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FINAL
TECHNICAL SUPPORT DOCUMENT
FOR THE CLASS II-B
GROUNDWATER RECLASSIFICATION PETITION
ELIZABETH PORT AUTHORITY MARINE TERMINAL

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Newark Bay Study Area

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EXECUTIVE SUMMARY

The Port Authority of New York and New Jersey (Port Authority) is filing a petition to reclassify shallow groundwater beneath the area occupied by Newark International Airport (EWR) and the Elizabeth Port Authority Marine Terminal (EPAMT). This petition has been prepared in accordance with the provisions of the New Jersey Administrative Code (N.J.A.C. 7:9-6). The petition seeks to amend N.J.A.C. 7:9-6.5 and designate the shallow groundwater beneath the proposed reclassification area as a Class II-B Classification Area. This will change the shallow groundwater in the reclassification area from a Class II-A to a Class II-B designation.

The proposed reclassification area occupies the former Newark Meadows. The area is bounded on the east by Newark Bay, on the north by the New Jersey Turnpike Extension and Interstate 78, and on the west by State Highway Routes 1 and 9. To the south the area extends just beyond the southern extent of EPAMT. Intense industrial development has occurred in the reclassification area since the 1920s. Industrial development of the area has included, and for the most part required, the placement of fill materials over the natural marsh deposits of the Newark Meadows. The nature of historical fill material placement in this area has varied widely from controlled structural soil fill placed for foundation support, to municipal waste landfilling activities, to miscellaneous construction and demolition debris disposal.

Placement of fill over the natural marsh deposits has caused the formation of the shallow groundwater-bearing zone for which this petition is being filed. The shallow groundwater occurs as a thin low-yielding saturated zone within the man-placed historic fill. The shallow groundwater saturated zone is less than 10 feet thick. Because the unit was created by the filling of the former Newark Meadows, the underlying marsh deposits, or meadow mat, provide a fine-grained low-permeability bottom for the shallow groundwater throughout the reclassification area. This low-permeability bottom serves to hydraulically isolate the historic fill from surrounding and underlying water-bearing units.

The shallow groundwater-bearing zone is a thin saturated zone that is not capable of producing significant or economically viable quantities of water by pumping from wells. The accumulation of the groundwater in the miscellaneous fill has also had an impact on the quality of the shallow groundwater, particularly in comparison to the groundwater that occurs in the surrounding natural geologic formations. The inherent impact of the historic fill materials, combined with impacts from other industrial activities conducted in the area such as bulk fuels storage and handling, has caused the shallow groundwater to not meet the New Jersey Department of Environmental Protection (NJDEP) Class II-A Groundwater Quality Standards (GWQSs) on an areawide basis. These conditions create a hydrogeologically unique regime, which meets the requirements for reclassification to a Class II-B area.

Class II-B groundwater is defined as groundwater that has little or no current use or potential use in the foreseeable future, has widespread exceedance of the NJDEP Class II-A GWQSs such that current remedial technologies are insufficient, and has a minimal potential to impact downgradient receptors. Existing hydrogeologic data demonstrate that the shallow groundwater-bearing zone beneath the area occupied by EWR and EPAMT and contiguous lands, meets the requirements for reclassification. NJDEP-published guidance for Class II-B groundwater reclassification identifies five areawide characteristics that must be demonstrated. Each of the five characteristics required for reclassification are stated below along with a summary of the existing conditions that demonstrate each characteristic.

1. Groundwater Quality Exhibits Extensive Exceedances of One or More of the Groundwater Quality Criteria as a Result of Past Discharges

   - Existing shallow groundwater quality data from 218 wells in the reclassification area were compiled from available reports. These data have indicated numerous exceedances of the Class II-A GWQSs throughout the reclassification area. Geostatistical analysis of the existing data demonstrated that within 80% of the reclassification area there is a greater than 80% probability of encountering groundwater contaminated above NJDEP Class II-A GWQSs.

   - Furthermore, in the course of filling the Newark Meadows, municipal wastes, construction and demolition debris, industrial wastes, and dredge spoils have been disposed of in the area of reclassification, creating a source of areawide shallow groundwater contamination. These fill deposits have been recognized as having impacted the shallow groundwater in the reclassification area.

2. Groundwater Restoration Cannot Be Achieved Using Technologically Practicable Means

   - Due to the large area that has been affected (approximately 10 square miles), remediation is not technically or financially feasible. The low hydraulic conductivity and thin saturated zone cause the shallow groundwater to have poor yield characteristics. The poor yield characteristics greatly inhibit and limit the effectiveness of conventional groundwater recovery and treatment systems, hydraulic control stations, bio-augmentation technologies, or other active remediation methods. Therefore, the application of currently available remedial approaches is technically impracticable and economically infeasible. For example, a remediation system based on groundwater collection from well points may require 550,000 well points and may cost $275 million.

   - The reclassification area is underlain by historic fill, which includes construction and demolition debris, trash from former municipal landfills, industrial wastes, and dredge spoils. Both of these are sources of contamination, especially inorganic compounds.

Although an exact estimate of the volumes of the demolition debris and trash does not exist, the debris and trash underlie most of the 10 square miles of the reclassification area. Consequently, a remedial approach such as excavation and treatment or disposal, or containment and stabilization are technically and financially impracticable, because they would require excavation or some form of in-situ or ex-situ treatment of almost the entire 10 square miles of reclassification area.

3. There Are or Will Not Be Any Potable Uses of the Groundwater for Reclassification

   - No public community supply wells or zones of contribution for such wells exist within the proposed reclassification area. All potable water used in the proposed reclassification area and surrounding region is imported from off-site. There are no registered production wells within the limits of the proposed reclassification area.

   - The potential use of the historic fill as a future potable water supply is not anticipated. Saltwater intrusion into the bedrock aquifer from historic overpumping has rendered the bedrock aquifer unusable beneath and around the proposed reclassification area.

   - The Port Authority, which operates in most of the reclassification area, does not have any plans to develop the shallow groundwater resources or to require the future use of groundwater in the area. Both the City of Newark and the City of Elizabeth are supplied by surface water, originating outside the region. Neither city plans to develop groundwater resources. Both cities indicated that they have adequate capacity from existing surface water sources for the next 25 years.

4. No Significant Risk of Pollution Migration into Class I, II-A, or III-A Areas

   - There is no risk of pollution migration to an aquifer of higher water quality. The underlying middle sand and bedrock groundwater are isolated from the historic fill groundwater by the meadow mat and silt and clay layers. In addition, because the reclassification area is situated along Newark Bay in a regional discharge zone, the groundwater flow gradients will be upward from the deeper aquifers to the shallow groundwater. The upward flow gradients further preclude migration into the underlying middle sand and bedrock. There are no Class I, II-A, or III-A areas between the reclassification area and where the shallow groundwater discharges into Newark Bay.

5. Natural Attenuation Can Be Relied on to Restore Groundwater Quality for Criteria Identified Pursuant to Characteristic No. 1

   - The organic contamination consists of low levels of petroleum hydrocarbon compounds, which have been demonstrated to be readily biodegradable and amenable to natural

attenuation. Whereas inorganic contaminants do not biodegrade, they will be adsorbed onto the soil matrix. Soil/water partitioning coefficients and solubility data for the inorganic contaminants of concern indicate that these analytes are generally moderately mobile to immobile and have a moderate to high affinity for soils. Because groundwater flow gradients are exceedingly low, most of the dissolved-phase contaminants are expected to be adsorbed or biodegraded before reaching the discharge zone.

- The contaminants of concern are arsenic, cadmium, chromium, lead, and benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds. The analysis of the migration potential of the contaminants of concern indicates that the dissolved organic compounds will degrade and the inorganic compounds will be immobilized before the groundwater discharges to Newark Bay. It is estimated that the dissolved contaminant concentrations will attenuate to undetectable levels within a 20-year time frame. Within 20 years the groundwater will have traveled a total distance of only 20 feet. Furthermore, a 50,000-times dilution is estimated for groundwater discharging into Newark Bay surface water. At this rate of dilution, any contaminants that reach the surface water will have no effect on surface water quality.

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SECTION 1.0

INTRODUCTION

1.1 BACKGROUND

On behalf of the Port Authority of New York and New Jersey (Port Authority), Roy F. Weston, Inc. (WESTON®) has prepared this report to provide the technical background in support of the reclassification petition for the shallow groundwater beneath the Newark International Airport (EWR) and the Elizabeth Port Authority Marine Terminal (EPAMT) from Class II-A to Class II-B. This reclassification area occupies the former Newark Meadows and has undergone intense industrial development since the 1920s.

As a result of industrial activities, shallow groundwater beneath EWR and EPAMT does not meet the New Jersey Department of Environmental Protection (NJDEP) Groundwater Quality Standards (GWQSs) for Class II-A Groundwaters (February 1993) on an areawide basis. In accordance with the provisions of the New Jersey Administrative Code (N.J.A.C. 7:9-6), the Port Authority is petitioning NJDEP to reclassify the shallow groundwater in this area from Class II-A to Class II-B. Class II-B groundwater is defined as groundwater that has little or no current use or potential use in the foreseeable future, has widespread exceedances of the NJDEP Class II-A GWQSs such that current remedial technologies are insufficient, and has a minimal potential to harm downgradient receptors. The Port Authority believes that the area occupied by EWR and EPAMT meets the requirements for reclassification. This report discusses, in detail, the justification for meeting these requirements.

1.2 SITE SETTING AND HISTORY

The proposed reclassification area is located in a heavily industrialized area of Newark, Essex County and Elizabeth, Union County, New Jersey. The area is occupied mostly by EWR and EPAMT. Other features that overlie the area include portions of U.S. Routes 1 and 9 and the New Jersey Turnpike. The area is bordered by Newark Bay to the east, the New Jersey Turnpike Extension and Interstate 78 to the north, and State Highway Routes 1 and 9 to the west, and extends just beyond the southern extent of EPAMT to the south. Industrial, commercial, and residential areas of the cities of Newark and Elizabeth lie beyond the western and southern boundary, respectively. The proposed reclassification area occupies approximately 10 square miles. Figure 1-1 presents an area location map.

EPAMT, which includes Port Newark and Port Elizabeth, is a waterfront terminal development located on the western shore of Newark Bay. The facility consists of approximately 930 acres of property that includes wharves, deep-water ship berths, transit sheds, open storage areas,

distribution buildings, specialized facilities, and railroad tracks. Port Newark was opened by the City of Newark in 1915. The City of Newark leased Port Newark property to the Port Authority beginning on 27 March 1948. The adjacent United States Naval Industrial Shipyard was acquired by the Port Authority in 1963 and is included in the leasehold. Construction of additional berths and related paving in the Naval Shipyard area began in 1971 and was completed in 1978. The Port Authority also developed the southern portion of the Port Newark facility along a channel that adjoins the Port Elizabeth facility. This developed area is also included in the reclassification area.

The EWR complex is comprised of paved surfaces (roads, runways, and parking lots), buildings, and support structures covering approximately 2,200 acres. The portion of EWR that falls within the County of Essex is under a lease with the City of Newark; the remaining portion (in Union County) is owned by the Port Authority. Current functions of the structures at the airport include passenger terminals, maintenance garages, storage areas, aircraft hangars, vehicle and aircraft maintenance facilities, aircraft fuel storage facilities, air cargo areas, and ancillary facilities.

The City of Newark built EWR in 1928. Construction began on the initial 68-acre unit in 1927, which included a 1,600-foot asphalt-topped runway and a hangar. In 1935 a new administration building was built, and after modifications for passenger use, the airlines transferred their operations to it. During the 1940s and World War II, the runway and other facilities were further expanded by the military. In 1967, an ambitious expansion program was initiated, which included the construction of new runways, passenger terminals, and parking and support facilities.

Prior to the construction of the EPAMT and EWR facilities (and features such as the New Jersey Turnpike and Route 1), the area was occupied by a salt marsh. The "bleak marshland" was progressively "reclaimed" by filling with debris and refuse. The Mosquito Control Commission was instrumental in the filling of the salt marshes in Essex and Bergen Counties. Land management practices of the time encouraged the draining of the marsh, application of oil to stagnant water pools to kill mosquito larvae, and the ultimate filling of the marsh with demolition debris, industrial wastes, and trash to create land for industrial development. Large portions of both EPAMT and EWR tracts were utilized for municipal and industrial waste disposal. Dredging spoils from the adjacent harbor were also utilized as fill. These activities began in the latter part of the 19th century and were continued up until the 1970s.

1.3 HYDROGEOLOGIC SETTING

Five hydrostratigraphic units have been identified beneath the reclassification area. These units include historic fill, meadow mat, middle sand, silt and clay, and bedrock. Figure 1-2 presents a generalized stratigraphic column of the geology in the petition area.

Historic fill varies from absent to 53 feet in thickness across the area, with an average thickness of approximately 10 feet. The fill can be divided into an upper and lower unit. The upper unit is sandy and the lower unit clayey. The upper fili is a mixture of hydraulic fill from dredging operations in Newark Bay, "sanitary" landfill materials, historic fill from construction of the Verrazano Bridge, and demolition debris from local construction projects. The lower fill is a mixture of hydraulic fill from dredging operations in Newark Bay, historic fill from construction of the Verrazano Bridge, and demolition debris from local construction projects. The upper fill contains a saturated zone under phreatic (water table) conditions. The lower fill is usually saturated and is a semiconfining bed, thereby impeding the vertical migration of groundwater and contaminants.

The meadow mat is grayish brown, dark brown to dark gray, laminated organic silt with an admixture of peat and lenses of peat and sandy organic silt. This unit is composed of tidal marsh and tidal creek deposits. The meadow mat is usually saturated, and because of its clayey consistency, acts as a confining bed. It is sandy in the northeastern section of Port Newark, where sand from the Passaic River has mixed with the tidal marsh deposits. On average, the meadow mat occurs approximately 10 feet below ground surface (bgs). This unit varies from absent to 33 feet thick, with the average thickness between 5 and 10 feet. The thickest section of meadow mat is in an elongated zone north-northwest of the EWR terminal complex, under the western end of Runway 11-29. Generally, the meadow mat thickens towards the east and south. This unit is locally absent in an area southeast of the EWR passenger terminal complex, under the southern end of Runway 4R-22L.

The middle sand is composed of gray to brown silty sand to gravelly sand, and locally contains beds or lenses of organic silt or grades into sandy silt. This unit is saturated and is a confined or semiconfined water-bearing unit. It represents post-glacial fluvial sedimentation, and it generally occurs at approximately 20 feet bgs. The middle sand varies from absent to 57 feet thick. Its average thickness ranges between 7 and 15 feet. The middle sand tends to thicken towards the east. It is absent under the terminal complex at EWR, in a zone in the central portion of Runway 4R-22L, and in small areas to the east of the New Jersey Turnpike.

The glaciolacustrine silt and clay is composed of thin laminae (varves) of silt and clay, with local sandy or gravelly zones. The silt and clay unit was deposited in glacial lake Hackensack, and according to the New Jersey Geological Survey, it is the main sedimentary mappable unit in the petition area (Standford et al., 1990). The silt and clay unit acts as a confining layer. This unit varies from absent to 95 feet thick, with the average thickness of the varved silt and clay being 20 to 30 feet. The unit thins to the west, and is draped against the glacial moraine that underlies Elizabeth, Hillside, and Newark. The silt and clay unit is absent along the western edge of the tidal marsh, southwest of the EWR terminal complex. . It is frequently underlain by 3 to 15 feet of gravelly, sandy, silty clay till. This glacial till is a relatively impermeable unit but is discontinuous.

The bedrock underlying EWR and EPAMT is red shale of the Brunswick Formation. The depth to bedrock varies from 34 to 113 feet under EWR and EPAMT. The bedrock is the major aquifer in the area of EWR and EPAMT (Nichols, 1968; Nemickas, 1976). The bedrock is separated from the shallow aquifer by the thick sequence of the silt and clay (glaciolacustrine) sediments. The Brunswick Formation has been dewatered in the Newark area because of past overpumping. The pumping has resulted in high chlorides due to saltwater intrusion from the Passaic River and Newark Bay in the Newark area (approximately 1 mile upstream from EPAMT) (Herpers and Barksdale, 1951). Dredging of ship channels for navigation has probably removed impermeable Recent and Pleistocene deposits along the shipping channels, allowing saltwater intrusion into the bedrock from the river and bay (Nichols, 1968). The nearest commercial public water supply well is in the City of Roselle, 2.5 miles to the west-southwest of EWR (Nemickas, 1976). The public water supply in Roselle is located outside the hydraulic region that is the subject of this study.

Several industrial wells were identified within 1 mile of EWR and EPAMT (Nichols, 1968 and Nemickas, 1976). These wells also pump from the bedrock, and are isolated from the EWR and EPAMT shallow groundwater. These wells are no longer in use because of the saltwater intrusion.

1.4 HORIZONTAL AND VERTICAL LIMITS OF THE PETITION AREA

Figure 1-1 illustrates the horizontal extent of the proposed reclassification area. In general, the proposed area of reclassification encompasses all of the property designated as EWR and EPAMT. The area is essentially semispherical in shape and includes a total of approximately 3,130 acres. The proposed area is bounded by latitudes 40° 39' 35" N and 40° 42' 00" N and longitudes 74° 07' 30" W and 74° 11' 35" W. The eastern border of the area is Newark Bay. The northern border of the area is delineated by Interchange 14 of the New Jersey Turnpike, the New Jersey Turnpike Extension, and Interstate 78, while the western border is delineated by State Highway Routes 1 and 9. The southern border extends just beyond the southern property boundary of EPAMT.

