client's name and address.
- Section II is filled out as each sample is taken. Record the number of sample, the container type and a description and/or designation of the sample. Safety concerns or other remarks should also appear here.
- Section III is filled out by the person who takes custody of the sample from the sampling team and delivers them to the laboratory.

- Section IV is completed as custody of the sample is initiated and relinquished by those who subsequently handle the sample. All names must be printed and then signed.

The preparation of sample containers is recorded in the laboratory notebook. The sample container is prepared, coded and permanently sealed with a tamper-proof uniquely coded label tape (i.e. Chain of Custody Label). The tape is ripped open in the field when the samples is to be taken.

After the sample is taken, the container is resealed. Such a seal is provided with each sample container. This seal is a corresponding unique label. By sealing the container with the sample, it prevents anyone from opening the container prior to receipt by the laboratory.

VI. LABORATORY SAMPLE DECONTAMINATION

All samples received by Lancaster Laboratories are recorded in a laboratory log book, and assigned an identification number. A sign-in procedure is necessary to ensure delivery of samples to the laboratory, as well as accurate registration into the laboratory's data system. The laboratory shall record the following information:

- Sample Number
- Data Sampled
- Temperature of Sample
- Matrix (Aqueous/Non-Aqueous/Solid)
- Special Handling Procedures
- Bottle Types

The laboratory shall check for:

- Proper Preservatives
- Chain of Custody
- Sample Designation
- Appropriateness of Analysis

The laboratory shall prepare a label for sample identification and indicate method of handling, and method of storage after analysis is complete.

VII. LABORATORY INTERNAL QUALITY CHECKS AND FREQUENCY

Lancaster Laboratory makes the following claim to Internal Quality Assurance:

A. Internal quality control is conducted with either Duplicate Determination and/or Spiked Sample Determination. A duplicate or duplicate spike analysis on one out of every ten (10) samples is done for every parameter determined.

B. The results of the duplication analysis are documented on control charts. Each test shall have a separate document showing the percent deviation in the duplicate results. A separate table will be attached to each chart showing notebook references and dates of each spiked analysis.

VIII. QUALITY ASSURANCE SAMPLES

The following procedures are utilized in identifying unknown waste materials and for soil samples:

A. Blanks:

A travel blank shall occupy the sample containers throughout the sampling and handling protocol. The travel blank consists of a 40 ml. septum vial containing deionized water and is prepared in the laboratory. Field blank shall also be collected on site. These are used to confirm that cross contamination between sample location is not occurring.

B. Duplicates:

For every parameter, duplicate spike analysis should be analyzed on one out of every ten samples (twenty for certain parameters). Duplicate and duplicate spike analysis is conducted to determine recovery. As a general rule, the laboratory performs duplicate or spike analysis on approximately 10 percent of its samples. All data results shall be documented.

C. Split Samples:

All samples will be stored by the laboratory performing the analysis. Upon request, split samples will be made available for the New Jersey Department of Environmental Protection and Energy.

APPENDIX D

Health & Safety Plan

HEALTH & SAFETY PLAN

I. INTRODUCTION

The Site Health and Safety Plan (HASP) defines general applicability and general responsibilities with respect to compliance with OSHA 1910.120, the hazardous waste operations and emergency response standard.

A. Scope of Applicability of the Site Health and Safety Plan

The purpose of this Site Health and Safety Plan is to define the requirements and designate protocols to be followed at Buildings R-6, R-7, the service station and the pump house at NWS Earle waterfront area during investigation activities. Applicability extends to all Government employees, contractors, subcontractors, and visitors.

All personnel on-site, contractors and subcontractors included, shall be informed of the site emergency response procedures and any potential fire, explosion, health or safety hazards of the operation. This HASP summarizes those hazards in table 3.1 and 3.2 and defines protective measures planned for the site.

B. Site Characterization

1. Site Location and History

On September 10, 1990, it was determined that a product release had occurred from a fuel line of an existing underground gasoline tank system. This caused in proximity to Buildings R-6 and R-7 collectively termed the Waterfront Gas Station.

During trenching operations for the installation of a vapor recovery line product was observed in close proximity to a compromise joint in the piping. This leak detection system for these lines will be tested to determine their integrity. Should the system be in good condition, the release would presumably have occurred during installation of the lines and theoretically be limited in nature. Should the integrity of the detection system be compromised or should the contaminating be emanating from another source, the contamination may be much more widespread.

Possible receptors in the area from vapors or free product would be existing buildings (R-6 & R-7), underground storm drain systems or other underground piping which might act as a conduit for the movement of contamination. Since the area is very close to the Raritan Bay, its presumed that groundwater is very shallow in the area. Its also presumed that, should contamination reach the water table, it would move based on localized groundwater flow as well as the tidal effects of the bay.

2. Climatology

The climate in the vicinity of the Earle NWS, Colts Neck is predominantly continental with some influence of Atlantic maritime air. The temperature is moderate with a mean daily high of 60-65°F, and mean daily low of 45-50°F. Average annual precipitation is about 42 inches which is evenly distributed throughout the year.

C. Visitors

All visitors entering the contamination reduction zone and exclusion zone at the Waterfront Gas Station shall be required to read and comply with the provisions of this HASP. In addition, visitors will be expected to comply with relevant OSHA requirements such as medical monitoring (Sec. 6.0), training (Sec. 4.0), and respiratory protection (if applicable). Visitors will also be expected to provide their own protective equipment.

In the event that a visitor does not adhere to the provisions of the HASP, he/she will be requested to leave the work area. All non-conformance incidents will be recorded in the site log, which shall be maintained by the health and safety officer.

II. KEY PERSONNEL/IDENTIFICATION OF HEALTH AND SAFETY PERSONNEL

A. Key Personnel

The following personnel and organizations are critical to the planned activities. The organizational structure will be reviewed and updated periodically by the site supervisor.

Name/Title	Organization/Branch	Address	Telephone
Valdur Kaselaan Project Manager	Kaselaan & D'Angelo	515 Grove Street Haddon Heights New Jersey	(609) 547-6500
Site Supervisor (See Section 4.2)	Kaselaan & D'Angelo	Haddon Heights	(609) 547-6500
Donald E. Smith Health & Safety Officer	Kaselaan & D'Angelo	11 Penn Plaza 5th Floor New York, NY	(212) 216-7000

The Health and Safety Officer HSO will have the authority to override the Project Manager, the On-Scene Coordinator and field personnel in any decision potentially impacting the health and safety of workers, the environment or the community. In the event of a disagreement, the HSO shall report directly to senior management.

B. Site Specific Health and Safety Personnel

The Site Health and Safety Officer (HSO) has responsibility for ensuring that the provisions of this HASP are adequate and implemented in the field.

III. TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS

A. Potential Hazards Anticipated at the Site.

The primary hazards at the Waterfront Gas Station appear to be due to the contamination of soils/or groundwater by gasoline and possibly fuel oil. Due to the investigative nature of the work activities on this phase of the project, additional hazards may be revealed during the work.

B. Field Testing

Selective sampling and analysis of the soils shall include volatile organics + 15, xylene, lead for the identification of gasoline constituents. Analysis of the groundwater for gasoline constituents shall include volatile organics + 15 modified to include calibration for xylenes, methyl tertiary butyl ether (MTBE) and tertiary butyl alcohol (TBA). Selective air sampling shall be performed for volatile organic compounds (via photoionization type detector) and exposure vapors (via an explosimeter).

TABLE 3.1

AIRBORNE CHEMICAL CONTAMINANTS ANTICIPATED AT THE SITES

Contaminant	Ionization Potential (ev)	IDLH (ppm)	Exposure Std. OSHA PEL/ACGIH TLV 8 hour TWA (ppm)
Benzene (A2)	9.25	Ca.	1/10
Ethylbenzene	8.76	2,000	100/100
Hydrogen Sulfide	10.43	300	10/10
Toluene	8.82	2,000	100/100
Xylene	8.56	1,000	100/100

Fuel Oil Constituents

Note:

Ca: Potential human carcinogen

IDLH: Concentration in air considered immediately dangerous to life or health.

(A2): Recognized as a suspect human carcinogen by the ACGIH

ACGIH: American Conference of Governmental Industrial Hygienists.

* Twenty-five percent (25%) lower exposure limit.

The concentration of these materials in air at the site is a function of their concentration in the groundwater and soil, groundwater elevation, temperature, and atmospheric conditions (wind, barometric pressure). Due to the potential for varying concentrations in air, the sampling plan will require initial monitoring to determine the levels in the vicinity of all of the anticipated work activities.

Table 3.2

Task Analysis and Description

	Task	Time	Description	Hazard
1.	Initial Air Monitoring	1 day	Air Sampling throughout the site at anticipated work areas for contaminants listed in Table 1	Inhalation of airborne contaminants/ flammable gas presence
2.	Well Inspection/ Survey	1 day	Visual observaton of monitoring wells	Inhalation of airborne contaminants
3.	Soil Sampling (split spoon)	3 days	Collection of soil samples utilizing a split spoon sampling from depths above the water table (10-15 feet)	Presence of flammable gas/inhalant of airborne VOC's. Noise.
4.	New Well Installation	2 days	Drilling (hollow stem auger), construction of monitoring wells and installation of piezometers.	Inhalation of VOCs release of methane and other gases. Contact with groundwater. Noise.
5.	Stream Sampling (surface & sediment)	1 day	Collection of surface water sample	Inhalation of airborne VOC's. Contact with surface water.
6.	Well Purging	1 day	Bail and purge to develop the groundwater monitoring wells.	Inhalation of VOC's. Contact surface water.
7.	Groundwater	1 day	Sampling of monitoring well Estimated 1 well to be sampled. Includes bailing of three volumes of the well.	Inhalation of VOC's. Release of methane. Contact with groundwater.