The groundwater to be reclassified is limited to the shallow groundwater contained in the historic fill material underlying the proposed area. The vertical limit of this groundwater is defined by the meadow mat layer, which is consistent throughout the proposed area. Based on available boring logs, the top of the meadow mat ranges from approximately 280 feet to approximately 310 feet local elevation datum. Local elevation datum 300 feet corresponds to 2.653 feet above mean sea level (msl) at Sandy Hook.

1.5 POTENTIAL RECEPTORS

There are no potable, commercial, or industrial wells located within the reclassification area, or in an area that is hydraulically connected to the proposed reclassification area. The lack of

current and planned use of shallow groundwater makes the surface water and sediment in Newark Bay the two most important potential receptors of shallow groundwater from the proposed reclassification area. Surface waters considered to be potentially affected by the groundwater reclassification include the Peripheral Ditch and Newark Bay. In addition, a few wetland areas remain along the Peripheral Ditch, and limited tidal flat areas still remain in the northern portion of EPAMT.

SECTION 2.0

INDUSTRY-SPECIFIC INFORMATION

Most of the proposed reclassification area is operated by the Port Authority. Roads such as the New Jersey Turnpike and Routes 1 and 9 are owned by the New Jersey Department of Transportation (NJDOT). Other private owners of land within the proposed reclassification area include IKEA, Inc. A portion of the area is owned by the City of Newark and leased by the Port Authority. In order to determine the current uses of the property above the proposed reclassification area, WESTON obtained tenant lists from the Port Authority for the areas that encompass the petition area. The Port Authority also provided historical reports and data from all environmental investigations that have taken place within the proposed reclassification area. In addition, WESTON obtained an environmental database search from Environmental Data Resources, Inc. (EDR) for the entire petition area. The following section presents the environmental regulatory status of the proposed petition area, including detailed information concerning facilities that occupy the petition area.

2.1 PARTIES INCLUDED IN THE PETITION

The reclassification petition is being filed by the Port Authority. Other parties within the proposed reclassification area that are not responsible for filing the petition include NJDOT, the New Jersey Turnpike Authority, and IKEA, Inc. Tables 2-1 and 2-2 present a listing of current tenants that occupy Port Authority-owned facilities at EWR and EPAMT, respectively. The listing of tenants is subject to change. Plates 1 and 2 present detailed maps of EWR and EPAMT, respectively.

2.2 SOURCES OF POLLUTION

To determine the potential sources of groundwater contamination in the petition area, WESTON reviewed available Port Authority files for EWR and EPAMT. In addition, WESTON conducted an environmental database search for the petition area through EDR. WESTON also consulted the most recent (January 1997) list of Known Contaminated Sites in New Jersey. The purpose of these activities was to identify active discharges to groundwater, source removal or aquifer restoration projects completed or under way, areas of known groundwater contamination, or remedial activity occurring in response to regulatory programs. The results of each activity are presented below.

2.2.1 Environmental Database Search

All of the facilities identified in the EDR database search as lying within the reclassification area are located on EPAMT and EWR. Table 2-3 lists the facilities located on EPAMT and EWR that were found in at least one of the environmental databases searched by EDR. Numerous other facilities were identified immediately adjacent to and surrounding the reclassification area. A summary of the results is presented below. Only those databases where sites were listed are presented. Appendix A presents the EDR database map depicting the approximate location of each of the sites.

EPA National Priorities List Database

The National Priorities List (NPL) is the United States Environmental Protection Agency (EPA) listing of uncontrolled or abandoned hazardous waste sites identified for remedial action under the Superfund program. A search of this database identified no NPL sites located on EWR or EPAMT.

EPA RCRIS Database

The EPA Resource Conservation and Recovery Act Information System (RCRIS) database is a compilation of reporting facilities that generate, transport, store, or dispose of hazardous waste. A total of 34 facilities on EPAMT and 26 on EWR were listed in the RCRIS database.

EPA CERCLIS Database

The EPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) list is a compilation of sites that EPA has investigated or is currently investigating regarding releases or threatened releases of hazardous substances pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980. A search of this database identified three CERCLIS sites within the limits of EPAMT and none on EWR.

RCRA Corrective Action Activity (CORRACTS) Database

The RCRA Corrective Action Activity Database (CORRACTS) is a database listing handlers that have had corrective action activities. A search of this database identified one RCRA CORRACTS site on EPAMT property and none on EWR.

Leaking Underground Storage Tanks Site Database

NJDEP maintains a database for leaking underground storage tanks (LUSTs) in the state. The LUST database identified 11 sites on EPAMT and 15 on EWR.

Solid Waste Facilities/Landfill Sites Database

NJDEP maintains a list of landfill and solid waste disposal sites. One solid waste or transfer station site was identified within the property boundaries of EPAMT, and none were identified on EWR.

Registered Underground Storage Tanks Site Database

NJDEP maintains a database of all registered underground storage tanks (USTs). A search of this database identified a total of 25 USTs on EPAMT and 10 on EWR.

Facility Index System Database

The Facility Index System (FINDS) database contains both facility information and indicators leading to other sources of information. A total of 39 sites on EPAMT and 13 on EWR were listed in the FINDS database.

Hazardous Materials Information Reporting System Database

The U.S. Department of Transportation maintains the Hazardous Materials Information Reporting System (HMIRS) Database, which contain all reported hazardous materials spill incidents. The HMIRS database listed three reported spills on EPAMT and none on EWR.

State Hazardous Waste Site Database

NJDEP maintains the State Hazardous Waste Site (SHWS) Database, which lists the known contaminated sites in New Jersey. A total of four sites were identified by EDR on EPAMT property. The date of the EDR version of the database is February 1996. WESTON reviewed a current version (January 1997) of the Known Contaminated Sites in New Jersey. Based on this review, a total of 25 known contaminated sites were identified on EPAMT and EWR. Table 2-4 presents a summary of these results.

CERCLA No Further Remedial Action Planned Database

In February 1995, CERCLIS sites designated as No Further Remedial Action Planned (NFRAP) were removed from the CERCLIS database. The CERC-NFRAP database identified three sites on EPAMT and none on EWR.

Major Facilities Database

NJDEP maintains a list of sites designated as major facilities in the State of New Jersey. One major facility was identified on EPAMT property.

Toxic Chemical Release Inventory System Database

EPA maintains the Toxic Chemical Release Inventory System (TRIS) Database, which lists facilities that release toxic chemicals to the air, water, and land in reportable quantities. The TRIS database listed one facility on EPAMT and none on EWR.

Toxic Substances Control Act Database

The Toxic Substances Control Act (TSCA) Database identifies manufacturers and importers of certain chemical substances. The TSCA database listed two facilities located on EPAMT and none on EWR.

Nearby Facilities

The EDR database report also identified a number of facilities within 0.25 mile of the proposed reclassification area boundary. Table 2-5 presents a list of these facilities, which summarizes current facility information. The EDR database search identified 15 facilities that operated USTs; 5 of these facilities were listed on the LUST database. All of the USTs for which contents were reported contained petroleum products. A total of 15 RCRA generators were located within 0.25 mile of the proposed reclassification area. One RCRA treatment, storage, and disposal facility (TSDF) was identified. Also identified within the search area were three state hazardous waste sites, two major facilities, and two sites that were assigned NFRAP recommendations under CERCLA. Based on the proximity of the above sites to the proposed reclassification area, there is a potential that these sites may have impacted the groundwater quality in the proposed reclassification area.

2.2.2 Port Authority File Review

WESTON obtained from Port Authority historical file information concerning groundwater contamination, remedial activity, NJDEP oversight, and enforcement activities. A summary of the information obtained is presented below.

2.2.2.1 EWR

Terminals A and B

In early 1980, jet fuel product was detected in the sumps that collect water from under-drain systems at Terminals A and B. To determine the source of the free product, 45 groundwater monitoring wells were installed in the area. The study concluded that leakage from the hydrant pits for the fuel supply lines was responsible for the release of the jet fuel. All hydrant pits were repaired by the mid-1980s. Monitoring of groundwater levels and free product thickness has continued on a regular basis. A March 1993 Summary Report for the area indicates that product thickness and rate of product removal had decreased over the 10-year period. In addition, groundwater levels had risen slightly.

In April 1996, 20 additional monitoring wells were installed in the area and were sampled to determine the extent of liquid- and dissolved-phase jet fuel and benzene, toluene, ethylbenzene, and xylenes (BTEX) in groundwater. The results of this effort delineated the extent of the liquid-phase jet fuel and indicated that the free product plumes in some locations may have shifted, possibly as the result of groundwater elevation changes. Figure 2-1 presents an illustration of the plumes identified. The horizontal extent of dissolved BTEX in groundwater was determined, and concentrations outside of the contaminant plumes were generally found to be below detection limits. Based on the data collected during this study, a remedial alternative evaluation is planned.

To coordinate management of subsurface remediation issues at EWR, the Port Authority has entered into a memorandum of agreement (MOA) with NJDEP. This MOA outlines NJDEP's oversight role regarding the conduct of subsurface remediation activities at EWR by the Port Authority.

Newark 2000

As part of the redevelopment program at EWR (Newark 2000), 11 soil borings and 3 monitoring wells were installed at various locations throughout the EWR property to evaluate necessary methods for handling excavated soil and groundwater during the development process. In each of the borings, one soil sample was collected from near the ground surface, one from just above the water table, one from just above the organic silt layer (meadow mat), and one from within the

meadow mat, for a total of four samples per boring. Each soil sample was analyzed for total petroleum hydrocarbons (TPH), Extraction Procedure (EP) Toxicity, explosivity, reactivity, and polychlorinated biphenyls (PCBs). Analytical results of the soil samples indicate elevated levels of TPH and EP Toxicity lead in the area of Parking Lot E, in the parking lot in front of Terminal C, and near Parking Lot D.

Groundwater samples from each of the monitoring wells were collected and analyzed for TPH, reactivity, explosivity, PCBs, and Priority Pollutant List (PPL) organics and metals. TPH was detected in all three groundwater samples collected; however, the highest detection was 6.6 parts per million (ppm). No other contaminants were detected in any of the groundwater samples collected.

Building 79 Vehicle Fueling Station

In September 1991, Port Authority representatives reported a leak of approximately 1 gallon of leaded gasoline from Tank No. 22, one of three gasoline USTs located in the northeast corner of EWR between Buildings 11 and 79. The NJDEP Spill Case No. assigned to the tank is 91-9-16-1018-22. A discharge investigation was conducted, and a Discharge Investigation and Corrective Action Report (DICAR) was prepared in August 1992. During the investigation, four soil borings and four monitoring wells were installed in the vicinity of the USTs. Two soil samples were collected from each boring, and one groundwater sample was collected from each well. All soil and groundwater samples were analyzed for volatile organic compounds (VOCs), methyl-tertiary-butyl-ether (MTBE), tertiary butyl alcohol (TBA), semivolatile organic compounds (SVOCs), and Priority Pollutant metals. Analytical results of the soil samples indicated the presence of VOCs (not detected to 8.185 milligrams per kilogram [mg/kg]), SVOCs (0.360 mg/kg to 97.75 mg/kg), TPH (170 mg/kg to 588 mg/kg), and lead (353 mg/kg). Analytical results of the groundwater samples indicated the presence of total VOCs (102 micrograms per liter [µg/L] to 5,587 µg/L), total SVOCs (1 µg/L to 45 µg/L), and TPH (1 milligrams per liter [mg/L]).

Building 10 USTs

Four USTs were located adjacent to Building 10 in the north-central portion of the EWR property. The USTs consisted of one 6,000-gallon gasoline tank (No. 19), one 6,000-gallon diesel tank (No. 20), one 10,000-gallon gasoline tank (No. 18), and one 10,000-gallon diesel tank (No. 17). In 1986, Tank No. 19 failed a tightness test and a discharge was reported to NJDEP; Case No. 86-04-20-09M was assigned. In July 1993, all four tanks were removed. During removal, gasoline odors were reportedly noticeable, and groundwater was observed entering the tank through a large hole in the tank wall. A total of 10 post-excavation soil samples were collected from the base of the excavation and analyzed for VOCs and lead. Analytical results of the soil samples indicated the presence of total xylenes (not detected to 1,060 mg/kg),

ethylbenzene (not detected to 55 mg/kg), toluene (not detected to 44 mg/kg), and lead (3.1 mg/kg to 33 mg/kg). No groundwater samples were collected during the investigation.

Building 51 USTs

In October 1992, two 4,000-gallon No. 4 fuel oil USTs were removed from an area adjacent to Building 51 in the northeast corner of the EWR property. Free product and stained soil were observed in the excavation. Due to the presence of the free product, no samples were collected. The excavation was backfilled with the contaminated soil generated during removal activities, and the area was secured.

South Fuel Farm

The South Fuel Farm is located in the southwestern portion of the EWR property. The fuel tanks were constructed in 1968. Prior to construction of the tanks, the meadow mat in this area was removed, and the area was regraded with sand fill. In 1993, a study was conducted to determine the amount of free product fuel in the subsurface underneath the fuel farm. Up to that time, a total of 90,000 gallons of fuel had been recovered over a 10-year period at the site. It was determined that approximately 250,000 to 500,000 additional gallons of fuel could be recovered through conventional pumping techniques. This value represented approximately half of the estimated free product in the subsurface. The time necessary to complete the fuel recovery process is now being determined.

Runway 4L-22R Extension

In November and December 1994, a geotechnical and environmental investigation was conducted south of Runway 4L-22R as part of an expansion project. The objective of the study was to determine subsurface soil conditions in the unsaturated zone beneath the project area. During the investigation, no visible indications of USTs, stressed vegetation, or previous spills were identified. The investigation involved the installation of 19 borings and 5 test pits. An additional four borings were also installed in stockpiled soil located near the project area to determine appropriate disposal requirements. Soil sample analytical results indicated TPH levels that ranged from 23 ppm to 2,900 ppm. BTEX was not detected in any of the soil samples collected. None of the waste characterization samples exceeded Toxic Characteristic Leaching Procedure (TCLP) criteria. Based on these results, the subsurface and stockpiled soils were characterized as Below Regulatory Concern Category.

2.2.2.2 EPAMT

Port Street and Navy Street Intersection

In October 1992, the Port Authority notified NJDEP that it had discovered evidence of a petroleum release on a property southeast of the intersection of Port and Navy Streets. An oily sheen was observed on the groundwater in a shallow excavation at a depth of approximately 5 feet below grade. The suspected release was assigned Spill Case No. 92-10-15-1235-22. A site investigation was initiated to determine the nature and extent of contamination and to identify potential sources. Based on the location and nature of the contamination, the adjacent BP North America Trading, Inc. fuel terminal aboveground storage tanks (ASTs) were determined to be the source of the contamination. A fingerprint analysis of four soil samples collected in the area indicated the presence of diesel oil, with components of No. 2, No. 4, and No. 6 fuel oil confirmed in the samples. Preliminary results indicated a 2-foot-thick layer of free product in the shallow monitoring well nearest the AST containment basin. Groundwater samples collected from shallow (surficial fill) and deep (middle sand) monitoring wells indicated the presence of benzene in the deep well at a concentration above the NJDEP Class II-A GWQS. Low levels of TPH and trace levels of VOCs were detected in the shallow monitoring well samples. A remedial investigation was recommended as a follow-up to the site investigation.

182 Calcutta Street

Operations conducted at 182 Calcutta Street prior to 1992 consisted of tire storage and shredding and rock salt storage. In addition, three 2,000-gallon USTs were reported to be located on the property. A preliminary assessment of the property was conducted in 1992 to establish background soil and groundwater conditions. Twelve soil borings and four monitoring wells were installed at the property during assessment activities. Soil samples were collected from 0 to 12 inches bgs and 1 foot above the water table in each boring. Soil samples were analyzed for TPH, BTEX, TCLP metals, PCBs, and SVOCs. Analytical results of the soil samples indicated the presence of TPH (not detected to 4,120 mg/kg), toluene (not detected to 2,040 micrograms per kilogram [µg/kg]), total xylenes (not detected to 2,270 µg/kg), naphthalene (not detected to 936 µg/kg), 2-methylnaphthalene (not detected to 3,911 µg/kg), and TCLP barium (not detected to 1.14 mg/L). One groundwater sample was collected from each of the four wells on-site. Analytical results of the groundwater samples indicated the presence of TPH (not detected to 0.45 mg/L), benzene (not detected to 105 µg/L), ethylbenzene (not detected to 1.9 µg/L), toluene (not detected to 6.5 µg/L), and xylene (not detected to 10.3 µg/L).

UST Closures

A number of USTs were removed from various areas across EPAMT. Analytical results of subsurface soil and groundwater samples collected during a majority of the removals indicated the presence of VOCs, SVOCs, TPH, and metals in the soil and groundwater underlying EPAMT.

SECTION 3.0

LAND AND WATER USE

3.1 AREA HISTORY

Historically, the proposed reclassification area had been occupied by an extensive salt marsh. Near the turn of the century, the industrial development in the greater Newark area generated a need for land on which to erect factories and access to means of bulk shipping. At the same time, public health concerns put a pressure on the authorities to manage the mosquito population of the area. To address these issues, an effort was initiated to reclaim the marshlands along Newark Bay. This program included the oiling of stagnant pools, the draining of the marsh, and the filling of the drained areas. Of particular significance to this petition is the filling of the marsh. These activities continued up until the 1970s.

To generate land suitable for industrial development, the marsh was filled with municipal and industrial waste, demolition debris, and (later) dredging spoils. In the early part of the century, these activities were sporadic and unfocused. A 1930 map of the "Newark Meadows" prepared by the New Jersey Department of Conservation and Development shows a single large tidal wetland area covering all of the proposed reclassification area, extending south to Port Elizabeth and east to Newark Bay. Starting in approximately 1935, three distinct areas of EWR were used for the dumping of mixed refuse, including liquid wastes, from the adjacent cities of Newark and Elizabeth. During the same time period, dredge spoils were also deposited. Dumping continued in some locations until the early 1950s. In addition, at least one section of EPAMT near Kapkowski Road was reportedly used as a landfill that also accepted liquid wastes.

The photos from 1961 and the 1970s show filling activities more representative of landfilling occurring near the southern boundary of the proposed reclassification area, in the area near the present-day IKEA building. This correlates with reports that the City of Elizabeth operated a landfill in this area. In addition, the Port Authority has indicated that certain areas on the current EWR property were used for landfilling purposes in the past. Many of these areas were reported to have accepted liquid waste. The constituents of any of the waste deposited in the proposed reclassification area are unknown. Figure 3-1 presents the areas of the EWR property that are known to have been used for landfilling activities. Figure 3-2 is a schematic representation of landfill, known contaminated site locations, and free-phase product plumes.

3.2 AREA LAND USE

The proposed reclassification area and surrounding areas are heavily developed and industrialized, with few of the original natural features remaining. Land use classifications for

the area include industrial, commercial, and transportation. This land use extends beyond the limits of the reclassification area. Figure 3-3 presents a summary of the land use classifications for the petition area and the areas immediately surrounding the petition area.

3.3 GROUNDWATER USE

Based on a well search conducted at the NJDEP Bureau of Water Allocation, NJDEP Geographic Information System (GIS) data, and conversations with local water departments, no public community supply wells or zones of contribution for such wells were identified within the proposed reclassification area. All potable water used in the proposed reclassification area is imported from off-site, from sources outside the petition area. All potable and industrial groundwater wells in the region draw from the bedrock aquifer, which is not hydraulically connected to the reclassification area. Because of the very low groundwater yields from this historic fill, which is evidenced by a small saturated thickness, long recovery times in monitoring wells, and the presence of dry wells at Building 220 (EPAMT), the saturated zone of the historic fill has no potential as a future potable water supply.

According to the New Jersey State Water Quality Inventory Report (NJDEP 1988), the reclassification area is not identified as one or part of any of the State's Drainage Basins or Watersheds.

3.4 SURFACE WATER USE

The proposed reclassification area is bounded to the east by Newark Bay, which is used extensively for commercial shipping activities. Newark Bay receives freshwater flow from the Hackensack and Passaic Rivers, and is hydrologically contiguous with the Arthur Kill and Kill Van Kull to the south. Estuarine intertidal flats are located along the shores of Newark Bay both north and south of the Port Newark and Elizabeth terminals, while the Great Ditch (south and west of the proposed reclassification area) is mapped by the U. S. Fish and Wildlife Service (USFWS) as estuarine intertidal open water, indicating that it is tidally influenced and supports minimal wetland vegetation.

The Peripheral Ditch surrounds the property occupied by EWR. This manmade drainage ditch is approximately 8 feet deep and 80 feet wide, and was constructed to drain the EWR property and some upland areas during the airport expansion in the 1970s. The Peripheral Ditch provides the principal means of surface water conveyance for an area of approximately 10 square miles, including EWR and industrial/commercial facilities in and adjacent to the petition area (Killam 1995). The ditch flows south and eastward through a tidal gate at the Elizabeth Channel, and into Newark Bay. Killam Associates identified several industrial point source discharges to the Peripheral Ditch, as well as the potential for five combined sewer overflows (CSOs) from the City of Newark and one from the City of Elizabeth to discharge to the Ditch.

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The Peripheral Ditch surrounds the property occupied by EWR. This manmade drainage ditch is approximately 8 feet deep and 80 feet wide, and was constructed to drain the EWR property and some upland areas during the airport expansion in the 1970s. The Peripheral Ditch provides the principal means of surface water conveyance for an area of approximately 10 square miles, including EWR and industrial/commercial facilities in and adjacent to the petition area (Killam 1995). The ditch flows south and eastward through a tidal gate at the Elizabeth Channel, and into Newark Bay. Killam Associates identified several industrial point source discharges to the Peripheral Ditch, as well as the potential for five combined sewer overflows (CSOs) from the City of Newark and one from the City of Elizabeth to discharge to the Ditch.

The Peripheral Ditch is not used for recreational purposes. Access to the Peripheral Ditch is controlled and limited. Neither Newark Bay nor the Peripheral Ditch is used as a potable water source, nor is it likely that they will ever be used for such a purpose, due to their salinity and degraded characteristics.

SECTION 4.0

HYDROGEOLOGIC AND HYDROLOGIC SETTING

4.1 GEOLOGY AND HYDROGEOLOGY

4.1.1 Regional Hydrogeology

The proposed reclassification area lies in the Newark Basin geomorphologic province. More specifically, the area is situated adjacent to Newark Bay. These two facts control the overall hydrogeologic setting of the proposed reclassification area.

The geology of the proposed reclassification area consists of two main units: bedrock and the overlying Quaternary deposits. Overlying the natural deposits is a thin veneer of man-placed historic fill deposits, typically emplaced in low-lying areas along the coastal margin. Bedrock consists of the sedimentary (and associated igneous rocks) of the Newark Group. In the reclassification area the bedrock sedimentary rocks are mostly shales, mudstones, and sandstones. Depth to bedrock ranges from approximately 40 feet bgs at the western end to approximately 100 feet bgs at the eastern end of the petition area (Figure 4-1). The overlying Quaternary deposits include Pleistocene and the more recent Holocene unconsolidated sediments. Pleistocene sediments are the result of the last glacial event. In the proposed reclassification area, the Pleistocene glacial deposits are lacustrine, deposited in glacial lake Hackensack. These deposits are primarily interbedded silts and clays. To the south and west of the reclassification area, these sediments give way to fluvio-morainal sediments, consisting of gravel, sand, silt, and clay, which were also deposited during the last glacial event. The Pleistocene lacustrine sediments give way upwards to fluvial sandy and silty deposits and Holocene marsh deposits (meadow mat). The meadow mat consists of clayey silts, interbedded with peat. The thickness of the Quaternary deposits ranges from 40 feet at the western end to approximately 100 feet at the eastern end of the petition area (Figure 4-2). Figure 4-3 presents a geologic cross section of the reclassification area.

Regionally, groundwater supply has been obtained from the bedrock aquifer. Groundwater in the bedrock occurs and is transmitted along fractures. Where the fracture network is dense and extensive, large-yield wells can be developed. However, buried valley and other glaciofluvial deposits outside the proposed reclassification area have been utilized as production aquifers, when they are extensive. Glaciofluvial deposits of sufficient extent to be useful as a production aquifer have not been identified under the proposed reclassification area.

At the present time, the bedrock and overburden aquifers are not utilized in the areas adjacent to the proposed reclassification area. Intense pumping during the first half of the century and earlier resulted in depletion of the groundwater resources, which was manifested as a large drop in water levels. More importantly, the intense pumping resulted in an extensive saltwater intrusion. Consequently, groundwater in the area is not used as a potable water supply or as an industrial noncontact water supply.

4.1.2 Local Hydrogeology

To determine the local hydrogeology, WESTON reviewed 202 Port Authority-created geotechnical and environmental boring logs for EPAMT and EWR. WESTON also reviewed reports of geotechnical and environmental investigations and reports of regional hydrogeologic and environmental investigations. Using these logs, five hydrostratigraphic units were identified: historic fill, meadow mat, middle sand, silt and clay, and bedrock. Each is discussed below in sequence from shallowest to deepest.

4.1.2.1 Historic Fill

Historic fill was identified in 200 borings, and varies from absent to 53 feet thick. The average thickness is approximately 10 feet. The fill can be divided into an upper and lower unit. The upper unit is sandy and the lower unit clayey.

The upper portion of the fill consists of brown to grayish-brown silty sand to gravelly silty sand with zones of construction debris and/or heterogeneous landfill material. The upper fill is thickest near the terminal complex of EWR, where it is up to 20 feet thick. The upper fill is a mixture of hydraulic fill from dredging operations in Newark Bay, "sanitary" landfill materials, historic fill from construction of the Verrazano Bridge, and demolition debris from local construction projects.

The distribution of the lower fill is variable. It is more continuous and thicker near Newark Bay, where it is up to 6 feet thick, and thins to the west. The lower portion of the fill is reddish-brown to gray silt and silty clay with scattered anthropogenic materials (e.g., plastic bags, bricks, etc.) and a variable amount of sand. The lower fill is a mixture of hydraulic fill from dredging operations in Newark Bay, historic fill from construction of the Verrazano Bridge, and demolition debris from local construction projects.

The upper fill has a low to moderate hydraulic conductivity and supports an unconfined saturated zone under water table conditions. The water table generally lies in the upper fill, within 5 to 10 feet bgs. The lower fill has a lower hydraulic conductivity than does the upper fill, is usually saturated, and is a semiconfining bed.

4.1.2.2 Meadow Mat

The meadow mat is grayish-brown, dark brown to dark gray, laminated organic silt and clay, with an admixture of peat and lenses of peat and sandy organic silt. This unit is composed of tidal marsh and tidal creek deposits. The meadow mat was deposited in an intertidal environment resulting from the rise in sea level after the last glaciations. This unit occupies the lowland between a glacial moraine near Weequahic Park and Newark Bay. The meadow mat extends south to the foot of a glacial moraine at Port Elizabeth, and north to Oak Island Junction, where it grades into alluvial sands of a tidal delta built by the Passaic River. The meadow mat is usually saturated, and because of the high clay and silt content, is a confining bed. It is sandy in the northeastern section of Port Newark, where sand from the Passaic River has mixed with the tidal marsh deposits.

The meadow mat varies from absent to 33 feet thick, based on 188 of the Port Authority geotechnical borings. Its average thickness is between 5 and 10 feet. The meadow mat is thickest where it fills paleo-channels or troughs on the surface of the underlying glacial formations. The thickest section of meadow mat is in an elongated zone north-northwest of the EWR terminal complex, under the western end of Runway 11-29. Generally, the meadow mat thickens towards the east and south. The meadow mat is absent in an area southeast of the EWR terminal complex, under the southern end of Runway 4R-22L.

4.1.2.3 Middle Sand

The middle sand is composed of gray to brown silty sand to gravelly sand, and locally contains beds or lenses of organic silt or grades into sandy silt. This unit is saturated and is a confined or semiconfined water-bearing unit. Based on its composition, the middle sand is expected to have moderate hydraulic conductivity. Nichols (1968) and Nemickas (1976) considered the middle sand to be insignificant as a water-supply aquifer because of its thinness and limited aerial extent.

The middle sand varies from absent to 57 feet thick, based on 157 of the 202 borings. Its average thickness ranges between 7 and 15 feet. The middle sand is thickest in paleochannels carved into the top of the underlying glacial lake silt and clay. The middle sand tends to thicken towards the east and is absent under the terminal complex at EWR, in a zone in the central portion of Runway 4R-22L, and in small areas to the east of the New Jersey Turnpike.

The middle sand represents glaciofluvial and fluvial deposits overlying the sediments of glacial lake Hackensack. It is likely that these sediments are related to the ancestral Newark Bay rather than to the regional glacial cover. The middle sand is in contact with the bedrock aquifer in small areas west and south of the EWR terminal complex.

4.1.2.4 Silt and Clay

The glaciolacustrine silt and clay is composed of thin laminae (varves) of silt and clay, with local sandy or gravelly zones. It is frequently underlain by 3 to 15 feet of gravelly, sandy, silty clay till. The silt and clay unit represents the southern extent of the sediments of the glacial lake Hackensack (Stanford et al., 1990) (Figure 4-4). This unit is known to possess low to very low hydraulic conductivity, and for all practical purposes, it is impermeable.

The glaciolacustrine silt and clay varies from absent to 95 feet thick, based on 122 soil borings. The average thickness of the silt and clay is 20 to 30 feet. The silt and clay thins to the west, and is draped against the glacial moraine that underlies Elizabeth, Hillside, and Newark. The silt and clay unit (but not the low hydraulic conductivity till) is locally absent southwest of the EWR terminal complex. The silt and clay is thickest in preglacial valleys that underlie the eastern portion of the EWR terminal complex and the central portions of the historic fill.

The silt and clay is underlain by massive till. This relatively impermeable unit is glacial till. The till is discontinuous in the reclassification area, and for the purposes of this report, it is included in the silt and clay unit.

4.1.2.5 Bedrock

The bedrock underlying the reclassification area is the red shale of the Brunswick Formation. Depth to bedrock ranges from approximately 40 feet bgs at the western end to approximately 100 feet bgs at the eastern end of the petition area. The bedrock surface is deepest in preglacial river channels (Witmer, 1959; Nemickas, 1974).

Regionally, groundwater supply has been obtained from the bedrock aquifer. Groundwater in the bedrock occurs and is transmitted along fractures. Where the fracture network is dense and extensive, large-yield wells can be developed.

At the present time, the bedrock and overburden aquifers are not utilized in the areas adjacent to the proposed reclassification area. Intense pumping during the first half of the century and earlier resulted in depletion of the groundwater resources, manifested as a large drop in water levels (Herpers, H. and Barkdale, H.C., 1951). More importantly, the intense pumping resulted in an extensive saltwater intrusion. Consequently, groundwater is not used as a potable water supply or as an industrial noncontact water supply.

4.1.3 Groundwater Movement in the Unconfined Historic Fill

The petition for reclassification is limited to the shallow groundwater, which occurs in the historic fill. The reason for this selection is that the shallow groundwater occurs in a well-

defined, hydraulically distinct and separate unit. The area to be reclassified is constrained by topographic and stratigraphic groundwater divides. Relatively high topographic recessional moraines flank the lowland containing EWR and EPAMT on the west and south. The silt and clay unit and the meadow mat define, in effect, a "basin" that is occupied by the saturated fill. Both the silt and clay unit and the meadow mat have low hydraulic conductivities, which control and limit the vertical migration of groundwater. Finally, because the reclassification area is located adjacent to Newark Bay, groundwater will preferentially discharge to the bay, thus minimizing the potential that it will impact or will be impacted by other groundwater.

It should also be emphasized that the historic fill water-bearing unit is a manmade unit and not a natural deposit. If the historic fill had not been deposited, then the water from precipitation would collect in the marsh where it would evapo-transpire or run off to the bay. This is another important and unique feature of the shallow groundwater unit, which supports its separate reclassification.

Based on the location of the proposed reclassification area, which is located on the banks of Newark Bay, it is expected that groundwater flow gradients will be in discharge configuration, as long as they are not modified by pumping or other influences. Since most of the pumpage in the vicinity surrounding the proposed reclassification area has stopped, due to saltwater intrusion, it is reasonable to assume that the net flow of groundwater is to the bay. In addition, it is reasonable to assume that gradients between the historic fill and any deeper water-bearing zones will be upward, as expected for a regional discharge zone.

The historic fill forms an unconfined water-bearing zone in the area of the petition. The groundwater flow within the historic fill is anticipated to be complex because of the influence of tides, irregular distribution of the fill materials, and anthropogenic features such as ship channels and storm sewers. The Peripheral Ditch acts as a groundwater/surface water sink in the area of EWR. It intercepts shallow groundwater and surface water and transports the water to Newark Bay via the Elizabeth Channel. The underlying meadow mat prevents groundwater in the historic fill from migrating down into the middle sand.

At EPAMT, the net groundwater flow in the historic fill is towards Newark Bay. Groundwater monitoring data collected at various locations across the proposed reclassification area indicate that the incremental groundwater flow vector field is quite complex. The flow is probably governed by factors such as inhomogeneities in the nature of the fill material, changes in hydraulic conductivity due to compaction under the weight of buildings and structures, and impervious structures.

Groundwater elevation data for EPAMT collected from monitoring wells completed within the historic fill indicate that groundwater elevations are fairly uniform and consistent throughout the EPAMT area (Figure 4-5). Generally, groundwater elevations are approximately 303 to 304 feet

local datum. Local datum 300 feet is mean high tide (MHT), 2.65 feet msl. This relatively flat water table surface is the result of a number of factors, including limited recharge due to extensive impervious coverage by buildings, parking lots, and roadways; low hydraulic conductivity; and fine-grained materials comprising the historic fill.

The shallow groundwater in historic fill beneath EWR flows from the fill into the Peripheral Ditch, which conveys it directly into Newark Bay. In the area of EWR, groundwater elevations have been measured in the range of 298 to 300 feet local datum. The groundwater under the apron and runways south and east of the EWR terminal complex is intercepted by the Ditch. The Peripheral Ditch also intercepts the shallow groundwater flowing towards EWR from the adjacent uplands to the west and south. The Peripheral Ditch is underlain by meadow mat, so downward migration of contaminants is precluded.

Within EWR groundwater elevations are also affected locally by groundwater pump-and-treat systems operated to capture contaminated groundwater in the areas of the fuel hydrants and the fuel tank farm. This creates a localized depression in the areas to the south of the passenger terminals. Groundwater elevations are further depressed by the presence of large impervious covers, such as buildings, airport aprons, runways, and roadways.

4.1.4 Estimation of Groundwater Flow Parameters

The relatively uniform groundwater elevations measured in the monitoring wells in the reclassification area suggest that the horizontal groundwater flow gradient is very small. An estimate was calculated based on the following assumptions, which were developed based on the range of conditions observed in the existing database.