IV. PERSONNEL TRAINING REQUIREMENTS

A. Preassignment and Annual Refresher Training

Prior to arrival on-site, each employer will be responsible for certifying that his/her employees meet the requirements of preassignment training. Consistent with OSHA 29 CFR 1910.120 paragraph (e)(3) and N.J. DEP requirements, each employer shall provide a document certifying 40 hours of health and safety training for site workers. An employer may also grandfather experienced personnel with equivalent documentable work experience or training. Personnel must receive 8 hours of annual refresher training if they have not completed the 40 hours of training within the last year. In addition, each employer must be able to document training in compliance with the federal hazard communication standard (OSHA 29CFR 1910.120).

At a minimum, this 40 hour training shall address the following:

1. Chemical hazards
2. Physical hazard
3. Toxicology and permissible exposure limits
4. Personal protective equipment and protection levels
5. Respiratory protection (29 CFR 1910.134) and written respirator program
6. Air monitoring
7. Confined spaces

B. Site Supervisors Training

Consistent with OSHA 29 CFR 1910.120 paragraph (e)(8), individuals designated as site supervisors require an additional 8 hours of training.

The following individuals are currently trained on site supervisors:

Name	Title/Responsibility
Donald E. Smith	Certified Industrial Hygienist/HSO.

Additional names shall be added as training is acquired.

C. Respiratory Protection Program

Each employer shall provide a copy of the corporate respiratory protection plan, which must be in compliance with OSHA 29 CFR 1910.134.

Each employer, as part of this respiratory protection plan shall include copies of fit test forms for each employee who is to perform work on the NWS Earle. This form must include the following information.

1. fit test administrator: name and signature
2. method of fit testing
3. name of employee
4. date of fit testing
5. respirator make, model, size
6. fit test results

Only NIOSH/OSHA approved respiratory protection equipment shall be permitted on-site.

V. PERSONAL PROTECTIVE EQUIPMENT TO BE USED

This section describes the general requirements of the EPA designated Levels of Protection (A-D), and the specific levels of protection required for each task at Quarters G & S-106.

A. Levels of Protection

The specific levels of protection and necessary components for each have been divided into four categories according to the degrees of protection afforded:

Level A: Should be worn when the highest level of skin, eye, and respiratory protection is needed.

Level B: Should be worn when the highest level of respiratory protection (but a lesser level of skin protection) is needed. Level B is the primary level of choice when encountering unknown environments.

Level C: Should be worn when the criteria for using air-purifying respirators are met, and a lesser level of skin protection is needed.

Level D: For the purpose of this HASP, level D refers to an ensemble without respiratory protection. It provides limited protection against chemical hazards via contact.

Modifications of these levels are permitted, and routinely employed during site work activities to maximize efficiency. For example, Level C respiratory protection and Level D skin protection may be required for a given task. Likewise the type of chemical protective ensemble (i.e., material, format) will depend upon contaminants and degrees of contact.

The Level of Protection selected is based upon the following:

- Type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity.
- Potential for exposure to substances in air, splashes of liquids, or other direct contact with material due to work being done.
- Knowledge of chemicals on-site along with properties such as toxicity, route of entry, and contaminant matrix.

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate Level of Protection must be selected based on professional experience and judgment until the hazards can be better identified.

B. <u>Level A and B PPE</u>:

It is not anticipated that level A or B protection will be necessary for any activities at Building S-106 and Quarters G during this phase of the investigation.

C. <u>Level C Personnel Protective Equipment</u>:

Level C protection will be used when the airborne contaminant is known, concentration measured, criteria for using air-purifying respirators is met, a canister is available, and skin and eye exposure is unlikely. Periodic monitoring of the air will be performed. The atmospheric concentration of oxygen must be at least 19.5 percent. Level C consists of the following personnel protective equipment.

- Air-purifying respirator, full-face, cartridge-equipped (OSHA/NIOSH approved) (cartridge to be specified by HSO)
- Chemical-resistant clothing (coveralls; hooded, one-piece or two-piece chemical splash suit disposable chemical-resistant coveralls such as Saranex or polyethylene coated Tyvek.
- Gloves: Outer: chemical resistant (nitrile, neoprene, or equivalent)
  Inner: latex or vinyl single use.
- Work Boots (leather), steel toe

- Chemical-resistant over boots*
- Hard hat
- Duct tape connection between chemical resistant clothing outer boots and gloves

* A steel toe, all rubber, over the sock boot may be substituted for work boot and over boot.

D. <u>Level D Personnel Protective Equipment</u>:

- Coveralls
- Gloves -- outer: chemical resistant (nitrile, neoprene, or equivalent) Inner: latex or vinyl single use.
- Boots leather or chemical-resistant, steel toe, that meet or exceed ANSI Z41.1
- Chemical resistant over boots.*
- Safety glasses or goggles (if eye hazards anticipated)
- Hard hat
- Disposable coveralls (at the discretion of the HSO)
- Duct tape connections between coveralls, outer boots, and outer gloves

* A steel toe, all rubber over-the-sock boot may be substituted for work boot and overboot.

E. <u>Donning Personal Protective Equipment</u>

A sequence for donning an ensemble shall be established. Assistance should be provided if necessary. Once the equipment has been donned, its fit should be evaluated. Following is a sample procedure for donning Level C personal protective equipment. This procedure should be modified as required, depending on exact ensemble used.

1. Inspect the clothing and respiratory equipment according to manufacturers' recommendations.
2. Don coveralls (work clothing/underclothing).

3. Don chemical-resistant clothing; step into legs of suit, ensuring feet are properly placed if "booties" are attached. Gather suit around waist, taping if necessary.

4. Don steel-toe boots.

5. Don chemical-resistant outer boots

6. Don chemical resistant disposable boot Tape top of outermost boots to suit covers.

7. Don respirator and perform positive and negative face seal tests as follows:

   a. Positive pressure test: cover exhalation valve with palm of hand, being careful not to exert any pressure on respirator. Exhale lightly for approximately 10 seconds. Any escape of air around the facepiece indicates a poor fit.

   b. Negative pressure test: cover each cartridge simultaneously with palms of hands. Inhale gently for approximately 10 seconds. Any inward rush of air indicates a poor fit.

   c. Employees who, after routine adjustments of the respirator straps, cannot obtain an acceptable fit, shall not be permitted to enter the Exclusion Zone if such respirator is required for that area.

8. Don inner (latex) gloves.

9. Don hard hat/face shield, adjusting as necessary.

10. Carefully raise hood over head and adjust to give satisfactory comfort.

11. Don outer chemical-resistant gloves and secure to sleeves.

12. Have assistant check all closures and observe wearer for period of time to be certain wearer is psychologically and physically comfortable.

F. Doffing Personal Protective Equipment

Exact procedures for removing personal protective equipment are needed to prevent contaminant migration from the Exclusion Zone and transfer of contamination to the wearer, the doffing assistant and others. Doffing procedure for a Level C ensemble is given. This procedure requires a suitably attired assistant. Both the wearer and the assistant should avoid direct contact with the outside surface of the suit.

1. Remove tape, outer boot covers, and outer gloves.
2. Have assistant open chemically resistant suit, lifting hood over head of wearer.
3. Carefully remove arms from suit while assistant rolls suit outside in.
4. Remove both legs from suit while sitting. Continue to roll suit outside in.
5. Remove respirator.
6. Remove safety boots.
7. Remove inner gloves by rolling them off hands, outside in.
8. Remove coveralls

G. Reassessment of Protection Program

The Level of Protection provided by PPE selection shall be upgraded or downgraded based upon a change in site conditions or findings of investigations as deemed appropriate by the site HSO.

When a significant change occurs, the hazards should be reassessed. Some indicators of the need for reassessment are:

1. Commencement of a new work phase, such as the start of stream or well sampling or work that begins on a different portion of the site.

2. Change in job tasks during a work phase.

3. Change of season/weather.

4. When temperature extremes or individual medical considerations limit the effectiveness of PPE.

5. Contaminants other than those previously identified are encountered.

6. Change in ambient levels of contaminants.

7. Change in work scope which effects the degree of contact with contaminants.

H. Standard Operating Procedures for Personal Protective Clothing

Inspection: The primary inspection of PPE in use for activities at Building R-6/R-7 will occur prior to immediate use and will be conducted by the user. This ensures that the specific device or article has been checked-out by the user, and that the user is familiar with its use.

Sample PPE Inspection Checklists

1. CLOTHING:

Before use:

- Determine that the clothing material is correct for the specified task at hand.

- Visually inspect for:
  - imperfect seams
  - non-uniform coatings
  - tears
  - malfunctioning closures

- Hold up to light and check for pinholes.

- Flex product:
  - observe for cracks
  - observe for other signs of shelf deterioration

- If the product has been used previously, inspect inside and out for signs of chemical attack:
  - discoloration
  - swelling
  - stiffness

During the work task, periodically inspect for:

- Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects.

- Closure failure.

- Tears.

- Punctures.

- Seam Discontinuities.

2. GLOVES

Before use:

- Visually inspect for:
  - imperfect seams
  - tears, abrasions
  - non-uniform coating
  - Pressurize glove with air; listen for pin-hole leaks.

I. Specific Levels of Protection Planned for Building R-6/R-7

The following levels of protection will be utilized during activities at Building R-6/R-7:

____	Level A:	____	modified
____	Level B:	____	modified
x	Level C:	x	modified
x	Level D:	x	modified

Table 5.1 presents the level of protection planned for the completion of individual task assignments and the specific components of each protective ensemble.