Based on the existing data, an "average" groundwater elevation of 304 feet local datum was assumed. That would result in a 4-foot vertical head over MHT. To obtain an estimate that is representative of the long-term "average", msl was used as the base level. As mentioned earlier, MHT is approximately 2.65 feet above msl, resulting in a vertical head (with respect to msl) of 7 feet. The distance over which this gradient is dissipated is taken to be the distance from the center of EPAMT land blocks to the channels and the bay. This distance ranges from 2,000 to 4,000 feet. As a conservative measure, the shortest distance (i.e., 2,000 feet) was utilized. Therefore, the estimated gradient is:

$$i = \frac{\Delta H}{\Delta L} = \frac{7}{2000} \Rightarrow i = 0.0035$$

An estimate of the Darcy velocity was obtained based on the following assumptions:

The hydraulic conductivity (permeability) was assumed at 10^{-4} centimeters per second (cm/sec). This was based on published values of hydraulic conductivity for natural components of the materials expected to be encountered in this area (mixtures of fine sands, silt and clay, and debris). This estimate is supported by limited data from slug tests of the EWR terminal complex area, which were conducted as part of the design of the free-phase product recovery design. Hydraulic conductivity data from those tests ranged from 10^{-3} to 10^{-4} cm/sec. Therefore, the estimated Darcy velocity is:

$$u = ki = 10^{-4} \text{ x } 0.0035 \Rightarrow u = 3\text{x}10^{-7}\ cm/sec \Rightarrow u = 9\ cm/year$$

The estimated volume of groundwater discharging to the bay (Q) under these parameters was based on the above estimates and an approximate length of a discharge zone of 37,500 feet, which corresponds to the waterfront outline of the reclassification area, as shown on the topographic quadrangle map. The cross-sectional area (A) was calculated by multiplying the approximate length of the discharge zone (37,500 feet) by the approximate saturated thickness (10 feet).

$$Q = kiA = 10^{-4}\ cm/sec \text{ x } 0.0035 \text{ x } 375{,}000\ ft^2 \Rightarrow Q = 0.004\ ft^3/sec \Rightarrow Q = 372\ ft^3/day$$

4.1.5 Estimation of Dilution Rates

The volume of shallow groundwater discharging to the bay is very small and volumetrically insignificant, compared to the volume of water flowing through the bay. To obtain an estimate of the volume of water flowing through the bay, data from the United States Geological Survey (USGS) gauging stations were utilized. As a conservative estimate, it was assumed that the net flow through the bay will be equal to the freshwater contribution from the Passaic River and the Hackensack River. The annual mean discharge rate for the Passaic River (Saddle River at Lodi station) is 100 cubic feet per second (ft^3/s). The annual mean discharge rate for the Hackensack River (New Milford station) is 98.1 ft^3/s. Therefore, the combined flow will be 198.1 ft^3/s. This is a conservative number because it does not account for additional discharges entering the system downstream of these stations and for the flushing action of the daily tides. Utilizing the groundwater discharge rate calculated in Section 4.1.4, the dilution rate is calculated:

$$Dilution\ Rate = \frac{Bay\ Net\ Flow}{Groundwater\ Discharge} = \frac{198.1\ ft^3/s}{0.004\ ft^3/s} = 49{,}525 \approx 50{,}000$$

SECTION 5.0

GROUNDWATER QUALITY/NATURAL ATTENUATION

5.1 GROUNDWATER QUALITY

WESTON reviewed available information on shallow groundwater quality within the vicinity of the proposed reclassification area. The following summary of groundwater quality is based upon data obtained from a variety of sources related to UST investigations, site remedial studies, and other environmental investigations where groundwater sampling was conducted within the surficial fill water-bearing zone. All of the data evaluated were developed by New Jersey certified laboratories. Most of the sampling events included the collection and analysis of appropriate Quality Assurance/Quality Control (QA/QC) samples, including field blanks and trip blanks. Based on this, the analytical data used for groundwater quality evaluations are believed to be of known and defensible quality for comparison purposes.

Groundwater quality within the historic fill is impacted by the fill material used to develop what was formerly an extensive tidal marsh area. NJDEP has acknowledged the pervasive metals contamination of the shallow groundwater as a result of historic filling throughout the area (Appendix B). Shallow groundwater quality data from within the proposed reclassification area were compared with NJDEP GWQSs for Class II-A groundwater. This comparison shows that several petroleum-derived compounds and metals in the shallow groundwater exceed the standards. These compounds are listed in Table 5-1.

Benzene was the most common petroleum-related compound detected in groundwater within the shallow zone, with an average concentration of 1,141.36 µg/L. This average concentration exceeds the benzene GWQS of 1 µg/L by more than 10 orders of magnitude. Lead was the most common metal detected in the surficial groundwater, at an average concentration of 799.79 µg/L. This average concentration of lead is more than 70 times greater than its GWQS. However, these are arithmetic means, which are conservative. Geometric means, which are more appropriate for log-normally distributed data, were calculated for the compounds with more than 10 GWQS exceedances. As shown in Table 5-1, the geometric means are significantly lower than the arithmetic means, indicating that although there are extensive exceedances of GWQSs, the magnitude of these exceedances is moderate. As Table 5-1 indicates, methylene chloride was the most frequently detected compound. However, methylene chloride is a common laboratory contaminant. As most of the detections were low-level, it is reasonable to assume that they are laboratory artifacts. Therefore, methylene chloride is not considered a significant contaminant in the shallow zone.

Both benzene and lead can be directly related to releases of gasoline. However, lead can also be related to the historic fill. The Port Authority has been advised by NJDEP that lead concentrations detected in the shallow groundwater may be related to the historic fill rather than to facility operations. The other more widely distributed compounds occurring at average concentrations exceeding the NJDEP GWQSs include arsenic, cadmium, chromium, and BTEX compounds. It is likely that many of the metals detected at exceedance levels in groundwater originated in contaminated historic fill material.

5.2 GEOSTATISTICAL ANALYSIS OF THE PROBABILITY OF GROUNDWATER CONTAMINATION

5.2.1 Overview

Assessing the spatial distribution of contamination and mapping areas where the concentrations of contaminants in groundwater exceed standards require an unbiased quantification approach to be defensible. Geostatistical contouring (a form of geostatical analysis) is generally considered to be the best approach to contouring environmental data.

Geostatistical contouring is much more involved than is contouring by simpler interpolation methods. First, a structural analysis is conducted to evaluate the spatial correlation structure of the data. This process involves the construction of a variety of semivariograms – plots of the spatial variance versus the distance between the samples. From these diagrams, models describing the spatial correlation structure are derived including:

- Nugget – the sum of natural variations in the magnitude of the spatial data (microvariance) and errors in the measurement of the variable (error variance).
- Sill – depending on the model used, the sill is approximately equal to the spatial variance of the data.
- Range – depending on the model used, the range is the minimum distance between samples at which the samples are statistically uncorrelated.

The range is also used to evaluate the spatial symmetry of the correlation structure (termed the anisotropy) of each model.

Grid values are estimated from the raw data using a statistical interpolation process called kriging. Kriging is an unbiased linear estimator that uses the spatial correlation structure as a basis for an inverse-distance-weighted interpolation. Because geostatistical interpolation is based on the raw data values as well as the correlation structure of the raw data, it generally

produces surfaces that are closer approximations of reality than does any other type of interpolation algorithm.

5.2.2 Data

Existing shallow groundwater quality data from 218 wells in the area were compiled from available reports. All wells were screened in the same water-bearing zone. Logs of the wells used for this analysis are included in Appendix C. Duplicate well locations were eliminated for the analysis. Data from each well were assessed to determine whether GWQSs were exceeded. Wells that had any exceedance were assigned a code of 1; wells that had no exceedances were assigned a code of 0. These codes can be interpreted as the probability of exceeding GWQSs. Geostatistical techniques were then used to analyze the spatial correlation structure of the assigned codes. The geostatistical analysis was conducted "blind" (without a base map) to reduce the possibility of analyst bias.

5.2.3 Structural Analysis

The structural analysis, which is the evaluation of the spatial correlation structure of the data, consists of several steps. First, variograms (plots of the spatial variance [the semivariance] versus the distance between samples) are developed for all data to identify characteristic lags. These lags are distances between sampling points that display some distinctive pattern in variograms. Using the characteristic lags, variograms are developed for a variety of directions. These variograms are then modeled to identify the parameters of the spatial correlation (i.e., range, sill, nugget, anisotropy). The results of these analyses are described in the following sections.

5.2.3.1 Variogramming

Omnidirectional variograms were developed for a variety of lags from 10 feet to 8,000 feet. Characteristic lags were identified at 70 feet and 5,085 feet. Directional variograms were then developed at 10-degree intervals for each lag. In these diagrams, the vertical axis is the semivariance and the horizontal axis is the distance between sample pairs. The numbers beside the points represent the number of data pairs used to calculate the semivariance at that distance. The smooth curve represents the theoretical model fit to the data.

Figure 5-1 is an example of a directional variogram for the 70-foot lag at an orientation of 20° north of east. This figure shows the semivariance gradually increasing to a fairly stable level (characteristic of a gaussian model) at a distance of approximately 374 feet (the range). The sill of the diagram is 0.18, and there is no nugget.

Figure 5-2 is an example of a directional variogram for the 5,085-foot lag also at an orientation of 20° north of east. This figure shows the semivariance increasing steeply to a fairly stable level (characteristic of a spherical model) at a distance of approximately 4,940 feet (the range). The sill of the diagram is 0.102, and the nugget is 0.122.

5.2.3.2 Anisotropy

Using the ranges derived from the directional variograms for each correlation structure, rose diagrams were developed to assess anisotropy. Figure 5-3 illustrates the rose diagram for the first correlation structure at a lag of 70 feet. This figure displays a major axis at 70 degrees with an anisotropy ratio (ratio of major axis length to minor axis length) of 1.4. Figure 5-4 illustrates the rose diagram for the second correlation structure at a lag of 5,085 feet. This figure also displays a major axis at 70 degrees with an anisotropy ratio of 2.

5.2.3.3 Composite Spatial Correlation

Using the variogram parameters described in the preceding sections, a composite spatial correlation was developed. This pattern is illustrated in Figure 5-5.

5.2.4 Probability of Groundwater Contamination

Based on the correlation structure interpreted from the semivariogram, a contour map was generated using *kriging* estimators. Figure 5-6 illustrates the spatial probabilities of exceeding groundwater standards.

Figure 5-7 illustrates the differences between the original data codings and the geostatistical surface shown in Figure 5-6. The lack of contours on the right side of the map indicates that there is good agreement between the data and the geostatistical surface. The left side of the map, however, indicates that the probability of contamination is less uniform and more subject to error.

5.2.5 Area of Groundwater Contamination

The area covered by the geostatistical map was assessed to determine approximately how much of the area had a high probability of being contaminated. Figure 5-8 is a plot of the percentage of the mapped area that exceeds groundwater standards at several probability levels. This graph indicates that in 80% of the reclassification area, there is an 80% probability that groundwater is contaminated above the NJDEP Class IIA GWQSs. Figure 5-9 shows that virtually all of the area east of the New Jersey Turnpike and most of the area west of it have a better than 80% probability of being underlain by groundwater contaminated above the NJDEP Class IIA GWQSs.

5.3 NATURAL ATTENUATION PROCESSES

Natural attenuation as a remedial approach relies upon natural processes (e.g., dilution, dispersion, sorption to aquifer materials, volatilization, chemical transformation, and intrinsic biodegradation) to contain contaminant plumes, to reduce groundwater contaminant levels, and to remediate groundwater. The contribution of the various attenuation mechanisms depends on the type of contaminants present and the geochemical conditions of the groundwater.

5.3.1 Biodegradation

Natural attenuation has been extensively demonstrated for petroleum hydrocarbons, which are known to be biodegradable groundwater contaminants. NJDEP's guidance on the subject of natural attenuation focuses on petroleum hydrocarbons, and suggests that "Due to the widespread occurrence of aerobic aquifers in New Jersey and the large number of sites contaminated with petroleum products, natural remediation is a viable alternative for many sites under investigation in the state." By having granted the Port Authority classification exception areas (CEAs) at several UST release sites, NJDEP has shown that natural attenuation is acceptable within the reclassification area.

The shallow groundwater quality data from the proposed reclassification area indicate that biodegradable organics are the main contaminants. Since the only groundwater receptor is the adjoining surface water body, where the impact of these compounds is negligible (see Section 6.0), natural attenuation presents a technically sound and regulatorily acceptable remedial approach. The majority of organic contaminants at the EWR and EPAMT sites are petroleum-derived hydrocarbons, which have been demonstrated to readily degrade in groundwater. The shallow groundwater to be reclassified is at a relatively shallow depth and is recharged by oxygenated surface water. The formation surrounding the shallow groundwater consists of a loose, heterogeneous mixture of fill. For these reasons biodegradation provides a viable remedial solution for the mitigation of impacts to the shallow groundwater. There is also evidence in the literature that suggests that anaerobic biodegradation will also significantly reduce contaminant mass in contamination plumes where oxygen has been depleted (Wilson, *et al.*; Eganhouse, *et al.*). Additional data also indicate that over an 8-year period, biodegradation of petroleum released to groundwater has effectively limited the transport of contaminants to a distance of 200 meters from the source (Eganhouse, *et al.*).

Information that further bolsters these statements can be inferred from several ongoing projects at EPAMT. For example, known old petroleum plumes (e.g., Buildings 183 and 220, and the BP-Coastal facility at the intersection of Port Street and Navy Street) have been shown to exhibit diffuse, rather than drawn-out, expansion patterns. Furthermore, these diffuse patterns have migrated limited distances, although they are many years old (e.g., BP-Coastal release occurred

in 1978). This suggests that in the amount of time that the groundwater will take to reach the discharge point, natural attenuation will degrade the contaminants to levels below concern. This could result in plume(s) being remediated before the groundwater reaches a preferential pathway and a receptor.

Based on the existing published information regarding the documented effectiveness of biodegradation and the general conditions observed within the reclassification area, it can generally be accepted that biodegradation processes are naturally occurring in the subsurface. The concentrations of TPH throughout the area are below the 20,000-ppm to 25,000-ppm range that is considered to be toxic to microorganisms. EPA has also stated that although it is not likely for all environmental conditions to be within optimal ranges under natural field conditions, natural attenuation processes will still be occurring. In addition, many of the sources contributing to the groundwater contamination have been removed, with the exception of the jet fuel currently being remediated in the area of the EWR terminal complex and fuel storage tanks.

Natural attenuation for inorganics, such as metals that will not be chemically or biologically destroyed, would depend primarily upon their immobilization in the aquifer by processes such as their precipitation on and sorption to the solid (soil) matrix. However, under the shallow groundwater geochemical conditions, which are not very aggressive (i.e., moderate pH and eH values), the literature indicates that inorganic compounds will be moderately mobile to immobile.

5.3.2 Rates of Attenuation

5.3.2.1 Petroleum Hydrocarbons

A large number of field and laboratory studies have been conducted to determine biodegradation rates for petroleum hydrocarbons. Generally, BTEX compounds have been shown to biodegrade at fairly rapid rates. A representative sampling of these estimates is presented below:

COMPOUND	DECAY RATE (d^{-1})	
	(Daniel, R.A. and Borden, R.C)	(Brown, K. *et al.*)
Benzene	0.0014	0.0035
Toluene	0.0063	0.0042
Ethylbenzene	0.0058	0.0025
m-, p- xylene	0.0035	NP
o-xylene	0.0017	NP
Total xylene	NP	0.0026
BTEX	0.0029	0.0029

d^{-1} = per day
NP = not provided

For first-order decay, the change in contaminant concentration through time is given by:

$$C(t) = C_0 e^{-\lambda t}$$

where:

C(t): Contaminant concentration as a function of time
C_0: Initial contaminant concentration
λ: First-order decay constant

As presented in Section 4.0, the shallow groundwater Darcy velocities are very low (9 cm/y). The corresponding particle velocity would be 30 cm/y (assuming 30% porosity), or 1 foot per year (ft/y). Therefore, the time t over which the contaminants can degrade is large.

Substituting into the above equation:

t=10 years
C_0=1,141ppb (arithmetic mean of detected benzene concentration)
λ=0.0014

The concentration in 10 years will be C(*10*)=6.8 ppb. Over the same period of time the plume, will migrate only 10 feet. In 20 years the concentration will be C(*20*)=0.04 ppb, and the plume will migrate 20 feet.

Although these are simplified degradation calculations, it is evident that because groundwater flow velocities are low, the residence time of the contaminant solutions is high, providing ample opportunity for the contaminants to degrade. The implication of this condition is that unless the contaminant source is adjacent to a receptor, in this case the surface water body, the contaminants will be degraded before the groundwater reaches the receptor.

5.3.2.2 Inorganics

Groundwater analytical results for inorganics from EWR and EPAMT are based on "total metals" analyses. These analyses are conducted on samples that have not been filtered to remove suspended solids. Because of the fine-grained nature of the fill materials, the groundwater samples collected from the monitoring wells are usually very turbid. When these samples are acidified and analyzed, the results reflect the metal content of both the groundwater and the suspended solids. Consequently, the results of the analyses are an artifact of the testing protocol, rather than a true representation of the groundwater conditions. However, as a worst-case, conservative approach, the analytical results were treated as if they were representing dissolved-phase concentrations.

Although there are no generally accepted rates of attenuation for inorganic compounds, an estimate of these rates was calculated based on generally accepted principles. Inorganic compounds are removed from solution when the environment favors the formation of insoluble compounds or when they are adsorbed onto the soil matrix. For the purposes of this estimate, it is assumed that adsorption is the main mechanism acting to remove inorganics from solution.