TABLE 5.1
SPECIFIC LEVELS OF PROTECTION PLANNED FOR THE TASK ASSIGNMENTS AT BUILDING R-6/R-7

Level A
Tasks:

None Anticipated

Level B
Tasks:

None Anticipated

Level C (modified)

- New Well Installation (Drilling)
- Well Purging
- Groundwater Sampling (Including Well Bailing)

Level D

- Initial Air Monitoring Survey
- Well Inspection Survey
- Soil Sampling (Surface)

VI. MEDICAL SURVEILLANCE REQUIREMENTS

Medical monitoring programs are designed to track the physical condition of employees on a regular basis as well as survey preemployment or baseline conditions prior to potential exposures. The medical surveillance program is a part of each employer's Health and Safety program.

A. Baseline or Preassignment Monitoring

Prior to being assigned to a hazardous or a potentially hazardous activity involving exposure to toxic materials, each employee will receive a preassignment or baseline physical to be performed by a licensed physician, preferably a specialist in occupational medicine. The contents of the physical are to be determined by the employer's medical consultant. The NIOSH/OSHA/USCG/EPA's Occupational Safety & Health Guidance Manual for Hazardous Waste Site Activities recommends the following medical protocol:

- Complete medical and work histories.
- Physical examination.
- Pulmonary function tests (FVC and FEVI).
- Chest X-ray (every 2 years).
- Resting EKG.
- Eye examination and visual acuity.
- Audiometry.
- Urinalysis (microscopic morphology & dipstick).
- Blood chemistry (SMAC 18 or equivalent).
- CBC, including plastlets and differential.

The preassignment physical should categorize employees as fit-for-duty and able to wear respiratory protection. A written certification of fitness for all onsite personnel will be provided by the administering physician prior to the start of work.

B. Periodic Monitoring

If the baseline physical was performed over one year ago, employees require a periodic physical within the last 12 months unless the advising physician believes a shorter interval is appropriate. The employer's medical consultant should prescribe an adequate medical examination which fulfills OSHA 29 CFR 1910.120 requirements. The preassignment medical examination outlined above may be applicable.

All personnel working in contaminated or potentially contaminated areas will be required to have current medical examinations (within 12 months).

VII. AIR MONITORING PLAN

This section explains the general concepts of an air monitoring program and specifies the surveillance activities that will take place during project completion at the Waterfront Gas Station.

The purpose of air monitoring is to assess airborne contaminants in order to determine the level of worker protection needed. Initial screening for identification is often qualitative, i.e., the contaminant, or the class to which it belongs, is demonstrated to be present but the determination of its concentration (quantification) must await subsequent testing. Two principal approaches are available for identifying and/or quantifying airborne contaminants:

- The on-site use of direct-reading instruments.
- Laboratory analysis of air samples obtained by gas sampling bag or collection media (i.e., filter, sorbent).

The Waterfront Gas Station air monitoring plan is designed to provide for the safety of the workers and surrounding population and to determine if on-site activities are creating the potential for off site migration of air contaminants. Due to the nature of the work activities there is very limited potential for the release of air contaminants. Thus the air monitoring plan is intended to be flexible by requiring increased sampling during selected activities and reduced efforts during non-invasive sampling and survey work. The HSO shall have the authority to require additional air monitoring as warranted for the various activities and conditions encountered at the site.

A. Initial Site Monitoring

Site monitoring shall be performed at the beginning of each work day or event to determine the presence of volatile organics. Testing shall be conducted using direct reading instruments (as follows) in all areas of anticipated work activity.

1. PID direct reading instrument (HNu or equivalent) to detect levels of photoionizable volatile organics.

2. Combustible gas indicator (for presence of methane)

3. Toxic gas indicator or detector tubes (for presence of hydrogen sulfide)

B. Periodic Monitoring

Periodic monitoring is an integral part of the plan and helps ensure the appropriate levels of PPE are maintained for the work activity. Again, the level of periodic monitoring is based on the nature of the work and background air sampling results. The levels of periodic monitoring are differentiated as follows. These efforts can be modified by the site HSO after sufficient data has been collected.

1. Level I - for all work exclusive of drilling.

   Initial monitoring using a CGI, PID, and hydrogen sulfide detector and periodic monitoring throughout the duration of the work activity. Periodic monitoring requires a minimum of four readings per day. Initial monitoring is required at the start of all work activity.

2. Level II - during drilling activities (well installation)

   Continuous monitoring during drilling for combustible gases, percent O_2, and organic vapors (CGI, PID).

TABLE 7.2

Instrumentation Action Levels:

Instrument	Action Level	Level of Protection or Action Required
Photoionization Detector	Background to 2 ppm ** (5 min. Time Weighted Avg)	No respirator maintain monitoring schedule
	≥ 2 ppm to 20 ppm**	Full facepiece air purifying respirator; establish exclusion zone if not already present.
	≥ 20 ppm to 500 ppm**	Supplied air respirator.
	≥ 500 ppm**	Shut down operation, evacuate personnel from area and let vent.

The photoionization detector shall be calibrated daily to benzene (or its equivalent). Monitoring will be performed in the breathing zone of personnel.

Combustible Gas Indicator	< 10% LEL*	Maintain monitoring schedule.
	10% to 25% LEL*	Conduct continuous monitoring.
	≥ 25% to 50% LEL*	Shut down operation, allow to vent, continue monitoring.
	≥ 50% LEL*	Shut down operation, evacuate personnel from area and let vent.
Hydrogen Sulfide	< 5ppm *	Maintain periodic monitoring.
	≥ 5 ppm to 10 ppm*	Conduct measurements every 15 minutes during work activities.

Instrument	Action Level	Level of Protection or Action Required
Hydrogen Sulfide	≥ 10ppm**	Supplied air respirator.
	> 50 ppm**	Shut down operation, evacuate personnel from area and let vent.

* Samples taken within 1 foot of the bore hole or excavation area.
** Samples taken at the breathing zone.

NOTE: IF AIR MONITORING RESULTS CALL FOR RESPIRATORS OR OTHER PROTECTIVE MEASURES WHICH ARE NOT IMMEDIATELY AVAILABLE, THE WORK SHALL CEASE AND PERSONNEL SHALL EVACUATE THE EXPOSURE AREA.

VIII. SITE CONTROL MEASURES

The following section defines measures and procedures for maintaining site control. Site control is an essential component in the implementation of the site health and safety program.

A. Buddy System

During all activities in the Exclusion Zone, the implementation of a buddy system is mandatory. A buddy system requires at least two people who work as a team, each looking out for each other. They must be in visual contact at all times.

B. Site Communications Plan

Successful communications between field teams and contact with personnel in the support zone is essential. The following communications systems will be available during activities at the Waterfront Gas Station.

1. A car will be used to drive to the nearest telephone, or a car phone will be present

2. All communication in the field will be verbal.

C. Work Zone Definition

There will be two general work zones established for Level C task assignments. For each Level C task, an exclusion zone shall be established which extends 20 feet in radius from the center of work. All people entering the exclusion zone during work activities shall be donned in Level C personal protective equipment. The Exclusion zone are may be reduced or increased by the HSO depending on the results for air monitoring.

Second general work area, called the contamination reduction zone shall be located between a twenty (20) foot and fifty (50) foot radius from the center of each level C activity.

The Contamination Reduction Zone is the area in which personnel conduct personal and equipment decontamination. It is essentially a buffer zone between contaminated areas and clean areas. This area shall be used for the decontamination of personnel and equipment including materials brought from off-site locations for decontamination.

All decontamination wash and water residues shall be collected and stored in this area. Volumes of water and residue will depend upon the degree and frequency of decontamination necessary, and cannot be predicted prior to the start of on-site activities.

The contamination reduction zone, as with the exclusion zone, shall be reduced or increased by the HSO depending on air monitoring results.

All areas beyond the contamination reduction zone shall be considered clean areas.

IX. DECONTAMINATION PLAN

A. Personnel

All outer layers of clothing such as suits, gloves, boots etc. will be disposed in 6 mil. plastic bags after use. Hand and face washing facilities are available. The site supervisor will obtain keys to the building and arrange for water to be turned on so that water and toilet facilities are available. All site personnel will minimize contact with contaminants in order to minimize the need for extensive decontamination.

B. Equipment

Drilling equipment will be decontaminated in the exclusion zone with a steam cleaner using potable water.

Air monitoring instruments will be wiped clean with moist wipes or clean wet rags. Rags will be disposed in 6 mil. plastic bags after use.

C. Sampling Equipment

Split spoon samples, bailers and thief samples will be decontaminated before and after each use as follows.

1. All sampling equipment will be hand-wiped to removed all visible residues or any caked-on materials.

2. The equipment will then be thoroughly used with a detergent/tap water solution, then rinsed with tap water.

3. The equipment will then be rinsed with distilled/deionized water.

4. If the samples are to be analyzed for metals, the sampling equipment must be rinsed with a ten percent nitric acid solution. After this rinse it is necessary to re-rinse the equipment with distilled/deionized water.

5. All equipment will then be rinsed with pesticide grade acetone and allowed to air dry.

6. A final rinse of all equipment using distilled/deionized water is required. The equipment should be allowed to air dry, unless conditions permit oven drying of sampling equipment.

D. Disposition of Decontamination Wastes

All equipment and solvents used for decontamination shall be decontaminated or disposed of properly. All disposal will be the responsibility of the contractor a drum staging area will be established in the Contaminant Reduction Zone. All used, disposable PPE shall be bagged and placed in the staging area for subsequent disposal at a facility authorized to receive such waste. Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment shall be informed of the nature of the contaminants anticipated to be present.

X. EMERGENCY RESPONSE/CONTINGENCY PLAN

This section describes contingencies and emergency planning procedures to be implemented.

A. Pre-Emergency Planning

During the site briefings held periodically/daily, all employees will be trained in and reminded of provisions of the emergency response plan, communication systems, and evacuation routes. Table 3.2 identifies the hazardous conditions associated with specific site activities.

The plan will be reviewed and revised if necessary on a regular basis by the HSO. This will ensure that the plan is adequate and consistent with prevailing site conditions.

B. Personnel Roles and Lines of Authority

The Site Supervisor has primary responsibility for responding to and correcting emergency situations. This includes taking appropriate measure to ensure the safety of site personnel and the public. Possible actions may include notification of the NWS Earle Emergency Coordinator of any emergencies involve evacuation of personnel from the site area, and coordination with NWS Earle Emergency Coordination regarding evacuation of adjacent facilities. He/she is additionally responsible for ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed. The HSO may be called upon to assist or act on the behalf of the site supervisor.

The individual contractor organizations are responsible for assisting the project manager in his/her mission within the parameters of their scope of work.

C. Evacuation Routes/Procedures

In the event of an emergency which necessitates an evacuation of the site, the following procedures will be implemented:

Personnel will be expected to proceed to the closest exit with their buddies, and mobilize at a safe distance area. Personnel will remain at that area until or an authorized individual provides further instructions.

The NWS Earle Emergency Coordinator, Chief Henry, shall be notified immediately of any site emergencies. He will assume responsibility for evacuating residents and other off-site personnel. Chief Henry can be contacted at (908) 577-2333.

D. Emergency Contact/Notification System

The following list provides names and telephone numbers for emergency contact personnel. In the event of a medical emergency, personnel will take direction from the site supervisor and notify the appropriate emergency organization. In the event of a fire or spill, the site supervisor will notify the appropriate local, state, and federal agencies.

Organization	Contact	Telephone
Emergency (on site spill, fire, release)	Chief Henry NWS Earle Fire Department	(908) 577-2333
Ambulance:	NWS Earle	(908) 577-2401
Security:	Marine Sergeant	(908) 577-2457 577-2443
Fire:	NWS Earle Fire	(908) 577-2333
Hospital:	Riverview Hospital	(908) 741-2700
Poison Control Center:		(800) 962-1253
State Authority:	NJDEP&E	(800) 648-0394
National Response Center:		(800) 424-8802

E. Emergency Medical Treatment Procedures

Any person who becomes ill or injured in the exclusion zone must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, partial decontamination should be attempted to the extent feasible, provided it does not present a risk of worsening the victim's condition. First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the project manager.

F. Spill or Leaks

In the event of a spill or a leak, site personnel will:

1. Inform their supervisor immediately;

2. Locate the source of the spillage and stop the flow if it can be done safely; and,

3. Begin containment and recovery of the spilled materials.

4. Notify the NWS Earle Emergency Coordinator.

XI. RECORD KEEPING

A. Medical Records

1. Medical records shall be kept numerically in accordance with the requirements of 29 CFR 1910-20.

2. Any subcontractors whose services will be utilized for the project shall make available to Kaselaan & D'Angelo Associates documentation of their employees' participation in a medical surveillance program.

B. Training Records

Records should be maintained in each employee's file to confirm that persons assigned to a task have had adequate, appropriate and up-to-date training regarding:

1. Occupational noise exposure in accordance with 29 CFR 1910.95

2. Hazard Communication in accordance with 29 CFR 1910.1200.

3. Records of training (e.g. daily safety meeting) shall be kept in a log book and shall include the following information, record keeping etc. at a minimum: date, topic(s) discussed, attendees, and signature of leader.

C. Sampling Results

The HSO must ensure that records pertaining to all on-site monitoring are maintained. This information shall include, but not be limited to: date, technician, sample identification number, sampling method, analysis requested, destination, and signatures of all persons involved in transferring the sample to its endpoint.

D. Respirator Fit Test Forms

Each company shall provide the following information for each employee assigned a respirator in accordance with 29 CFR 1910.134.

1. Make, model, and size respirator.

2. Fit test records including the method used and the person administering the test, shall also be provided.

3. This information shall be kept by Kaselaan & D'Angelo Associates or their designee and be accessible to the HSO.

E. Occupational Noise Exposure

Personnel in the immediate vicinity will wear hearing protection during drilling operations.

APPENDIX E

Field Method for Determining Free Product in Soil

THE NJDEP&E'S RECOMMENDED

FIELD METHODS FOR DETERMINATION OF PETROLEUM

FREE PRODUCT IN CONTAMINATED SOILS[1]

The two methods presented below can be used in the field to make a distinction between soils contaminated with free product (soils at residual saturation) and soils that are contamianted with dissolved product. These methods will not determine if a soil is "clean". These methods are only intended to separate out free product contaminated soils from soils which may be contaminated at a lower concentration. These methods are only applicable to petroleum fuels such as gasoline.

METHOD 1 - SOIL/WATER AGITATION

A clear jar is partially filled with the soil/fill sample. Sufficient water is added to saturate the soil and bring the water level to about 1 cm above the soil surface. The jar is sealed, and the sample is agitated by shaking. The jar is then opened to check for the presence of a sheen on the water surface. If a sheen is present, the soils have been contaminted by free product. If no sheen is present, the soils are either contaminated with dissolved product or are free of contamination. The presence of a sheen should be checked under various lighting conditions and backgrounds since these factors will affect the visibility of the sheen. Obviously, this method should only be used with products that exhibit visible sheens in water. This method should be supplemented with Method 2 below.

METHOD 2 - FIELD SORPTION METHOD

This method is used to sorb free product from contaminated soils. A sample of the soil/fill is pressed against a brown paper bag for about 10 seconds. Soils contaminated by free product result in a "greasy" staining of the bag. The stain is more pronounced with fuel oils than for gasoline. Due to rapid evaporation of gasoline, the observer must check for evidence of staining from gasoline quickly, before it volatilizes from the paper. Interference from soil moisture may result in water transfer to the bag but generally the water does not spread on the bag as does fuel oil or gasoline. This method should be supplmented with the soil/water agitation method.

[1] New Jersey Department of Environmental Protection, Division of Water Resources, Bureau of Underground Storage Tanks, Technical Guidance Document, Interim Closure Requirements for Underground Storage Tank Systems, September 1990.

APPENDIX F

Well Survey - 1/2 Mile Radius
NJDEP&E Division of Water Resources
Bureau of Water Allocation Records

Let's protect our earth

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
CN 029
Trenton, N.J. 08625-0029

Office of
the Director

(609) 292-1637
Fax # (609) 984-7938

The well survey that you have requested includes the wells that are currently contained in the Water Allocation Files which relate to the area in question. Recognizing the fact that not all well records have been submitted, wells installed before 1947 are not included and that there can be errors in location, it is advisable to use this resource as a guide. The Bureau recommends that a field survey of the area in question be performed in order to verify all data. We try to maintain accurate well records; however, well locations are only as accurate as the information supplied by the drilling company. Therefore, we cannot guarantee their reliability. Local Health Departments should also be contacted concerning the locations of wells within their jurisdiction. Please call or write to us in reference to "Well Surveys" at:

NJDEP
Division of Water Resources
Bureau of Water Allocation
CN - 029
Trenton, New Jersey 08625
(609) 292-2957

Thank you.

JGG/la

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Recycled Paper

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 29 19434
Atlas Sheet Coordinates ~~29~~ : ~~03~~ : ~~566~~

OWNER IDENTIFICATION - Owner KOELSCH, KEVIN & JANICE
Address 1106 BAY AVENUE
City TOMS RIVER State NJ Zip Code 08753

WELL LOCATION - If not the same owner please give address. Owner's Well No.
Address 333 Shore Road
County Monmouth Municipality MIDDLETOWN TWP. Lot No. 48.01 Block No. 1141

WELL USE Domestic Status

WATER USE Potable Average gals. daily Maximum gals. daily

WELL CONSTRUCTION Date well completed 10 / 23 / 87
BOREHOLE DIMENSIONS Depths: Total 120 ft. Finished 120 ft.
Diameter: Top 4 in. Bottom 4 in.
Land Surface Elevation at well 43 ft. Elevation was determined using topography Map #29
Casing Height (stick-up) above land surface 1.5 ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL *Screens: Note Slot Size(s)*
Casing 1		120	4	PVC
Casing 2				
Casing 3				
Screen 1	100	15	4	.015" PVC
Screen 2				
Tail Piece		5		
Gravel Pack				500# of #1
Grout				
Grouting Method				

WELL FLOWS NATURALLY 100 gals. per min. at ft. above the land surface.
Water rises to ft. above the land surface.

RECORD OF TEST Test Date 10 / 23 / 87
Static water-level before pumping 21 ft. below land surface. Water level 60 ft. below land surface after 1 hrs. of pumping.
Water level was measured using orafice Drawdown 39 ft.
Discharge rate measured using Discharge Rate 100 gals. per min.
Well was pumped using air Specific Capacity .39 gals. per min. per ft. of drawdown
Observed effects on nearby wells none
Water Quality (taste, odor, color, etc.) good

PERMANENT PUMPING EQUIPMENT Installed by Dave Van Brunt Pump Type submersible
Mfrs. Name Goulds Model
CAPACITY: Pump delivers 10 GPM at PSI pressure.
POWER: ½ HP at 3450 RPM Power Source electricity
DEPTHS: Pump ft. Footpiece ft. Airline ft.
FLOW METER: Model installed on in. diameter pipe.