The potential for a compound to be adsorbed onto the soil matrix is expressed by the *sorption coefficient* defined as :

$$\log Kd = \log(C_S / C_W)$$

where: C_s is the concentration of the chemical in the solid (soil) phase (mg/kg) and C_w is the concentration of the chemical in the aqueous (groundwater) phase (mg/L).

The partitioning between the soil and aqueous phase is governed by the nature of the soil (e.g., a clayey soil will have a different *Kd* than will a gravelly soil). *Kd* values have been estimated for various inorganic compounds and different soil types. EPA has published selected values in the "Soil Transport and Fate Database 2.0", which were utilized in calculating these estimates. For the compounds of interest, *Kd* values range from 0.01 to 7.70. However, the majority of values tend to concentrate in the 2.0- to 4.0-range.

The effect of the adsorption onto the migration of a particular compound is expressed as the *Retardation Factor.* A linear retardation isotherm was utilized for this calculation. This type of isotherm is independent of solute concentration and assumes infinite adsorption capacity. Although nonlinear isotherms compensate for adsorption capacity, they cannot be estimated by forward calculation. Instead, they must be back-estimated from a transport model. For this reason, the linear isotherm was utilized.

$$R = 1 + \frac{\rho_b}{\theta} K_d$$

Where: R is the retardation factor
ρ_b is the bulk density of the porous medium (soil)
θ is the porosity
Kd is the distribution (adsorption) coefficient

Therefore, the retardation factor is estimated to be:

$$R = 1 + \frac{\rho_b}{\theta} Kd = 1 + \frac{1.3 gr/cm^3}{0.3} 2.0 cm^3/gr \Rightarrow R \approx 10$$

By utilizing a conservative (low) Kd value, this calculation compensates for the infinite adsorption capacity of the linear model.

To estimate the rate at which the inorganics are removed from solution, and the distance over which the removal occurs, a simple analytical solution of the transport equation was utilized. The one-dimensional advection-dispersion transport of a nonconservative contaminant through a semi-infinite porous medium is given by the following equation:

$$D\frac{\partial^2 C}{\partial x^2} - \bar{v}\frac{\partial C}{\partial x} = R\frac{\partial C}{\partial t}$$

The analytical solution of this equation is:

$$C(x,t) = C_i + (C_0 - C_i)\left\{\frac{1}{2} erfc\left[\frac{R_x - \bar{v}t}{2\sqrt{(DRt)}}\right] + \frac{1}{2}\exp\left(\frac{\bar{v}x}{D}\right) erfc\left[\frac{R_x + \bar{v}t}{2\sqrt{(DRt)}}\right]\right\}$$

where: $C(x,t)$ is the concentration at distance x from the source at time t
C_0 is the concentration at the source
C_i is the concentration at distance x from the source at time t=0
R is the retardation factor
D is the dispersion coefficient
$\bar{v}$ is the average pore water velocity

Assuming a constant concentration source with a concentration of 22,500 µg/L (the maximum observed concentration of lead), all solute will be removed over a distance of 60 meters (180 feet).

Although the above estimate is based on many assumptions and simplifications (including the assumption that the dissolved concentration is equal to the total concentration), it demonstrates that because the shallow groundwater flow velocities within the reclassification area are very low, the residence time of the contaminant solutions is high. This provides ample opportunity for the inorganic solutes to be adsorbed onto the soils. Therefore, unless the contaminant source is adjacent to the bay, the contaminants will be immobilized before the groundwater reaches the bay.

WESTON

SECTION 6.0

IMPACT OF GROUNDWATER ON RECEPTORS

WESTON reviewed several prior studies conducted within the proposed reclassification area and immediate vicinity to identify potential human and ecological receptors that could be influenced by groundwater quality within EWR and EPAMT. This review revealed that there is no direct human health exposure route from contaminated groundwater within the reclassification area. Groundwater from beneath the reclassification area is not used nor are there plans for its use. The absence of a human exposure route is due to the following factors:

- Neither the groundwater within the proposed reclassification area nor potential receiving water bodies (the Peripheral Ditch at EWR, Newark Bay) are used as a potable source. Moreover, the recreational potential of these receiving waters is very limited within the area potentially affected by groundwater flows from the proposed reclassification area.

- Access to the Peripheral Ditch is limited by an existing chain-link fence, and by the fact that the ditch is on EWR property, making human contact highly unlikely. Future residential or other uses of the property allowing human contact with the ditch are also unlikely.

- Access to Newark Bay is limited by the industrial nature of the area, which includes fenced and guarded properties.

- Contaminants of potential concern in the groundwater (i.e., those compounds exceeding NJDEP GWQSs within the reclassification area) are expected to either attenuate or to become adsorbed onto the soil matrix and immobilized before reaching Newark Bay.

- In the event that any contaminants reach Newark Bay, the groundwater from the reclassification area is diluted by a factor of approximately 50,000 by the surface waters of the bay, before it potentially reaches any human receptors.

Exposure to ecological receptors is also expected to be insignificant, because of the attenuation of groundwater contaminants or the lack of mobility of groundwater contaminants, and the high dilution rate once groundwater enters the bay. In addition:

- Most of the proposed reclassification area has been developed, and offers little wildlife habitat that would potentially be affected by groundwater.

- Most of the wetlands previously mapped by the National Wetland Inventory (NWI) program within the proposed reclassification area have been filled.

- Habitat provided by the Peripheral Ditch is very limited and consists primarily of aquatic habitat within the channel itself. Water quality within the ditch is known to be degraded, and the ditch offers poor-quality fish habitat (Section 6.1.1, and Appendix D).

- The shoreline of Newark Bay adjacent to the proposed reclassification area is nearly entirely bulkheaded, and shoreline habitat is limited.

Hence, the discussion below is presented primarily to meet the requirements of the NJDEP guidance for reclassification petitions, which specifies that the petition must identify receptors potentially influenced by the groundwater reclassification.

6.1 POTENTIAL GROUNDWATER RECEPTORS

Only the surrounding surface water bodies, which receive discharge of groundwater, are considered potential receptors. The surface waters considered to be potential receptors of the groundwater from the reclassification area are the Peripheral Ditch and Newark Bay. Whereas several wetland areas appear on the USFWS NWI program maps, a field reconnaissance conducted by WESTON revealed that only two of these wetland areas remain undeveloped within the proposed reclassification area. None of the groundwater data collected to date, in conjunction with information on flow rates and travel times reviewed in Section 5.0, suggest that groundwater contamination has reached any of these receptors. Appendix D describes the ecological receptors associated with each of the habitats identified below.

6.1.1 Waterways

6.1.1.1 Peripheral Ditch

The Peripheral Ditch surrounds the property occupied by EWR, and is the principal means of surface water drainage for the EWR property. The approximately 8-foot-deep, 80-foot-wide ditch was constructed to drain the EWR property during the EWR expansion in the 1970s. However, the ditch actually drains an area of approximately 10 square miles, since it originates within the cities of Newark and Elizabeth (Killam, February 1995). From EWR the ditch flows south and eastward through a tidal gate at the Elizabeth Channel, and into Newark Bay. Killam Associates identified several industrial point source discharges to the Peripheral Ditch, as well as the potential for five CSOs from Newark and one from Elizabeth to discharge to the ditch. Surface water quality within the Peripheral Ditch is classified by the State of New Jersey as FW-2 Non-Trout, while the lower, tidal portion is classified as SE-3.

Human access to the ditch is limited by a 6-foot-high chain-link fence, and any recreational or other use of the ditch is prohibited by the Port Authority. The ditch is not used as a potable water source, nor is it connected to any water body that is used for potable purposes.

The Peripheral Ditch is fed primarily by surface water runoff from EWR, and the upstream flows referred to above. Portions of the ditch are piped as it runs through EWR. Because of the presence of tide gates, water is allowed to flow out into the bay, but is not allowed to enter the ditch from the bay. Water is regularly pumped from the ditch by the City of Newark as a stormwater management tool in anticipation of heavy precipitation events.

The banks of the Peripheral Ditch are lined with riprap, such as concrete and asphalt blocks, for its entire length. Since the surrounding grassy areas are regularly mowed up to the top of the bank for most of the length of the ditch, available habitat is limited to the banks of the ditch itself, which support *Phragmites* vegetation, and in some areas young Tree-of-Heaven (*Ailanthus altissima*) trees. Available habitat that is potentially affected by shallow groundwater flow is limited to open water areas within the channel. Thus, while the ditch may support limited populations of benthic invertebrates and killifish, it supports little aquatic vegetation required by many species of aquatic or wetland wildlife for cover or breeding habitat.

6.1.1.2 Newark Bay

The proposed reclassification area is bounded to the east by Newark Bay, as well as the shoreline of Newark Bay itself. Groundwater from the proposed reclassification area flows south and eastward, eventually reaching Newark Bay, but accounts for a relatively small proportion of the total water entering the bay. Most of the freshwater flows received by Newark Bay come from the Hackensack and Passaic Rivers, which enter the bay just north of the proposed reclassification area. Since Newark Bay is hydrologically contiguous with the Arthur Kill and Kill Van Kull to the south, the primary source of the surface water present is ultimately the Atlantic Ocean. As a result, water quality in the bay is affected by many sources other than shallow groundwater flows from the proposed reclassification area. Specifically, the surface water quality of Newark Bay is influenced by the following factors:

- Regional water and sediment quality within the Hudson-Raritan estuary.
- Pollution loadings from the Hackensack and Passaic Rivers, as well as smaller tidal streams such as the Peripheral Ditch.
- New Jersey Pollutant Discharge Elimination System (NJPDES) and State Pollutant Discharge Elimination System (SPDES) permitted, as well as unpermitted industrial discharges.
- Oil and chemical spills.

- Combined sewer outfalls and municipal wastewater discharges.
- Urban/industrial/residential stormwater runoff.
- Contaminated groundwater flow into the bay, especially from landfills and other historically filled areas.
- Atmospheric deposition of contaminants from surrounding industries.

The degraded water quality of the bay is reflected by its New Jersey surface water quality classification of SE-3. The "SE-3" classification means that the bay consists of estuarine surface waters that have the designated uses of secondary contact recreation, maintenance and migration of fish populations, migration of diadromous fish, maintenance of wildlife populations, and any other "reasonable" uses. Secondary contact recreation is defined by the State of New Jersey as consisting of activities "where water ingestion is minimal and includes but is not limited to boating and fishing."

The bay itself does not represent a potable water source due to its salinity and degraded characteristics. Moreover, given its classification of SE-3, primary contact recreation (e.g., swimming) in the bay is not encouraged, and is unlikely. Therefore, human exposure routes to the diluted groundwater should be limited to secondary contact recreation.

Secondary contact recreation in the immediate vicinity of Ports Newark and Elizabeth is limited by the shoreline access restrictions present at Ports Newark and Elizabeth; most of the land is privately owned and fenced, while the shoreline is bulkheaded. The area is also used regularly by large commercial vessels, which should preclude the use of the port area by small craft. While fishing from a boat in the vicinity of Ports Newark and Elizabeth is possible, published fish advisories exist for striped bass, bluefish, eels, and blue crabs within the area. If recreational boating or fishing occurs in the area, it is highly unlikely that people would receive significant exposure to shallow groundwater from the proposed reclassification area, given the amount of dilution groundwater would undergo upon entering the bay.

Thus, even if groundwater from the proposed reclassification area flowed directly into the bay without any attenuation or adsorption to soil particles, the potential effects would be limited to ecological receptors within the available habitat provided (Appendix D). Moreover, the greatest potential for ecological effects would be at the point of entry of groundwater into the bay, namely within the bay sediments (see Section 6.2 and Appendices D and E). This assumes that significant mixing does not occur in the tidally influenced groundwater present near the edge of the bay.

6.1.2 Wetland Areas

While several wetland areas were mapped in the vicinity of the proposed reclassification area by the USFWS NWI program in the 1970s, wetland habitats influenced by groundwater within the reclassification area are limited to two small areas that have not been filled. The wetlands identified by the NWI program were mapped on the basis of aerial photography from 1976. Since that time many of the areas mapped as freshwater wetlands have been filled or altered. The areas originally mapped by the NWI program are shown in Figure 6-1, and fall into several categories, including:

- Palustrine open water (small freshwater ponds).
- Palustrine emergent wetlands (freshwater marsh).
- Estuarine intertidal emergent.
- Estuarine subtidal open water.
- Estuarine intertidal flats.
- Riverine lower perennial open water.

During a field reconnaissance conducted on 26 August 1997, only one of the 13 palustrine emergent (freshwater) wetland areas mapped by the NWI program within the proposed reclassification area could be located. The remainder have been apparently filled in since 1976 as the area was developed. The only presently remaining palustrine emergent wetland is a narrow strip located along the Peripheral Ditch in the southeastern corner of EWR. The Peripheral Ditch itself is mapped by NWI as riverine lower perennial open water habitat.

Estuarine intertidal flats are located along the shores of Newark Bay both north and south of the Port Newark and Elizabeth terminals. The Great Ditch (located south and west of the proposed reclassification area) is mapped by USFWS as estuarine intertidal open water, meaning that it is tidally influenced and supports little wetland vegetation. However, within the proposed reclassification area, only one small (<1 acre) estuarine intertidal emergent wetland remains. This area is located in Port Newark in the northeastern corner of the proposed reclassification area. The area consists of approximately 0.5 acre of *Spartina* marsh, with approximately 0.25 acre of *Phragmites* marsh along its upland margin. A small (approximately 0.25-acre) mudflat area is located adjacent to this wetland, along the bay side. The remainder of the coastline within the proposed reclassification area consists either of bulkhead or riprap-lined areas. Riprap is present primarily in the northeastern corner of the area, near the aforementioned estuarine intertidal emergent wetland.

6.2 POTENTIAL FOR BIOACCUMULATION

The potential for bioaccumulation of a contaminant is based upon the presence of at least one exposure pathway. Potential exposure pathways require four basic elements:

(1) A source and the release of a contaminant of potential concern (COPC) from that source.

(2) Subsequent migration through an environmental medium.

(3) Potential contact between a receptor and the medium.

(4) An uptake mechanism associated with a potential receptor.

Thus, in order for a groundwater contaminant to bioaccumulate, it must first reach an aquatic habitat (e.g., surface water body) where ecological receptors are present. Since groundwater contaminants are expected to attenuate or (in the case of metals) become adsorbed to soil particles before they reach Newark Bay, the potential for bioaccumulation of these contaminants is considered insignificant.

Appendix E provides a discussion of the bioaccumulation potential of groundwater contaminants based upon the overly conservative assumption that contaminated groundwater reaches Newark Bay in an undiluted, unattenuated form. A conclusion that may be drawn from this conservative assessment is that even if groundwater were to reach Newark Bay at the concentrations measured in the groundwater wells, significant bioaccumulation effects would largely be limited to metals in the sediment. Since metals in bay sediments are already highly impacted by other contaminant sources (see Section 6.4 below), it is unlikely that the volume of groundwater entering the bay could cause a significant impact.

6.3 POTENTIAL FOR METALS UPTAKE INTO PLANTS

The potential for uptake of the metals of potential concern in groundwater (arsenic, cadmium, copper, lead, mercury, nickel, and zinc) is considered insignificant because of the following factors:

- The low probability that metals in groundwater from the proposed reclassification area ever reach Newark Bay.
- The limited wetland habitat provided within the proposed reclassification area, should metals in groundwater reach it.
- The fact that vegetation within the Peripheral Ditch is largely limited to its banks, and hence would not be expected to come into contact with groundwater.

A review of reports (Keystone Environmental Resources, Inc. 1990) and other information available for the proposed reclassification area, in conjunction with the site reconnaissance conducted in August 1997, indicates that existing wildlife habitat is very limited, as much of the area is developed and unvegetated. Since most of the proposed reclassification area is filled upland that is developed with buildings, impervious cover, and lawns, the opportunity for uptake of groundwater by plants is limited to wetland areas. Within the Peripheral Ditch, there is little opportunity for contaminant uptake by plants, since little submerged aquatic vegetation exists within the channel, and the banks of the ditch are rip-rapped throughout much of its extent. Thus, the plants should not come into contact with groundwater to any appreciable extent.

Natural attenuation and adsorption of contaminants to soil particles are expected to prevent groundwater contaminants from reaching the bay. Even if these contaminants did reach the bay, the only potential opportunity for metals uptake by groundwater exists within the estuarine emergent wetland noted at Port Newark in the northeastern corner of the proposed reclassification area. This area provides limited habitat, as it is less than 1 acre in extent. The opportunity for metals uptake into plants and subsequent ingestion by primary consumers, therefore, is considered insignificant.

6.4 DISCUSSION OF EXISTING SEDIMENT AND WATER QUALITY AT EACH RECEPTOR

6.4.1 Peripheral Ditch

Surface water quality data in the Peripheral Ditch is limited to studies conducted by WESTON (October 1991) for the Port Authority from 1989 through 1991. Parameters measured were pH, TPH, chemical oxygen demand (COD), total suspended solids (TSS), and total organic carbon (TOC). Of these, only TPH results are directly applicable to the Class II-B reclassification petition. TPH concentrations at 10 locations sampled within the ditch ranged from 0.1 mg/L to 2.6 mg/L. While no surface water quality standards exist for TPH, these results suggest that the ditch has somewhat degraded water quality as a consequence of petroleum contamination and high COD values.

Sediment data collected by WESTON within the Peripheral Ditch suggest that the ditch is impacted by petroleum-related compounds. The presence of these compounds is apparently associated with runoff from EWR, the southern fuel farm, and upstream areas, as opposed to shallow groundwater flow, since there are no known plumes that occur within the immediate vicinity of the ditch.