CONTRACTOR - Name of Drilling Contractor TIGER CONSTRUCTION CORP.
Address 806 Highway 71, P.O. 394
City Spring Lake Heights State N.J. Zip Code 07762
Name of Driller Dennis Buchannan License No. 1393

Signature of Contractor [signature] Date 11 / 2 / 87

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 29 - 19434
29: 03: 566

Driller: Please use the space below for the log description. Note water bearing zones geological formation.

Are samples available? ☐ Yes ☒ No

Drilling Method Rotary

Type of Rig

Aquifer/Geo. Fm.

DEP USE ONLY

Storet Hydrogeo Code
USGS Hydrogeo Code
Depth to Bedrock ft.
Bedrock Lith. Code
Bedrock Fm. Code

Completed by
Date / /

LOG

	Thick.	Lith.	Fm.
0-3 Clayey topsoil			
3-12 Brown sandy clay & sand			
12-38 Gray clay			
38-71 Fine to medium gray Quartz sand			
71-76 Gray clay			
76-116 Fine to medium coarse gray sand			
116-120 Fine gray sand & gray clay lenses			

GWPI No. -

NJPDES No. -

Latitude ° ' "

Longitude ° ' "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10' ☐ 20"

USGS Quadrangle

Drainage Basin Code

County/Municipality Code

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data
☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by

Date / /

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

- K -

Form 87-5M-4-49

RECEIVED JAN 30 1951 Department of Conservation & Economic Development Geological Survey

DEPARTMENT OF CONSERVATION AND ECONOMIC DEVELOPMENT
Division of Water Policy & Supply

Permit No. 29-124
Application No.
County Monmouth

WELL RECORD

1. OWNER U. S. Navy Naval Ammunition Depot ADDRESS Earle, New Jersey

Owner's Well No. 24 SURFACE ELEVATION +51 Feet (Above mean sea level)

2. LOCATION Quarters "K"

3. DATE COMPLETED Nov. 6, 1950 DRILLER C. W. Lauman & Co., 50 Church St., N.Y.C.

4. DIAMETER: Top 6 Inches Bottom 6 Inches TOTAL DEPTH 171' 5" Feet

5. CASING: Type Single Diameter 6 Inches Length 163 Feet

6. SCREEN: Type Johnson Everdur Size of Opening #12 Diameter 5½" OD. Inches Length 10' 9"

Range in Depth { Top 160' 8" Feet / Bottom 171' 5" Feet } Geologic Formation See DWG 6DD-3

Tail piece: Diameter None Inches Length -- Feet

7. WELL FLOWS NATURALLY - Gallons per Minute at - Feet above surface

Water rises to -- Feet above surface

8. RECORD OF TEST: Date Nov. 3, 1950 Yield 11 Gallons per minute

Static water level before pumping 43 Feet below surface

Pumping level 84 feet below surface after 7 hours pumping

Drawdown 41 Feet Specific Capacity 27 Gals. per min. per ft. of drawdown

How Pumped Drop Pipe Plunger How measured Filling 5 gal. pail

Observed effect on nearby wells No observations made

9. PERMANENT PUMPING EQUIPMENT:

Type Unknown - not in our contract Capacity Gallons per minute

How Driven -- Horse Power -- R.P.M. --

Depth of pump in well - Feet Depth of foot piece in well - Feet

10. USED FOR Household AMOUNT { Average 500 Gallons Daily / Maximum 750 Gallons Daily }

11. QUALITY OF WATER See over Sample: Yes No.

Taste Odor Color Temperature °F

12. LOG See DWG 6DD-3 Are samples available? Yes
(Give details on back of sheet or on separate sheet)

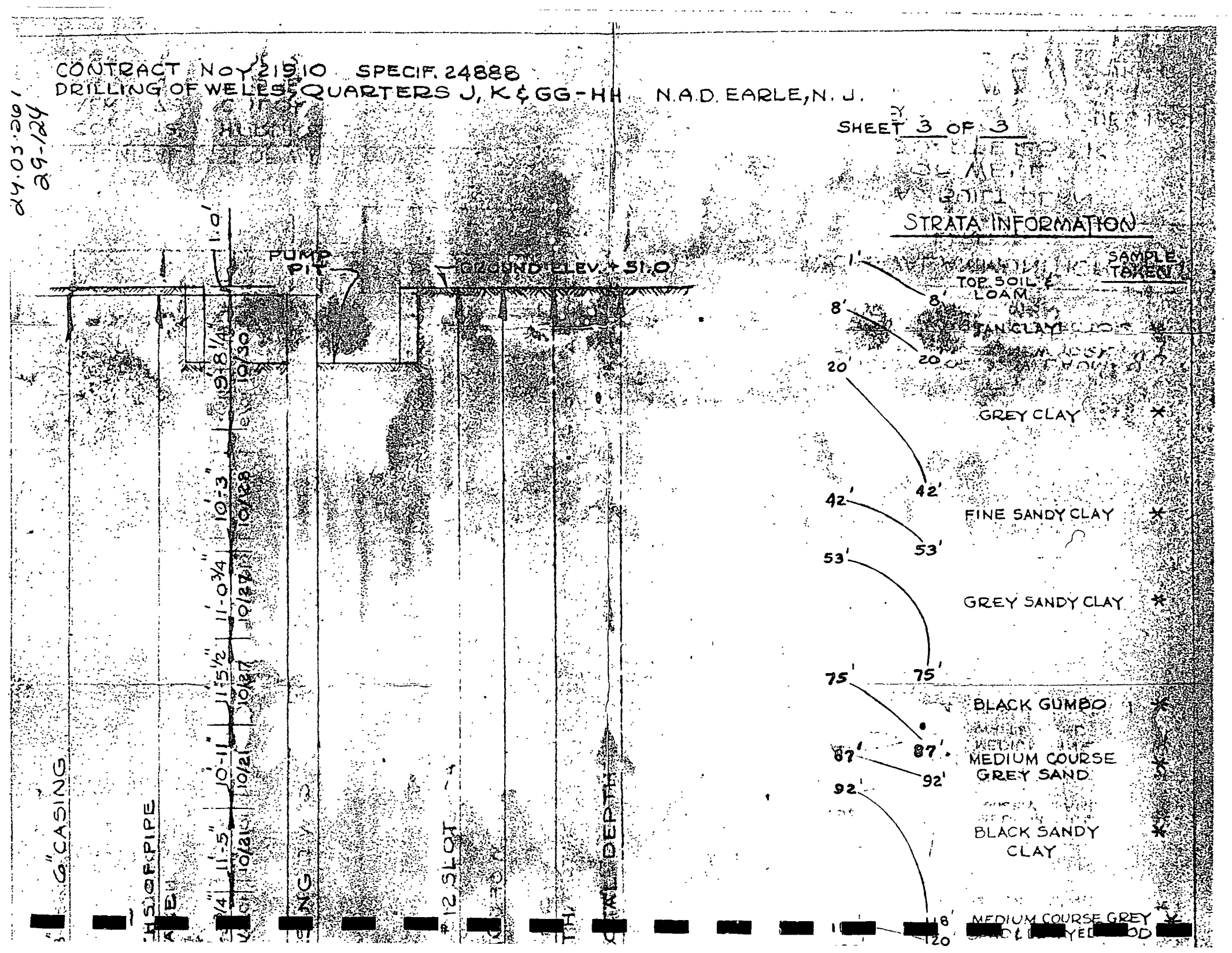
13. SOURCE OF DATA Driller's Log

14. DATA OBTAINED BY R. C. Bunten DATE Jan. 29, 1951

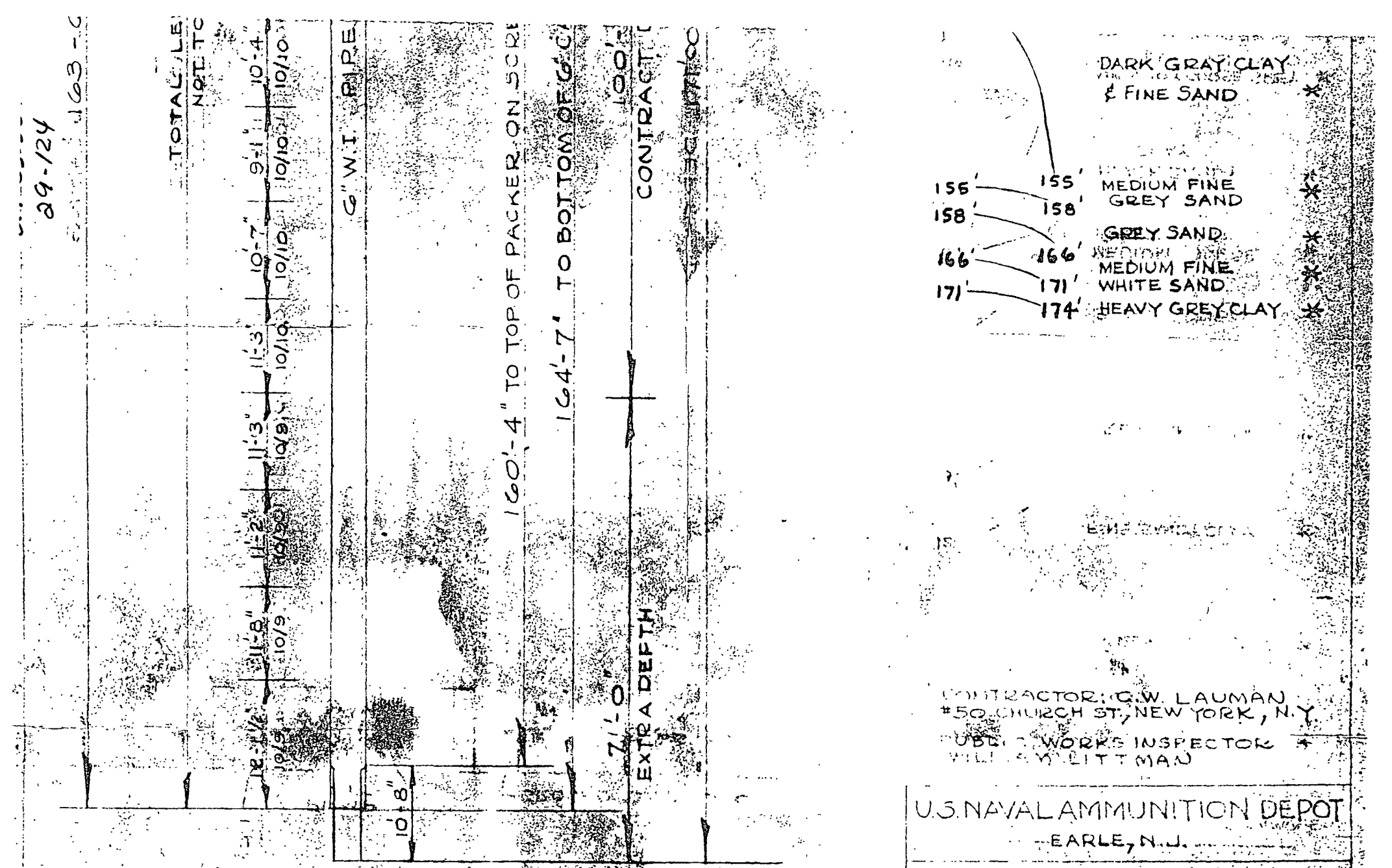
(Note: Use other side of this sheet for additional information such as log of materials penetrated, analysis of the water, sketch map, sketch of special casing arrangements, etc.)

CONTRACT NO Y-21910 SPECIF. 24888
DRILLING OF WELLS QUARTERS J, K & GG-HH N.A.D. EARLE, N. J.

SHEET 3 OF 3



24.03.201
29-124



CHEMICAL TEST OF WATER MADE BY STATION FORCES 11/6/50.

CO_2	12	HARDNESS	80
ALK	72	COLOR	CLEAR
PH	6.7	TASTE	NONE
FE	1.3	ODOR	NONE

U.S. NAVAL AMMUNITION DEPOT
EARLE, N.J.

"AS BUILT" PLAN
OF WELL
AT QUARTERS "K"

PW-693-B 8 DEC 1950

SUBMITTED: 20 Kirk

APPROVED: H. Hartness

[redacted] DR. [redacted] U.S.N. [redacted] C.D. [redacted]

Form DWR-138
11/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 29 – 22807
Atlas Sheet Coordinates ~~29~~ : ~~03~~ :~~569~~

OWNER IDENTIFICATION - Owner Tuttle, Bill
Address 64 Leonardville Road
City Leonardo State NJ Zip Code

WELL LOCATION - If not the same owner please give address. Owner's Well No.
Address Same As Above
County Monmouth Municipality Middletown Lot No. 31Thr36 Block No. 1201

WELL USE Withdrawal Status In Use

WATER USE Irrigation Average 2000 gals. daily Maximum 4000 gals. daily

WELL CONSTRUCTION Date well completed 89 / 06 / 19
BOREHOLE DIMENSIONS Depths: Total 68 ft. Finished ft.
Diameter: Top 8.5" in. Bottom ----- in.
Land Surface Elevation at well 50 ft. Elevation was determined using Topographic Map
Casing Height (stick-up) above land surface ~~1.5'~~ 0 ft.

	DEPTH TO TOP (FT.)	LENGTH (FT.)	DIAMETER (IN.)	TYPE AND MATERIAL *Screens: Note Slot Size(s)*
Casing 1		53	4.0"	Schedule 40 PVC
Casing 2				
Casing 3				
Screen 1	53	10	4"	~~Schedule 40 PVC/.020~~
Screen 2				
Tail Piece		5'	4"	
Gravel Pack	43	25'	8.5"	.025 Blended
Grout	Surface	43		200 mesh Bentonite
Grouting Method	Pressure, Thru Tremie Pipe			

WELL FLOWS NATURALLY gals. per min. at ft. above the land surface.
Water rises to ft. above the land surface.

RECORD OF TEST Test Date 89 / 06 / 19
Static water-level before pumping 30 ft. below land surface. Water level 46 ft. below land surface after 1 hrs. of pumping.
Water level was measured using Estimated Drawdown 16 ft.
Discharge rate measured using Measured Container Discharge Rate 45 gals. per min.
Well was pumped using Air Lift Specific Capacity 2.8 gals. per min. per ft. of drawdown
Observed effects on nearby wells None
Water Quality (taste, odor, color, etc.) Good

PERMANENT PUMPING EQUIPMENT Installed by PICKWICK WELL DRLG Pump Type Submersible
Mfrs. Name ~~Gould~~ Model 10EJ05
CAPACITY: Pump delivers 12 GPM at 40 PSI pressure.
POWER: 1/2 HP at 3450 RPM Power Source Electric
DEPTHS: Pump 50 ft. Footpiece ft. Airline ft.
FLOW METER: Model installed on in. diameter pipe.

CONTRACTOR - Name of Drilling Contractor PICKWICK WELL DRILLING
Address P.O. Box 6, Farmingdale, NJ 07727 (201) 938 5300
City State Zip Code
Name of Driller David Primost M1041 ~~Norman Primost J1040~~ ~~Allen Primost J1407~~ License No.

Signature of Contractor Date 89 / 07 / 25

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

Form DWR-138
1/85

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

WELL RECORD

Well Permit No. 29 - 22807
29·03·569

Driller: Please use the space below for the log description. Note water bearing zones geological formation.

Are samples available? ☐ Yes ☒ No

Drilling Method MUD ROTARY

Type of Rig T.H. DRIVE

Aquifer/Geo. Fm. KET

LOG

0-5 Tan & Brown Silty Fine Sand w/Clay
5-10 Tan Med. Sand w/ Coarse gravel
10-15 Dark Brown Clay
15-27 Dark Gray Clay
27-40 Med. & Fine Gray Sand / trace bark
40-68 Med & Fine Gray Sand / bark / Some gray Clay / Some coarse Sand w/ bark

DEP USE ONLY

Storet Hydrogeo Code
USGS Hydrogeo Code
Depth to Bedrock ft.
Bedrock Lith. Code
Bedrock Fm. Code

Completed by
Date / /

Thick.	Lith.	Fm.

GWPI No. - NJPDES No. -

Latitude ° ' " Longitude ° ' "

Lat-Long Accuracy ☐ 1" ☐ 5" ☐ 10" ☐ 20"

USGS Quadrangle

Drainage Basin Code County/Municipality Code

OTHER FILES: ☐ Lithologic Log ☐ Samples Available ☐ Aquifer Test ☐ Water Level Data
☐ Geophysical Logs ☐ Water Chemistry ☐ Pollution Case

Checked by Date / /

FIGURES

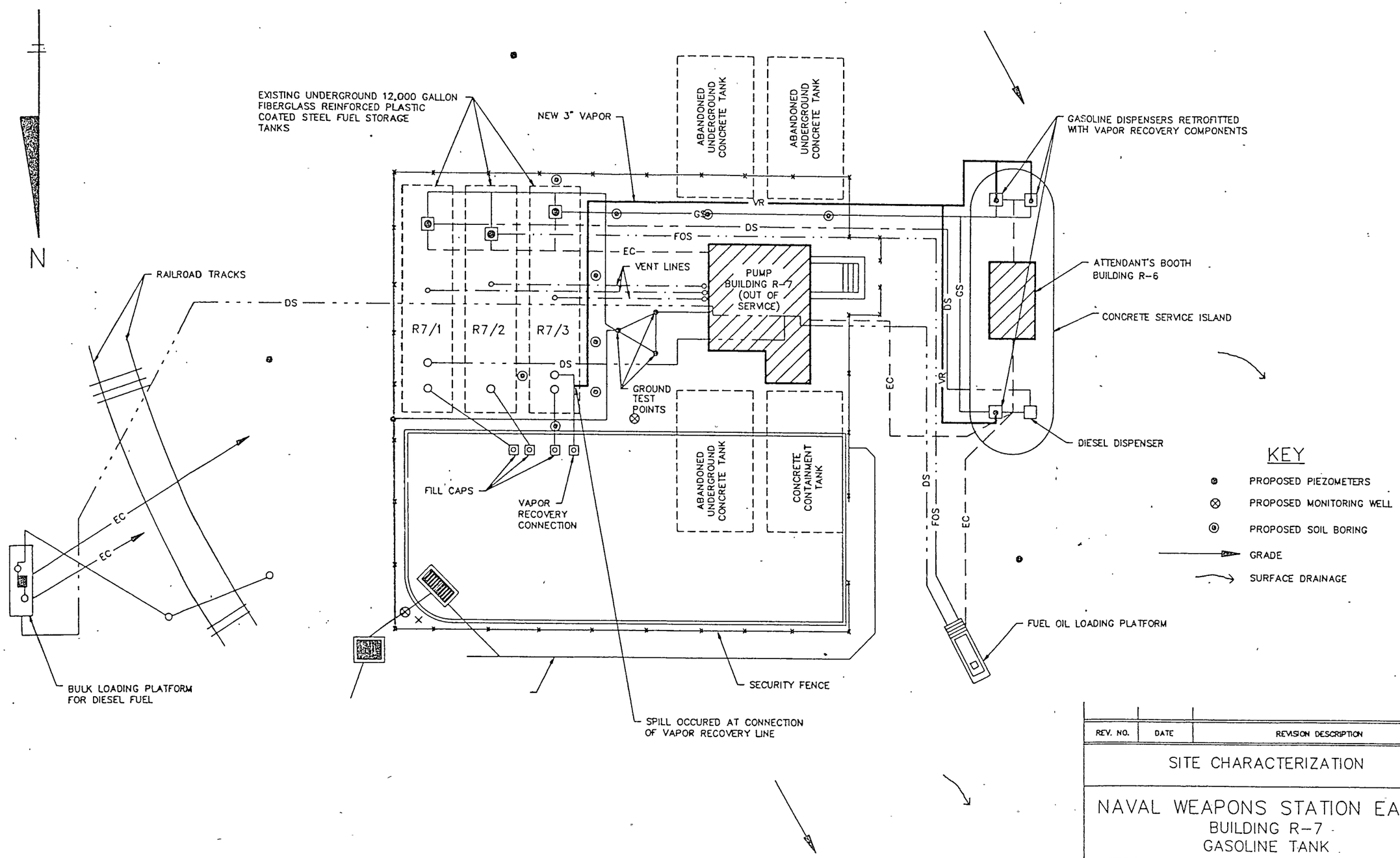
Figure 1 - Building R-6/R-7 Site Characterization Plan