Of the petroleum-related compounds detected, TPH ranged from 4,610 mg/kg to 31,300 mg/kg at the 10 locations sampled within the ditch. Total SVOCs ranged from 18.2 to 52.7 mg/kg, and

individual SVOCs, such as anthracene, phenanthrene, pyrene, fluorene, benzo(a)anthracene, naphthalene, benzo(a)pyrene, and benzo(b)fluoranthene, exceeded National Oceanic and Atmospheric Administration (NOAA) effects-range median (ER-M) or effects-range low (ER-L) sediment quality guidelines for the protection of aquatic life, each at a minimum of one location.

6.4.2 Newark Bay

6.4.2.1 Surface Water Quality

As noted above (see Sections 5.0 and 6.1.1) the proposed reclassification is likely to have little impact on Newark Bay water quality since:

- Contaminants in groundwater from the reclassification area are not expected to reach Newark Bay due to natural attenuation of organic compounds, and adsorption of metals onto soil particles.
- Groundwater flows are an insignificant portion of the total hydrological inputs into Newark Bay (1:50,000 dilution).
- Many other significant contamination sources affecting Newark Bay water quality have been identified. The existing water quality of Newark Bay has been reported to be the result of contaminant discharges directly into the regional surface water system from industrial and municipal sources.

The ensuing discussion is primarily for the purpose of describing water quality characteristics of the bay as a *potential* receiving water body.

In some cases, measurements of surface water quality can provide an indication of whether the water body is impacted by contaminated groundwater. However, in Newark Bay the situation is complicated by the facts that the bay is contaminated from multiple sources, that it is tidal and well-mixed, and that the water volume of the bay is significantly larger than the groundwater volume entering it. Moreover, surface water quality measurements are instantaneous and may vary with tides, temperature, precipitation, and other factors that can vary daily or seasonally. As a result, no inferences can be made by comparison of groundwater quality results with surface water quality results in the bay. However, should groundwater contaminants be absent or present at levels not posing an ecological risk (i.e., below EPA ambient water quality criteria), it can be inferred that the effects of groundwater contamination on the water quality in the bay are insignificant. Conversely, if water quality criteria were to be exceeded in the bay, it could not be concluded on the basis of those results alone that the contamination resulted from groundwater, since there are many documented pollutant sources to the bay.

Table 6-1 summarizes surface water quality results measured at two locations in Newark Bay for groundwater contaminants of concern within the proposed reclassification area. Data are presented from the 1992 Battelle study (data collected in October 1991) for the New York City Department of Environmental Protection's (NYCDEP's) New York Harbor water quality monitoring program, in which a sample at location "A7" just off Port Elizabeth was collected and analyzed for selected metals (Battelle, 1992). Data are also presented from a 1995 groundwater study conducted by the Port Authority in which a single water quality sample was collected and analyzed for Priority Pollutant metals and VOCs, for comparison with groundwater results. Despite the wealth of studies on sediment quality within the Hudson-Raritan estuary, these were the only three studies of surface water quality found with data relevant to the groundwater reclassification petition.

During a fourth study conducted by Lawler, Matusky and Skelly (LMS) (Memorandum, 1995) for the Port Authority on sediment quality, a water quality sample was collected just off Port Elizabeth, but was only analyzed for traditional water quality parameters such as biological oxygen demand (BOD), TSS, TDS, and dissolved oxygen (DO).

NYCDEP also conducts routine water quality monitoring within the New York/New Jersey Harbor region (NYCDEP 1993). However, the closest point monitored to Newark Bay is Shooter's Island, near the juncture of the Arthur Kill and Kill Van Kull (station K2). NYCDEP only measures BOD, DO, nitrogen, chlorophyll a, and fecal coliform; these parameters are not directly applicable to the proposed Class II-B groundwater reclassification.

No inferences can be made by comparison of groundwater quality with surface water quality results from the bay, for the reasons noted above. However, comparison of results of these limited surface water quality studies within Newark Bay with EPA water quality criteria indicate that the compounds of potential concern in groundwater do not exceed EPA surface water quality criteria in Newark Bay. This comparison indicates that groundwater from the reclassification area is not significantly impacting surface water quality in the bay.

6.4.2.2 Sediment Quality

Contaminated groundwater from the proposed reclassification area is not expected to reach Newark Bay; therefore, sediment quality in the bay should remain unaffected by groundwater quality. The following discussion is intended to provide a profile of existing contamination in the bay sediments in the vicinity of the proposed reclassification area, as a result of other pollutant sources.

Sediment data measured in several studies (Table 6-2) conducted in Newark Bay show much higher values of most parameters as compared to surface water values. This is to be expected, since contaminants often adhere to suspended particles that eventually settle from the water

column into the sediment. As a result, sediments within the bay are among the most toxic in the New York/New Jersey Harbor region (NOAA, 1995).

Appendix F shows results of metals concentrations in New York/New Jersey Harbor sediments measured as part of two regional studies. The first study was conducted by Battelle Ocean Sciences in 1992 on behalf of NYCDEP as part of the New York/New Jersey Harbor Estuary program (Battelle, 1992). That study measured concentrations of trace metals in sediment and pore water at 20 sampling locations within the harbor region. Location "A7" was located closest to Ports Newark and Elizabeth. The sample result plots for the metals of potential concern described above (arsenic, cadmium, copper, lead, mercury, nickel, and zinc) show that Location A7 has lower concentrations in the sediment than do other locations measured within the immediate vicinity. (No plots were available for selenium.) Nearly all of these metals were detected at substantially higher concentrations at location A5 (near the juncture of Newark Bay and the Kill Van Kull), and locations A8 and A9 in the Passaic and Hackensack Rivers, respectively. These data suggest that regional sources of contamination other than EWR and EPAMT are major determinants of sediment quality within Newark Bay.

The second study was conducted by NOAA (NOAA 1995) to characterize the extent of sediment toxicity within the Hudson-Raritan estuary. During Phase I of the study in 1991, 117 sediment samples were collected throughout the entire estuary and tested for toxicity using three different organisms. Some of these locations were also analyzed for chemical parameters, including two locations within Newark Bay. Location No. 16 was in upper Newark Bay, and is the closest sampled location to the proposed reclassification area. Location 17 was located in lower Newark Bay near the Kill Van Kull, and had higher concentrations of metals measured than those in Location 16.

During Phase II of the study in 1993, an additional 57 samples were collected within Newark Bay and the immediate vicinity and also measured for toxicity. Some of these samples were also analyzed for chemical parameters. Of the six locations analyzed by NOAA for sediment chemistry in Newark Bay in 1993, the two closest to Port Newark and Port Elizabeth are Stations 31 and 36, which are located closer to the eastern side of the bay. Table 6-2 summarizes analytical results from the above sediment quality studies in the vicinity of the proposed reclassification area, as well as a third study conducted by Squibb *et al.* (1991).

While sediment chemistry was not analyzed within the Port Elizabeth or Port Newark channels during either Phase I or Phase II of the NOAA investigation, five out of six of the sediment samples within the channels or immediate vicinity were considered highly toxic (<80% survival) to amphipods (benthic macroinvertebrates). Most of the sediments in Newark Bay and in the Passaic and Hackensack Rivers were also found to be highly toxic to the three organisms tested.

The above toxicity results confirmed results of the Squibb study, which found that several parameters (metals, DDT, PCBs, and polycyclic aromatic hydrocarbons [PAHs]) in Newark Bay sediments exceeded NOAA sediment quality guidelines for the protection of aquatic life. The report concluded that Newark Bay sediments have an extremely high potential for toxicity to aquatic biota, and are likely to be among the most impacted in the New York/New Jersey Harbor region.

Results of these three major sediment quality studies suggest that several contaminant sources present in the bay contribute to the observed sediment toxicity. These chemicals include several parameters that were not detected with high frequency at levels of concern in groundwater within the proposed reclassification area, such as dioxin congeners, PCBs, and PAHs. A review of the sediment quality plots (Appendix F) indicates that the presence of these contaminants in Newark Bay is clearly related to major sources in other locations, such as hazardous waste sites and industries along the Passaic and Hackensack Rivers. The Hackensack and Passaic Rivers flow southward into Newark Bay, and carry with them sediment loads that ultimately influence the toxicity of the bay sediments. This can be seen in the case of dioxins originating in the Passaic River, which have affected Newark Bay sediment quality (Bopp *et al.*, 1991).

In summary, contaminated groundwater from the proposed reclassification area is not expected to reach the bay sediments. However, if it did, its contribution to the pollutant load of the bay and subsequent sediment toxicity would likely be little, relative to the regional inpus from other sources.

6.4.3 Wetlands

A review of reports available on the proposed reclassification area revealed no information on water quality within the two wetland areas identified from the NWI map that were confirmed in the field as still existing (see Section 6.1.2). Only one freshwater wetland area was identified within the proposed reclassification area; this is associated with the Peripheral Ditch in the southeastern corner of the ditch, before the ditch exits EWR. A report by Killam (April 1995) noted that the wetlands present within the reclassification area are classified by NJDEP as FW-2 Non-Trout. Since the wetland is associated with the ditch, its water quality is probably degraded given that most of the area consists of disturbed fill material, much of which is thought to consist of dredge spoils (Killam, April 1995). However, the principal hydrological source for the Peripheral Ditch is stormwater runoff, as well as flows from upstream.

The remaining wetland area is an estuarine emergent wetland located at Port Newark. The hydrology of that wetland is associated with Newark Bay, and hence the water quality within the wetland is also largely determined by Newark Bay. Because groundwater contaminants are not expected to reach the bay, and the water quality of the wetland is determined by Newark Bay water quality, there should be no adverse effects to this wetland associated with reclassifying the shallow groundwater.

WESTON

SECTION 7.0

DEMONSTRATION OF THE FIVE NJDEP CHARACTERISTICS FOR CLASS IIB

This section presents the five characteristics of a Class IIB groundwater unit and discusses how the information presented in the preceding sections demonstrates that the groundwater unit proposed for reclassification is characteristic of a Class IIB area.

7.1 CHARACTERISTIC NO. 1 - GROUNDWATER QUALITY EXHIBITS EXTENSIVE EXCEEDANCES OF ONE OR MORE OF THE GROUNDWATER QUALITY CRITERIA AS A RESULT OF PAST DISCHARGES

The groundwater quality in the region is shown to have numerous exceedances of the NJDEP Class II-A GWQSs a result of past discharges of groundwater pollutants for several contaminants, principally petroleum-derived VOCs, SVOCs, and metals. These contaminants are presumably associated with the fill material used to create the reclassification area. As discussed in Section 5.2, in 80% of the site area there is a greater than 80% probability of encountering groundwater contaminated above GWQSs. NJDEP, in correspondence with the Port Authority, acknowledged that contaminated fill had been utilized to create the area. Figure 3-2 depicts the suspected and known sites in and around EWR and EPAMT that exhibit exceedances for Class II-A GWQSs. The following discussion explains the determination of "extensive exceedances":

Existing shallow groundwater quality data from 218 wells in the area were compiled from available reports. All wells were screened in the same water-bearing zone. Data from each well were assessed to determine whether GWQSs were exceeded. Wells that had any exceedance were assigned a code of 1; wells that had no exceedances were assigned a code of 0. These codes represent the probability of exceeding GWQSs. Geostatistical techniques were then used to analyze the spatial correlation structure of the assigned codes.

Based on the correlation structure interpreted from the semivariogram, a contour map was generated using kriging estimators. Figure 5-9 illustrates the spatial probabilities of exceeding groundwater standards. The area covered by the geostatistical map was assessed to determine approximately how much of the area had a high probability of being contaminated. Figure 5-8 is a plot of the percentage of the mapped area that exceeds GWQSs at several probability levels. This graph indicates that the probability is high that groundwater beneath most of the mapped area is contaminated.

7.2 CHARACTERISTIC NO. 2 - GROUNDWATER RESTORATION CANNOT BE ACHIEVED USING TECHNOLOGICALLY PRACTICABLE MEANS

Under the EPA's Subpart S rule, the determination that aquifer restoration is not technologically practicable involves a consideration of the "engineering feasibility and reliability" of attaining media cleanup standards, as well as situations where remediation may be "technically possible," but the "scale of the operations required might be of such a magnitude and complexity that the alternative would be impracticable."

As discussed in Section 7.1, contaminated groundwater occurs in most of the reclassification area. Furthermore, GWQSs are widely exceeded. The contaminants of concern are petroleum-derived VOCs, SVOCs, and metals. Typical remedies for organic compounds include the following:

- Pump, treat, and dispose of.
- Pump, treat, and re-inject.
- Vent and sparge.
- Bioremediate and bioaugment.

Typical remedies for inorganic compounds (metals) include the following:

- Pump, treat, and dispose of.
- Pump, treat, and reinject.

As indicated above, the affected area is very large (approximately 10 square miles). The saturated thickness of the historic fill unit is small (approximately 10 feet), the permeability is low, and the unit is highly inhomogeneous. Because of these properties, the capture zone of any groundwater capture system (extraction wells or trenches) will be limited to, at best, a few tens of feet. Under these conditions, an extensive network of recovery points would be necessary. For example, assuming a capture zone of 20 feet, approximately 550,000 well points will be necessary, assuming that approximately 80% of the reclassification area (i.e., 8 square miles) is contaminated above the standards. At an average cost of $500 per well point, the cost of well installation will be $275 million. This number does not include the cost of constructing, operating, and maintaining a treatment system. This calculation demonstrates that hydrogeologic and economic constraints preclude remediation of the contaminated groundwater on a regional scale. Similarly, while natural biodegradation of organic compounds will lower their concentrations over time, any attempt to augment and accelerate the process on a regional scale by constructing a nutrient and oxygen delivery system will incur costs comparable to those listed above.

Source removal in areas of fuel spills indicates that the geometric constraints of the historic fill unit make recovery a long-term undertaking. Reportedly, free-phase product recovery at the EWR fuel terminal has been under way for 6 years and is expected to continue for an indefinite amount of time.

As discussed in other sections of this report, the reclassification area is underlain by historic fill, which includes construction demolition debris and trash from former municipal landfills. Both of these are sources of contamination, especially inorganic compounds. An exact estimate of the volumes of the demolition debris and trash does not exist. However, the debris and trash underlie most of the 10 square miles of the reclassification area. Consequently, a source removal action (such as excavation and treatment or disposal) or source control action (such as containment or stabilization) is technically and financially unimplementable, because it would require excavation or some form of in-situ or ex-situ treatment of almost the entire reclassification area.

7.3 CHARACTERISTIC NO. 3 - THERE ARE OR WILL NOT BE ANY POTABLE USES OF THE GROUNDWATER FOR RECLASSIFICATION

As described in Section 3.0, no public community supply wells or zones of contribution for such wells were identified within the proposed reclassification area. All potable water used in the proposed reclassification area and surrounding region is imported from off-site. There are no registered production wells within the limits of the proposed reclassification area.

Because of the anticipated very low groundwater yields from the historic fill, which is evidenced by a thin saturated thickness, long recovery times in monitoring wells, and the presence of dry wells, the potential use of the historic fill as a future potable water supply is not anticipated. All potable and industrial groundwater wells in the greater region draw from the bedrock aquifer, which is not hydraulically connected to the historic fill. Furthermore, saltwater intrusion into the bedrock aquifer, from historic overpumping, has rendered the bedrock aquifer unusable beneath and around the proposed reclassification area.

Furthermore, the Port Authority, which operates most of the area, does not have any plans to develop groundwater resources in the area. As a public agency, the Port Authority has the long-term authority and permanence to guarantee that groundwater will never be utilized in this area. Inquiries to the City of Newark and City of Elizabeth indicated that there are no plans for developing groundwater resources in this area. Inquiries to the City of Newark and City of Elizabeth indicated that there are no public or private wells in or near the reclassification area. Both the City of Newark and the City of Elizabeth are supplied by surface water, originating outside the region. Both cities indicated that they have adequate capacity for the next 25 years.

7.4 CHARACTERISTIC NO. 4 - NO SIGNIFICANT RISK OF POLLUTION MIGRATION INTO CLASS I, II-A, OR III-A AREAS

As discussed in detail in Section 4.0, there is no risk of pollution migration to an aquifer of higher water quality. The underlying middle sand and bedrock groundwater is isolated from the historic fill groundwater by the meadow mat and silt and clay layers. In addition, groundwater gradients are expected to be upward, further precluding migration into the underlying middle sand and bedrock. Consequently, because the petition area is situated along Newark Bay, it occupies a regional discharge zone and the predicted groundwater flow gradients will be upward, since there are no active pumping centers to deflect them.

There are no Class I or Class III-A aquifers within the proposed reclassification area.

7.5 CHARACTERISTIC NO. 5 - NATURAL ATTENUATION CAN BE RELIED ON TO RESTORE GROUNDWATER QUALITY FOR CRITERIA IDENTIFIED PURSUANT TO CHARACTERISTIC NO. 1

7.5.1 Natural Attenuation Processes

Based upon the principles of natural attenuation discussed in Section 5.3, it is reasonable to rely on the natural attenuation approach for remediation of the contamination at the reclassification area. Available data suggest that most of the organic contamination consists of low levels of petroleum hydrocarbon compounds, which have been demonstrated to be readily biodegradable and amenable to natural attenuation.

Whereas inorganic contaminants do not biodegrade, they will be adsorbed onto the soil matrix. Soil/water partitioning coefficients and solubility data for the contaminants of concern indicate that these compounds are generally moderately mobile to immobile and have a moderate to high affinity for soils. Because groundwater flow gradients are exceedingly low, most of the dissolved phase is expected to be adsorbed before it reaches the discharge zone. As a conservative measure, this report has assumed that the entire measured concentration of inorganics is in the dissolved phase, while in fact, observations indicate that the largest percentage of the measured concentrations is due to the presence of suspended fines in the groundwater samples.