Figure 2 - Historic Condition and Soil Borings

Figure 3 - USGS Quadrangle - Waterfront Area (1/2 Mile Radius)

Figure 4 - USGS Quadrangle - Waterfront Area (1 Mile Radius)

Figure 1 - Building R-6/R-7 Site Characterization Plan



REV. NO.	DATE	REVISION DESCRIPTION

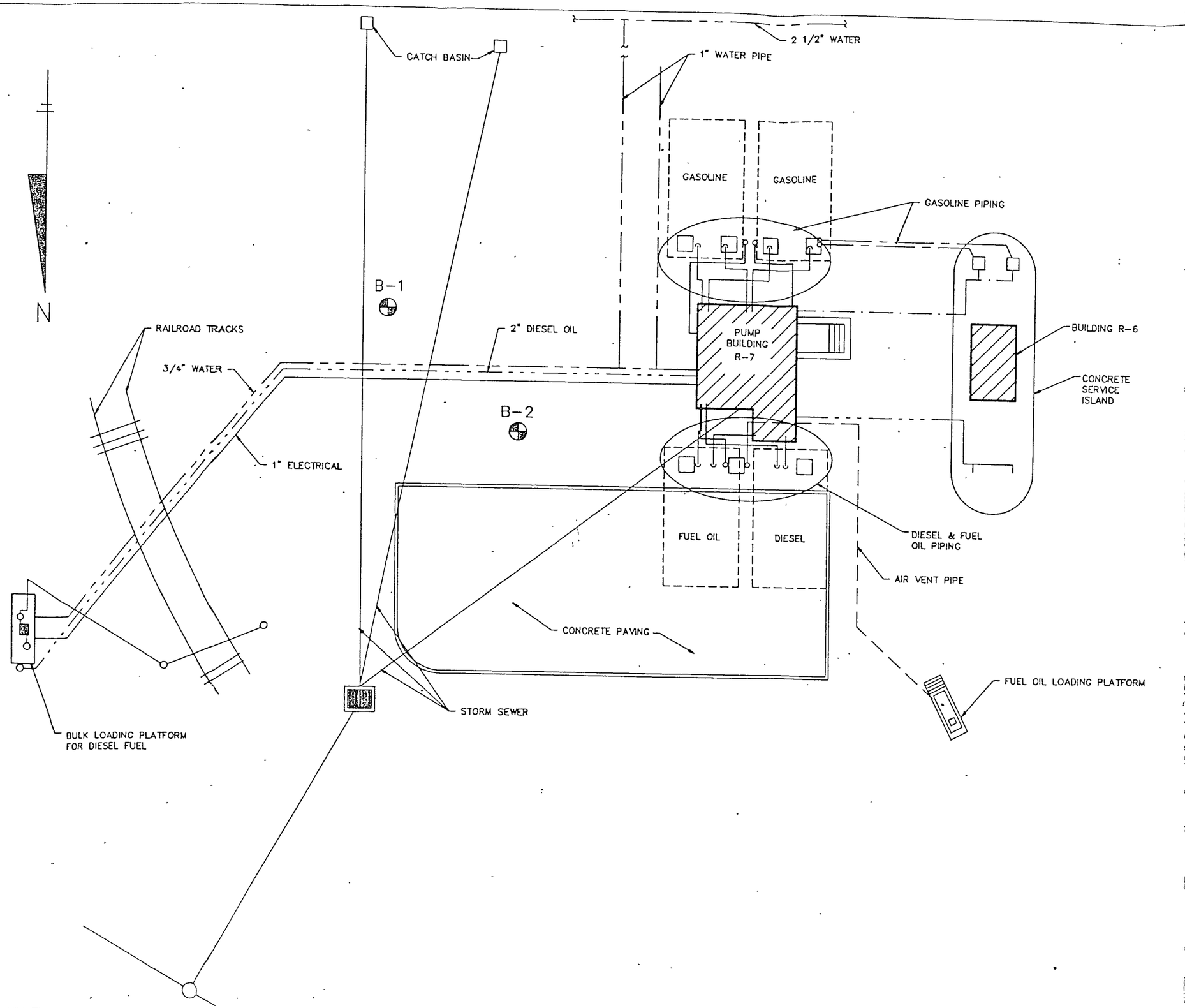
SITE CHARACTERIZATION

NAVAL WEAPONS STATION EARLE
BUILDING R-7
GASOLINE TANK

WATERFRONT AREA — NEW JERSEY

Drawn By: M.S.	Kaselaan & D'Angelo Associates, Inc.	Scale: 1/16"=1'
Approved By:	Engineering & Land Surveying Environmental Consultants	Sheet: Figure 1
Date:	515 Grove Street, Haddon Heights, N.J. 08035 (609) 547-6500	Drawing No.: E1-3078-4

Figure 2 - Historic Condition and Soil Borings



BORING LOG B-1

DATE: 9/2/82

Depth	Description
0–4	BROWN FINE TO MEDIUM SAND SOME GRAVEL, LITTLE SILT
4–8	BROWN FINE SAND, SOME SILT, LITTLE TO SOME CLAY
8	GROUND WATER
8–17	GRAY FINE SAND, LITTLE SILT
17–22	DRAK GRAY CLAY, LITTLE SILT, LITTLE FINE SAND

BORING LOG B-2

DATE: 9/2/82

Depth	Description
0–4	BROWN FINE TO MEDIUM SAND, LITTLE TO SOME SILT, TRACE OF GRAVEL
4–8	BROWN FINE SAND. SOME SILT, THIN LAYERS OF SILT & CLAY
8	GROUND WATER
8–16	BROWN & GRAY FINE SAND. TRACE TO LITTLE SILT
16–22	DARK GRAY CLAY & SILT. LITTLE FINE SAND

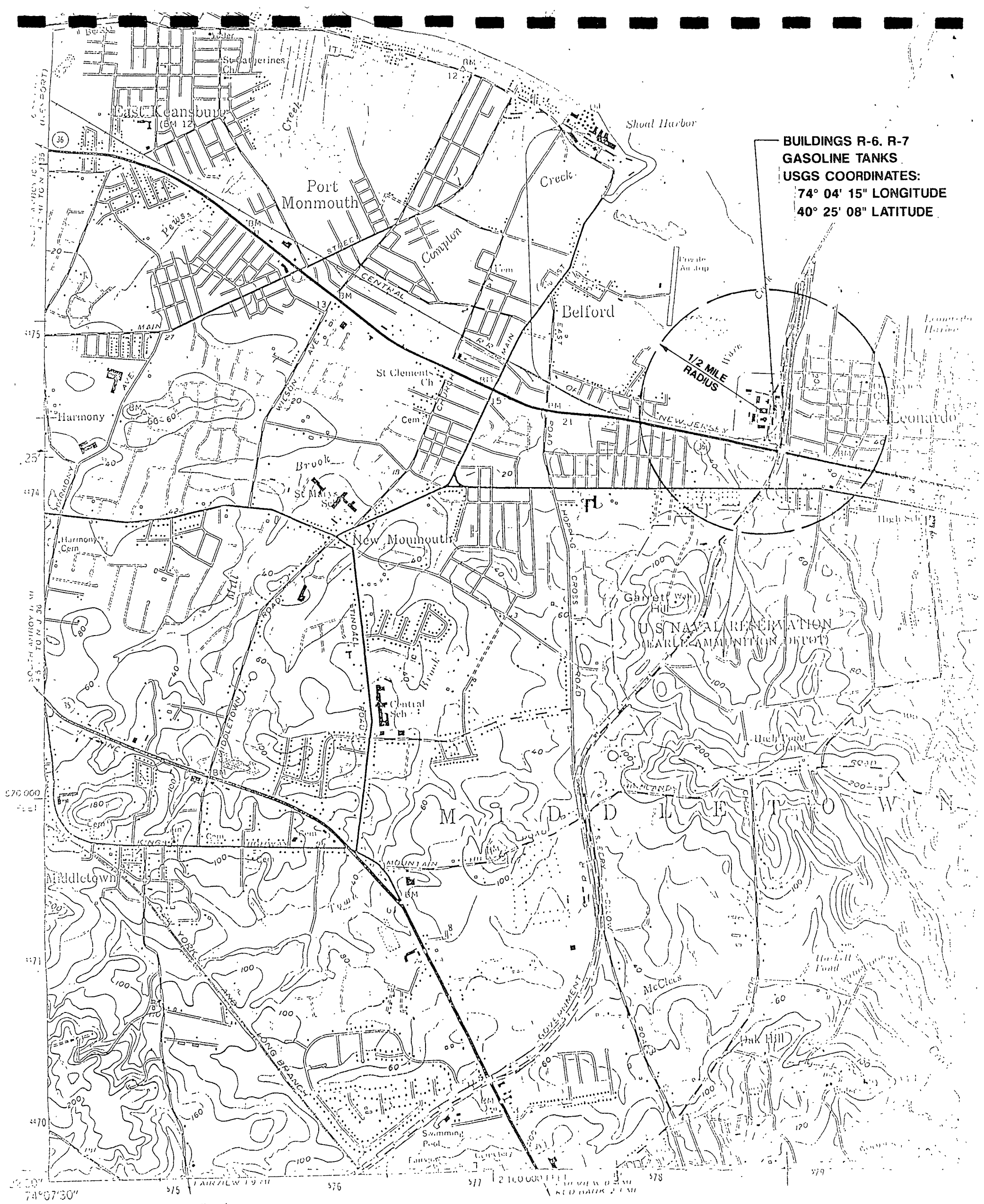
REV. NO.	DATE	REVISION DESCRIPTION

HISTORIC SITE CONDITIONS, BORING LOGS AND SURROUNDING SUBSURFACE UTILITIES

NAVAL WEAPONS STATION EARLE
BUILDING R-7
GASOLINE TANK
WATERFRONT AREA
NEW JERSEY

Drawn By: M.S.	Kaselaan & D'Angelo Associates, Inc.	Scale: 1/16"=1'
Approved By:	Engineering & Land Surveying Environmental Consultants	Sheet: Figure 2
Date:	515 Grove Street, Haddon Heights, N.J. 08035 (609) 547-6500	Drawing No.: E1-3078-4

Figure 3 - USGS Quadrangle - Waterfront Area (1/2 Mile Radius)



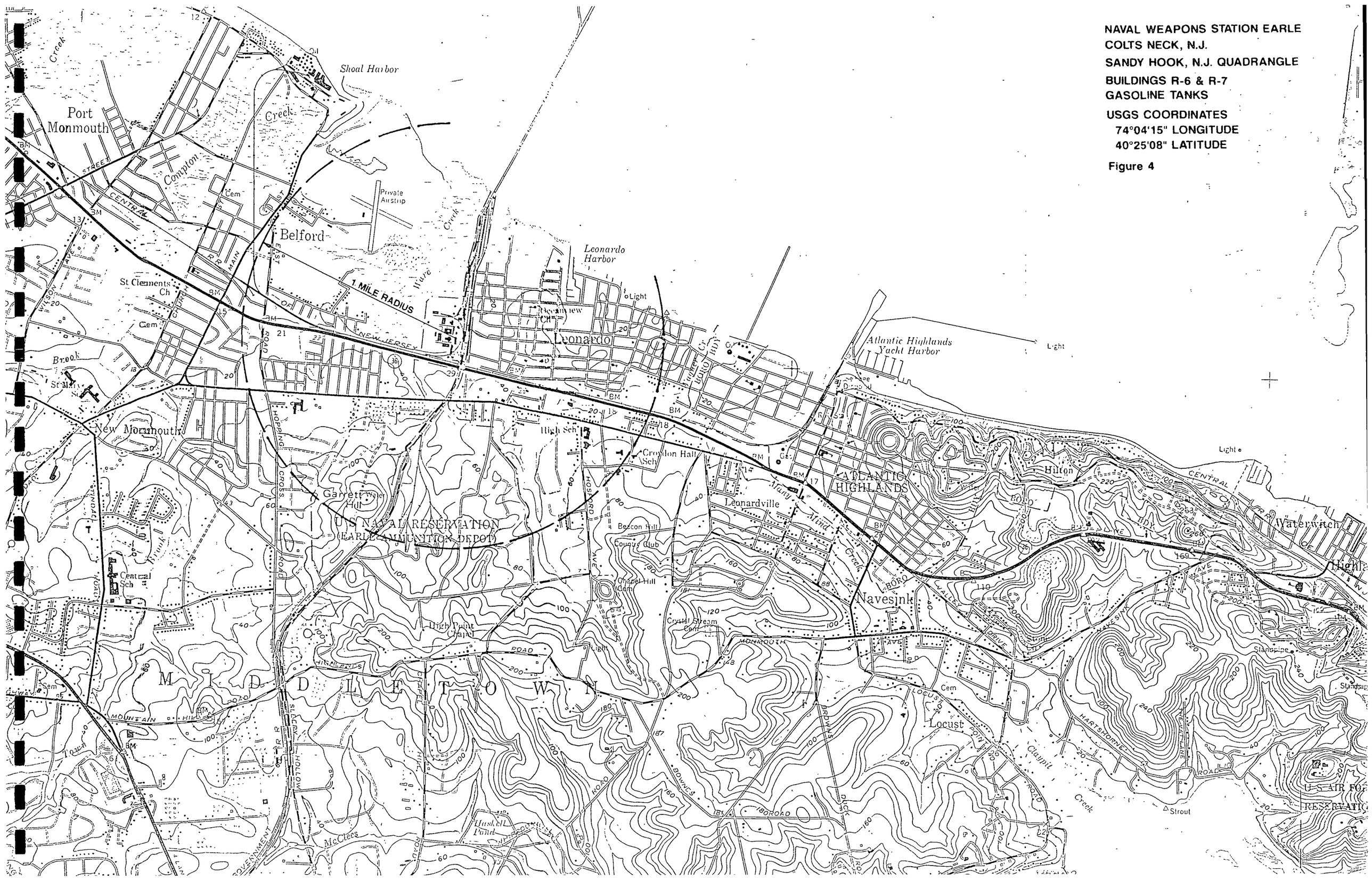
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY
E1-3078-004

Figure 3

Figure 4 - USGS Quadrangle - Waterfront Area (1 Mile Radius)

NAVAL WEAPONS STATION EARLE
COLTS NECK, N.J.
SANDY HOOK, N.J. QUADRANGLE
BUILDINGS R-6 & R-7
GASOLINE TANKS
USGS COORDINATES
74°04'15" LONGITUDE
40°25'08" LATITUDE

Figure 4



TABLES

Table 1 - Summary of Sampling and Analytical Protocol - Soils

Table 2 - Summary of Sampling and Analytical Protocol - Groundwater

TABLE 1

Summary of Sampling and Analytical Protocol - Soils

TABLE 1

SUMMARY OF SAMPLING AND ANALYTICAL PROTOCOL - SOILS

Sample Number	Sample Matrix	Sample Type	Analysis For	Analytical Method	Sample Container	Holding Time	Preservative
1A	Soil	Grab	VO + 15 including xylene	SW-846-8240	Glass	14 Days	Cool, 4°C
1B	Soil	Grab	Lead	SW-846-7421	Glass	6 Months	Cool, 4°C
2A	Soil	Grab	VO + 15 including xylene	SW-846-8240	Glass	14 Days	Cool, 4°C
2B	Soil	Grab	Lead	SW-846-7421	Glass	6 Months	Cool, 4°C
3A	Soil	Grab	VO + 15 including xylene	SW-846-8240	Glass	14 Days	Cool, 4°C
3B	Soil	Grab	Lead	SW-846-7421	Glass	6 Months	Cool, 4°C
4A	Soil	Grab	VO + 15 including xylene	SW-846-8240	Glass	14 Days	Cool, 4°C
4B	Soil	Grab	Lead	SW-846-7421	Glass	6 Months	Cool, 4°C
5A	Soil	Grab	VO + 15 including xylene	SW-846-8240	Glass	14 Days	Cool, 4°C
5B	Soil	Grab	Lead	SW-846-7421	Glass	6 Months	Cool, 4°C

Sample Number	Sample Matrix	Sample Type	Analysis For	Analytical Method	Sample Container	Holding Time	Preservative
6A	Soil	Grab	VO + 15 including xylene	SW-846-8240	Glass	14 Days	Cool, 4°C
6B	Soil	Grab	Lead	SW-846-7421	Glass	6 Months	Cool, 4°C
7A	Soil	Grab	VO + 15 including xylene	SW-846-8240	Glass	14 Days	Cool, 4°C
7B	Soil	Grab	Lead	SW-846-7421	Glass	6 Months	Cool, 4°C
8A	Soil	Grab	VO + 15 including xylene	SW-846-8240	Glass	14 Days	Cool, 4°C
8B	Soil	Grab	Lead	SW-846-7421	Glass	6 Months	Cool, 4°C
9A	Soil	Grab	VO + 15 including xylene	SW-846-8240	Glass	14 Days	Cool, 4°C
9B	Soil	Grab	Lead	SW-846-7421	Glass	6 Months	Cool, 4°C
10A	Soil	Grab	VO + 15 including xylene	SW-846-8240	Glass	14 Days	Cool, 4°C
10B	Soil	Grab	Lead	SW-846-7421	Glass	6 Months	Cool, 4°C

TABLE 2

Summary of Sampling and Analytical Protocol - Groundwater

TABLE 2 SUMMARY OF SAMPLING AND ANALYTICAL PROTOCOL - GROUNDWATER

Sample Number	Sample Matrix	Sample Type	Anlaysis For	Analytical Method	Container	Holding Time	Preservative
11	Groundwater	Grab	VO+15 compounds of the Priority Pollutant parameters plus xylene, methyl tertiary butyl ether and tertiary butyl alcohol	EPA 624	Glass, 40 ml viles	14 Days	Cool, 4°C pH<2 w/HCL
12	Groundwater	Grab	VO+15 compounds of the Priority Pollutant parameters, plus xylene methyl tertiary butyl ether and tertiary butyl alcohol	EPA 624	Glass, 40ml viles	14 Days	Cool, 4°C pH<2 w/HCL