Information that further bolsters these statements can be inferred from several ongoing projects at EPAMT. For example, known old petroleum plumes (e.g., Buildings 183 and 220, and the BP-Coastal facility at the intersection of Port Street and Navy Street) have been shown to exhibit diffuse, rather than drawn-out, expansion patterns. Furthermore, these diffuse patterns have migrated limited distances, although they are many years old (e.g., the BP-Coastal release occurred in 1978). These observations support the following:

- The hydraulic gradient is very flat and resulting flow velocities are very low. The dissolved contaminant plume is moving away from the assumed source at a slow rate by diffusion rather than by advection. The estimated rate of shallow groundwater flow (particle velocities) is 1 foot/year. At this rate, groundwater from the center of the reclassification area will take 2,000 to 4,000 years to reach the surrounding surface water.

- In the amount of time that groundwater will take to reach the discharge point, natural attenuation will degrade the contaminants to levels below concern. The estimates presented in Section 5.0 suggest that the contaminant concentrations will attenuate to undetectable within a 20-year time frame.

By granting CEAs at several EPAMT UST sites, NJDEP has recognized that natural attenuation is an acceptable solution for the dissolved phase contamination in the shallow groundwater in the area proposed for reclassification.

7.5.2 Types of Contaminants Having the Potential to Reach Receptors

The contaminants of concern are arsenic, cadmium, chromium, lead, and BTEX compounds. The analysis of the migration potential of the contaminants of concern indicates that the organic compounds will degrade and the inorganic compounds will be immobilized before groundwater discharges to Newark Bay. The estimates presented in Section 5.0 suggest that the contaminant concentrations will attenuate to undetectable within a 20-year time frame. Furthermore, as presented in Section 4.0, a 50,000-times dilution is estimated for water discharging into the surface water. At this rate of dilution, any contaminants that reach the surface water will have no effect on surface water quality.

7.5.3 Potential for Bioaccumulation

The contaminants of concern having the potential to bioaccumulate are metals. The extent of uptake is determined by the physiological and behavioral characteristics of the organism exposed, and the duration of exposure. Thus, bioconcentration factors vary not only between these metals, but also for the organisms exposed, and are difficult to predict. However, the preceding analysis has demonstrated that the metals will likely be adsorbed onto the site soils and will be immobilized before reaching the bay. Therefore, bioaccumulation does not represent a significant concern.

7.5.4 Potential for Metals Uptake into Plants

The review of available reports and information for the proposed reclassification area indicates that existing wildlife habitat is very limited; much of the area is developed and unvegetated.

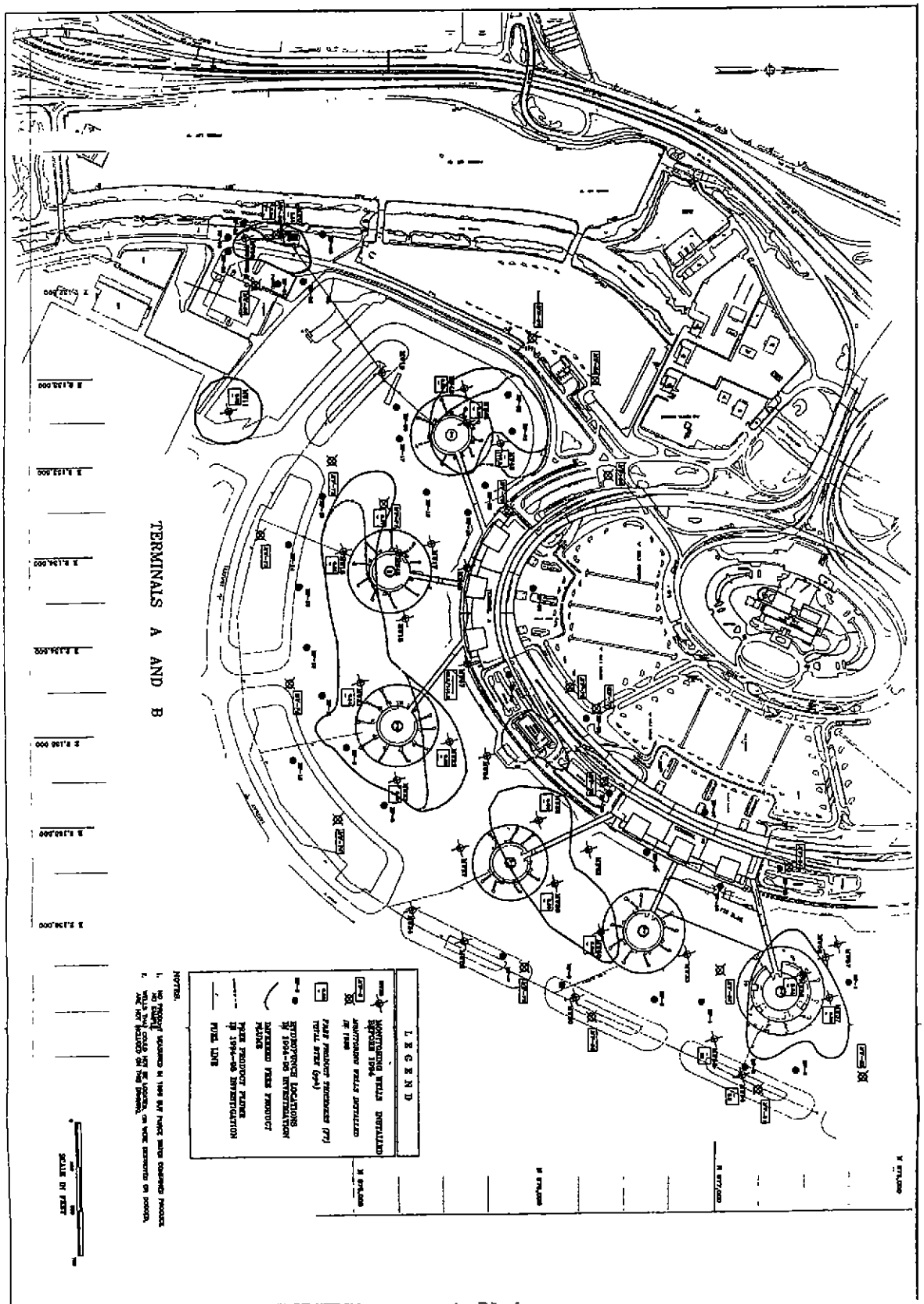
Plant species present in the proposed reclassification area are mostly indicative of disturbed conditions and represent poor wildlife habitat quality; hence, the potential for metals uptake into plants is not a significant ecological concern.

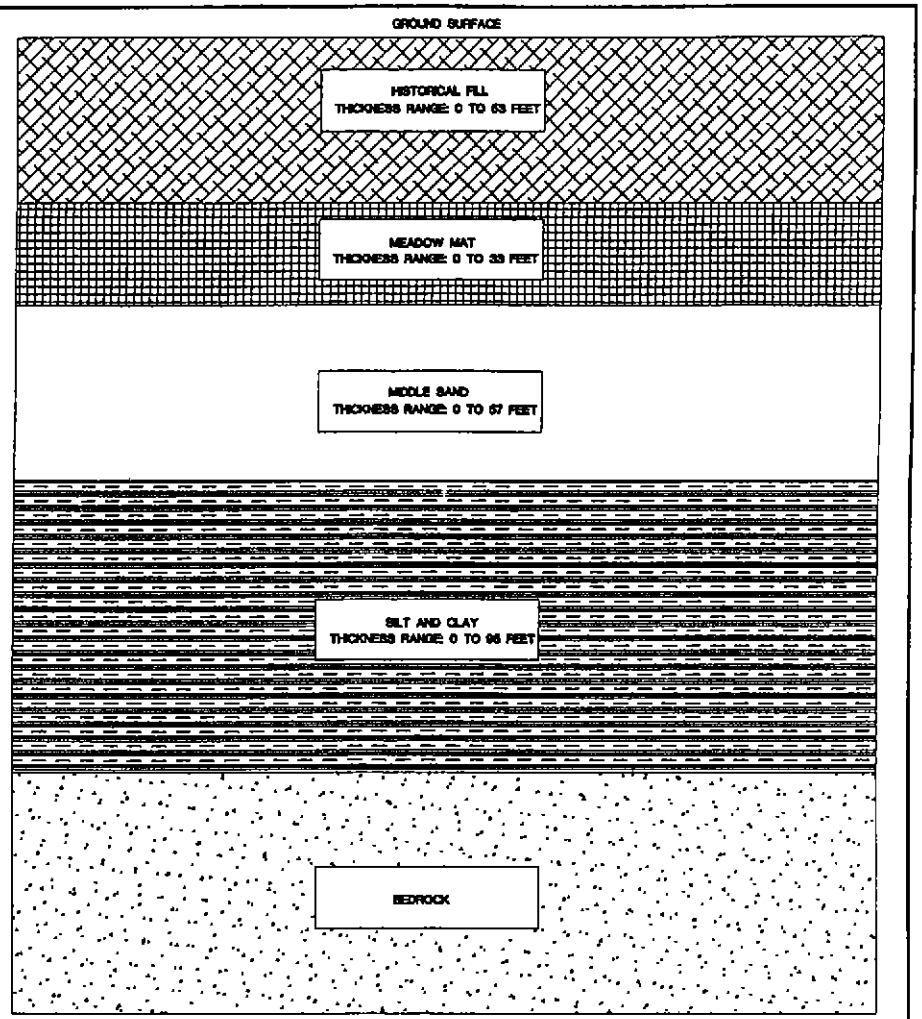
7.5.5 Wetlands

Only one freshwater wetland area is associated with the Peripheral Ditch. A report by Killam (April 1995) noted that the wetlands present within the reclassification area are classified by NJDEP as FW-2 Non-Trout. The water quality of this wetland is probably degraded given that most of the area consists of disturbed fill material, much of which is thought to consist of dredge spoils (Killam, April 1995). The principal hydrological source for the Peripheral Ditch is stormwater runoff, as well as flows from upstream.

The remaining wetland area is an estuarine intertidal emergent wetland located at Port Newark. The hydrology of that wetland is associated with Newark Bay, and hence, the water quality within the wetland is also largely determined by Newark Bay. Reclassification of the aquifer within the proposed reclassification area is not anticipated to have a significant effect on this wetland, relative to the influence of Newark Bay water quality.

Figures


TERMINALS A AND B
LEGEND
GROUNDWATER RECLASSIFICATION PETITION
PORT AUTHORITY OF NY & NJ
TERMINALS A & B
FREE PRODUCT PLUMES
AUGUST 1997
2-1



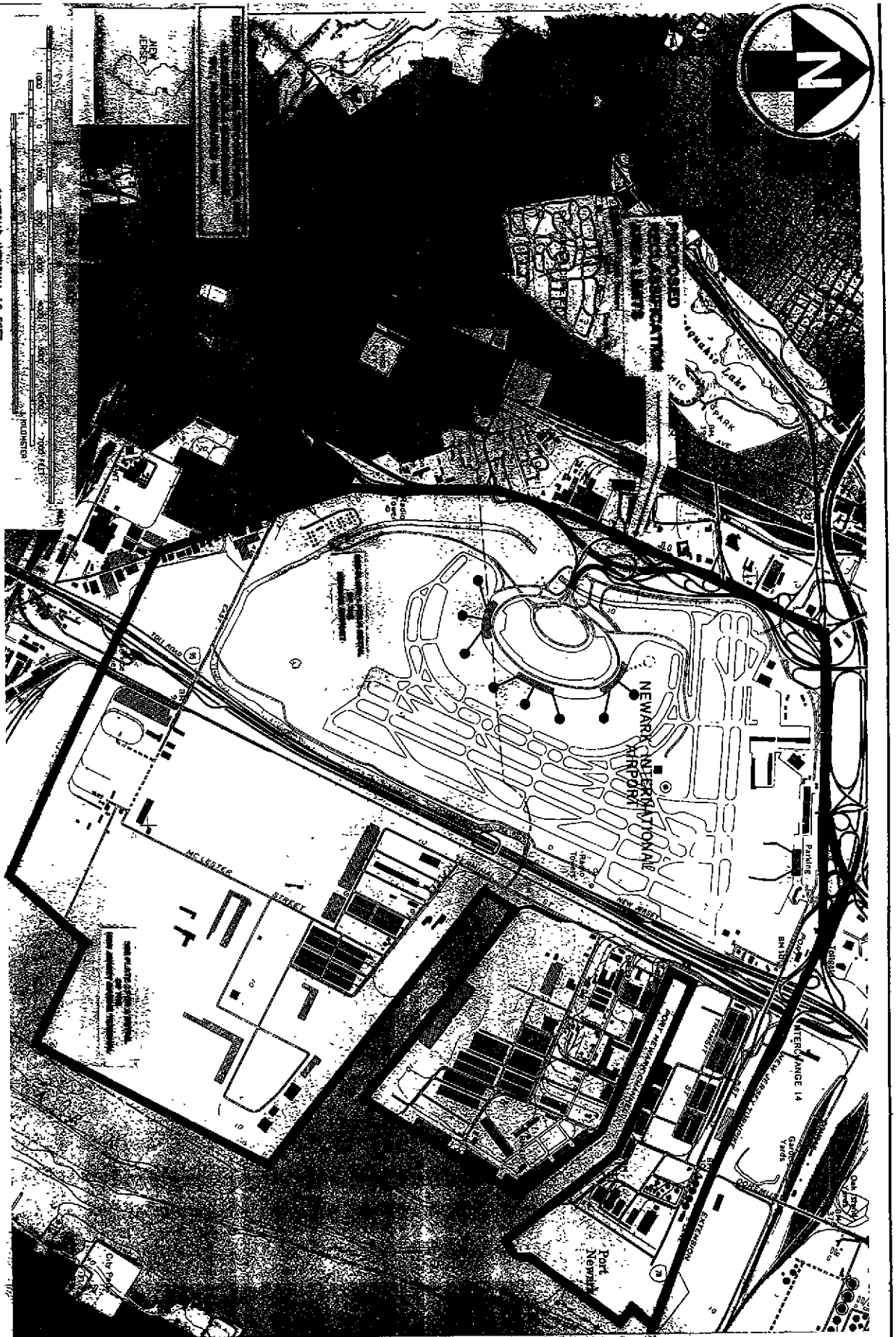
WESTON
IMAGOS DESIGNS/CONSULTANTS

PROJECT NAME
GROUNDWATER RECLASSIFICATION PETITION
NEW YORK NEW YORK
CLIENT NAME:
PORT AUTHORITY OF NY & NJ

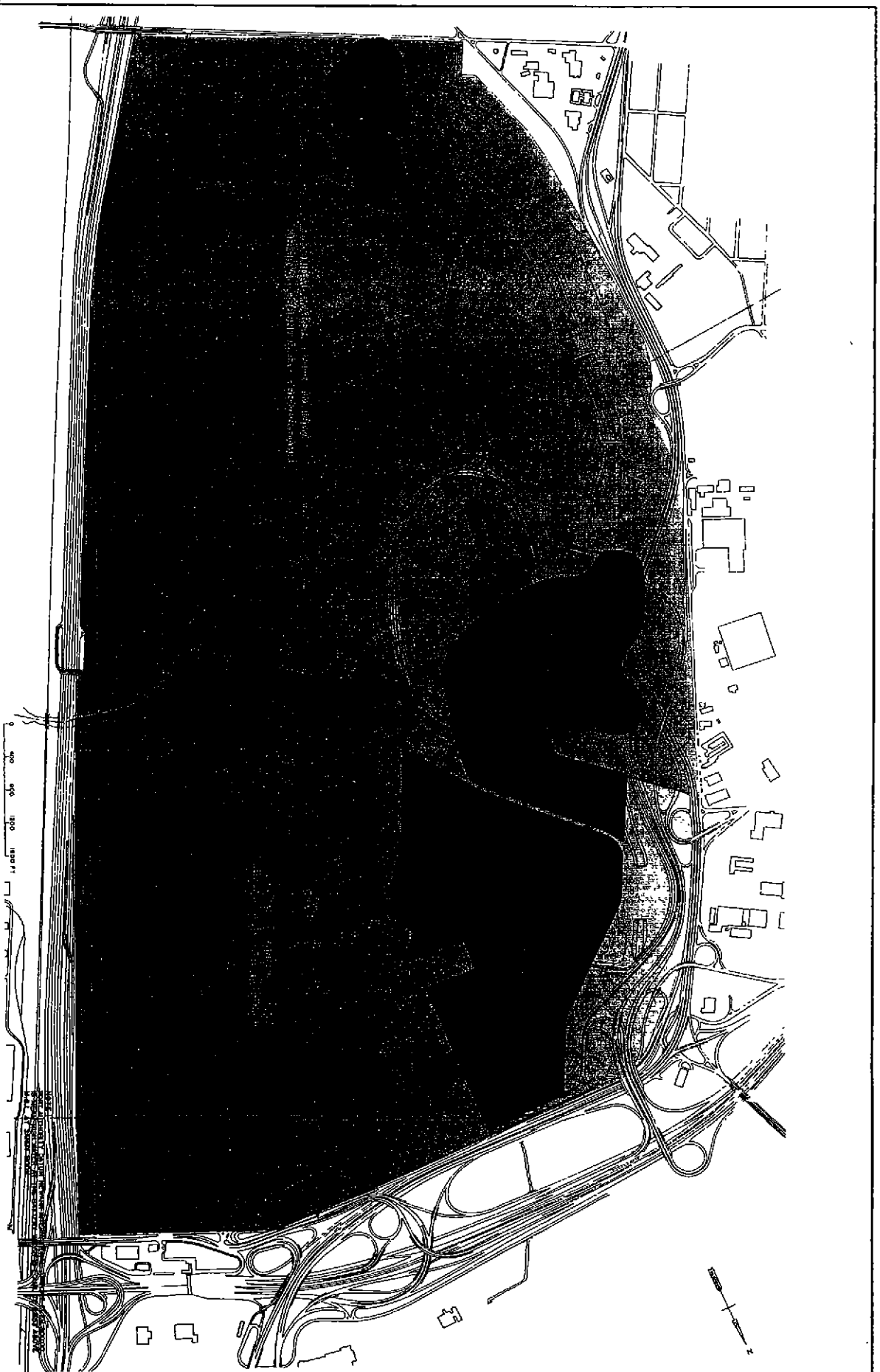
GENERALIZED PETITION AREA STRATIGRAPHIC COLUMN

DATE: SEPTEMBER 1997

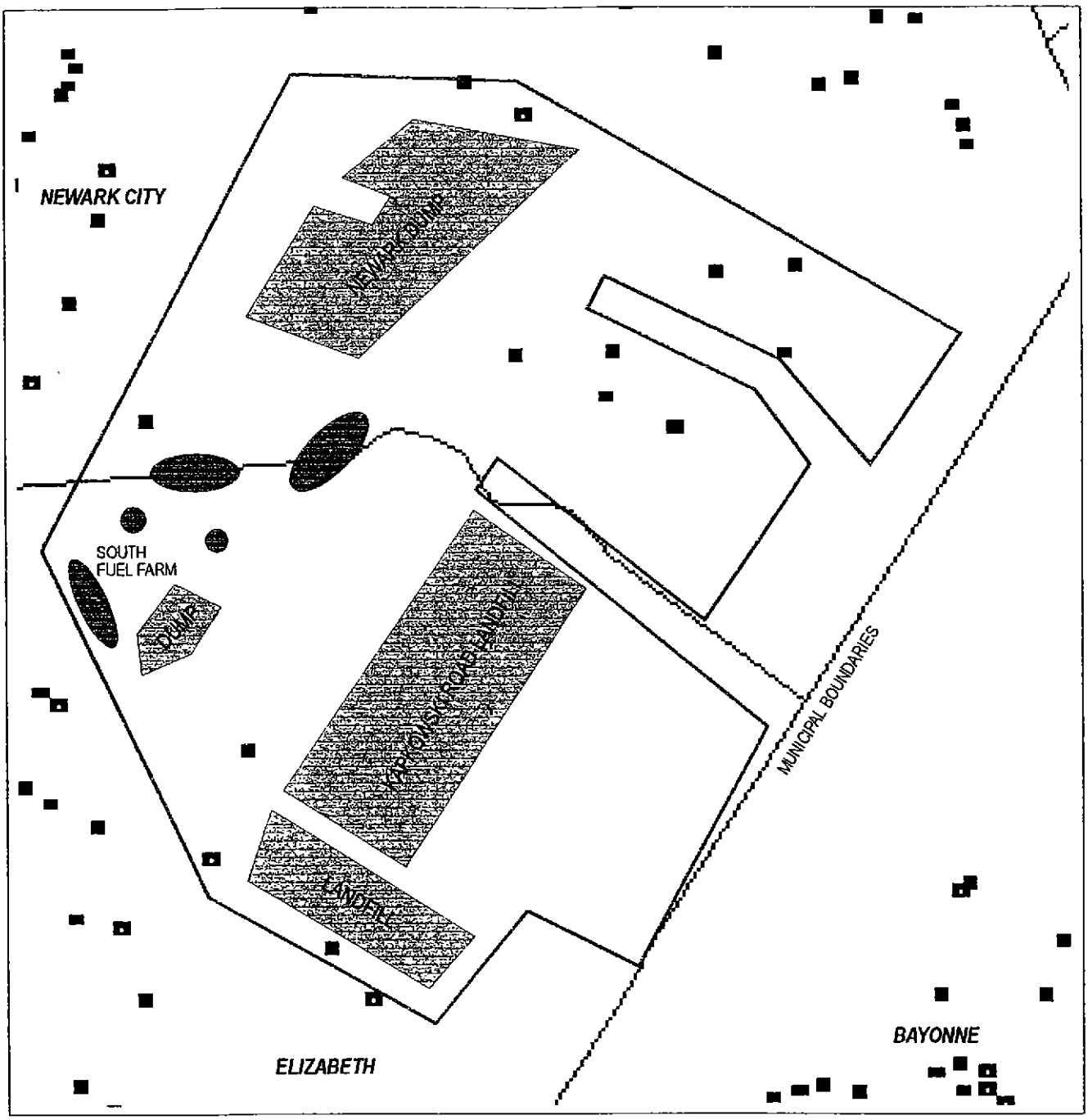
FIGURE #: 1-2



WESTON MANAGERS DESIGNERS/CONSULTANTS	PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION	PROPOSED RECLASSIFICATION AREA LIMITS	
	CLIENT NAME: PORT AUTHORITY OF NY & NJ	DATE: JULY 1997	FIGURE #: 1-1



WESTON MANAGERS DESIGNERS/CONSULTANTS	PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION	LANDFILL AREAS ON NEWARK AIRPORT PROPERTY	
	CLIENT NAME: PORT AUTHORITY OF NY & NJ	DATE: AUGUST 1997	FIGURE #: 3-1



SCALE

3500 0 3500 7000

FEET

KEY

- KNOWN CONTAMINATED SITE (from NJDEP GIS)
- FREE-PHASE PRODUCT PLUMES
- HISTORIC DUMPS AND LANDFILLS

Note: Location of features presented in this figure is approximate and for illustrative purposes only. Other contaminated sites may also exist within the area of the figure.

WESTON MANAGERS DESIGNERS/CONSULTANTS

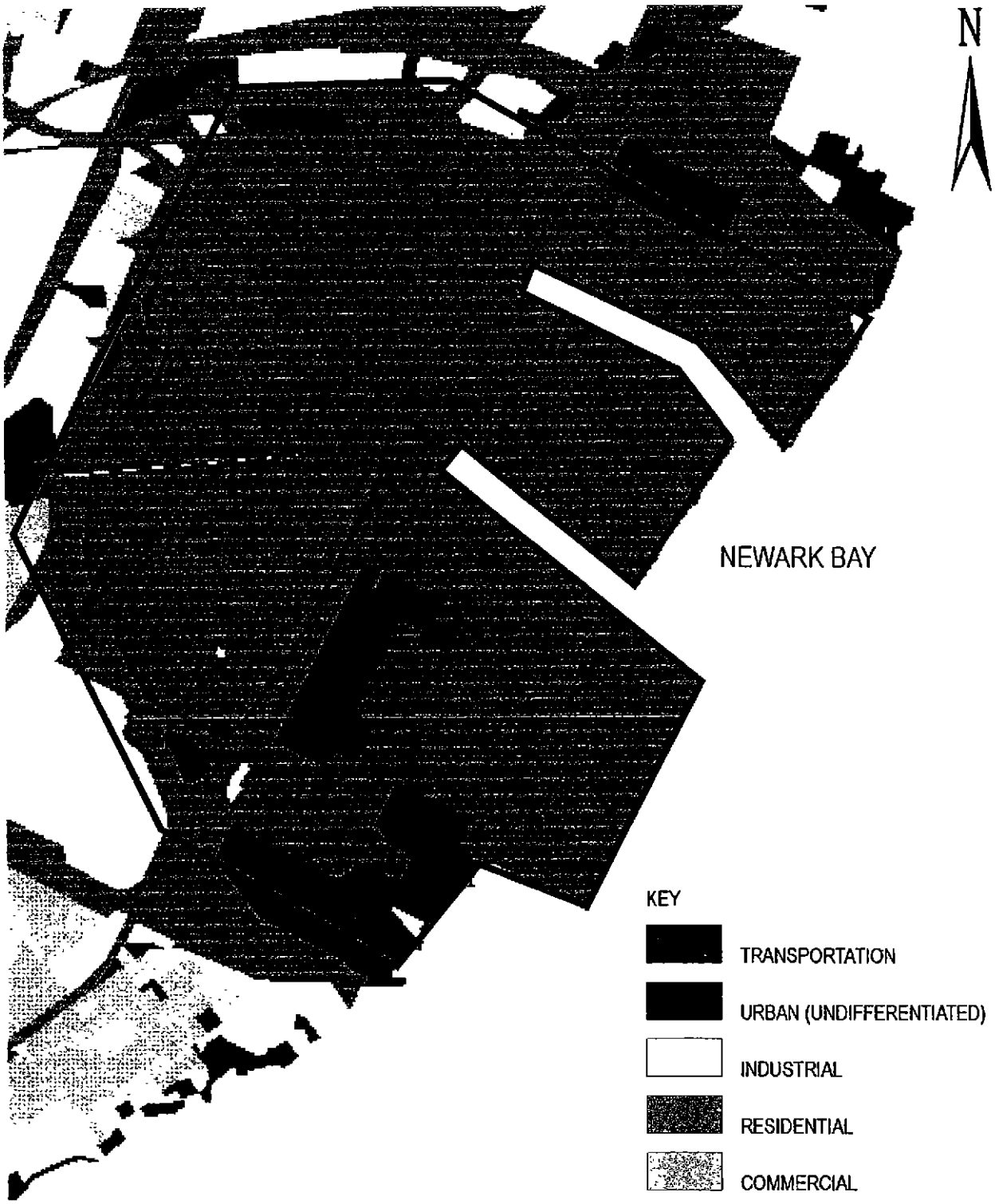
PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION

CLIENT NAME: THE PORT AUTHORITY OF NY & NJ

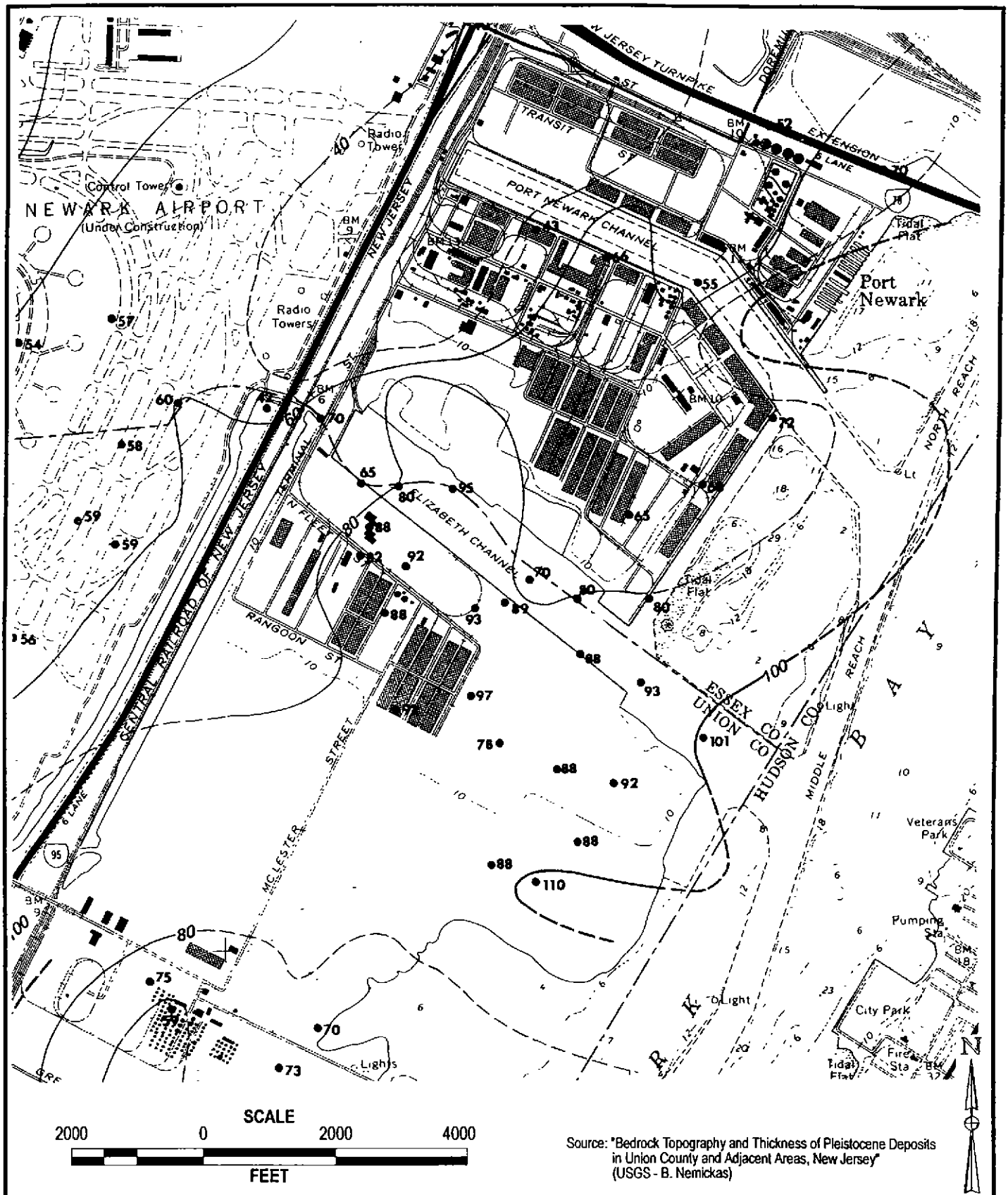
LANDFILLS, KNOWN CONTAMINATED SITES AND FREE PHASE PRODUCT PLUMES

DATE: September 1997

FIGURE #: 3-2

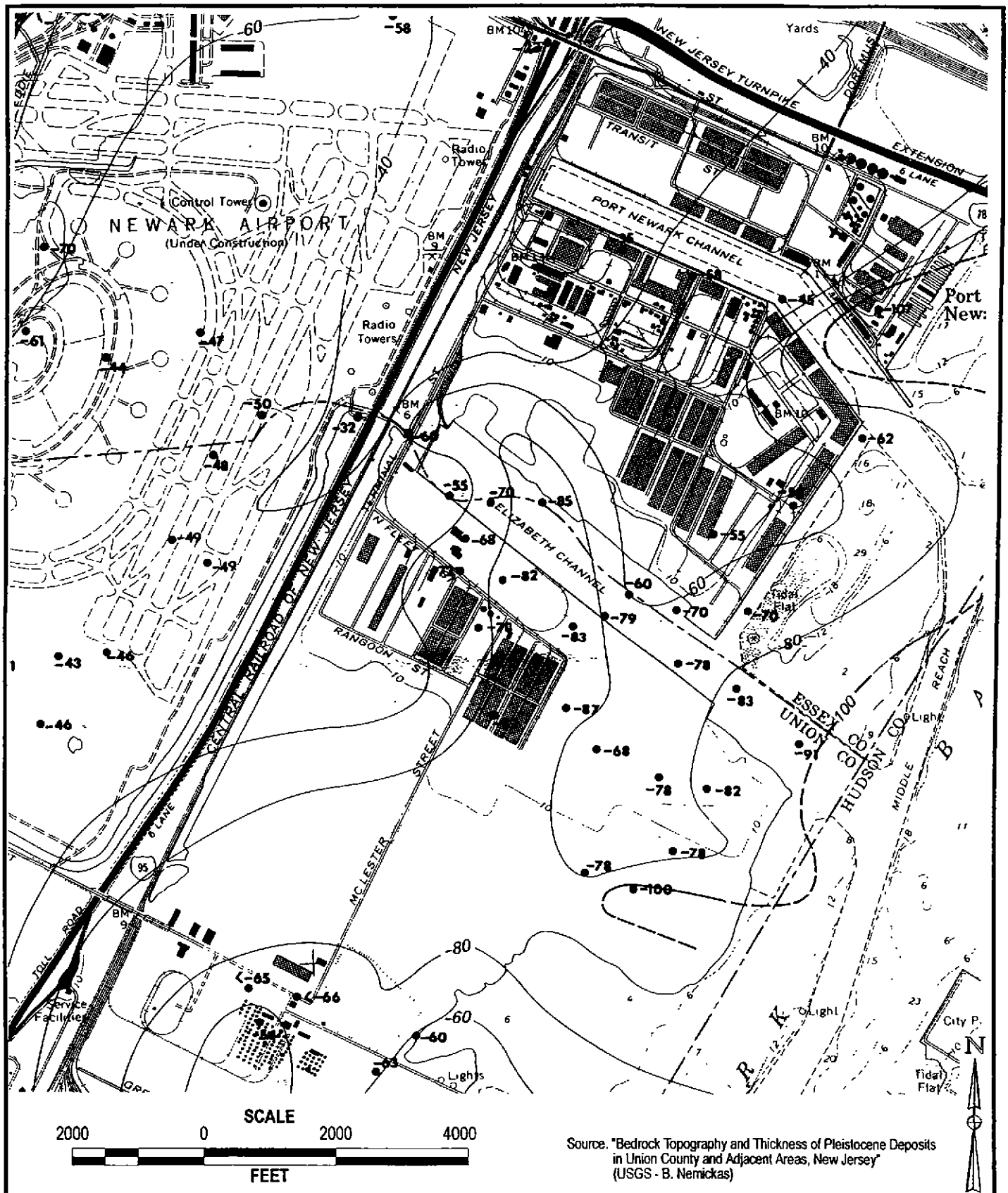


WESTON MANAGERS DESIGNERS/CONSULTANTS	PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION	LAND USE CLASSIFICATION
	CLIENT NAME: THE PORT AUTHORITY OF NY AND NJ	DATE: September 1997 / FIGURE #: 3-3



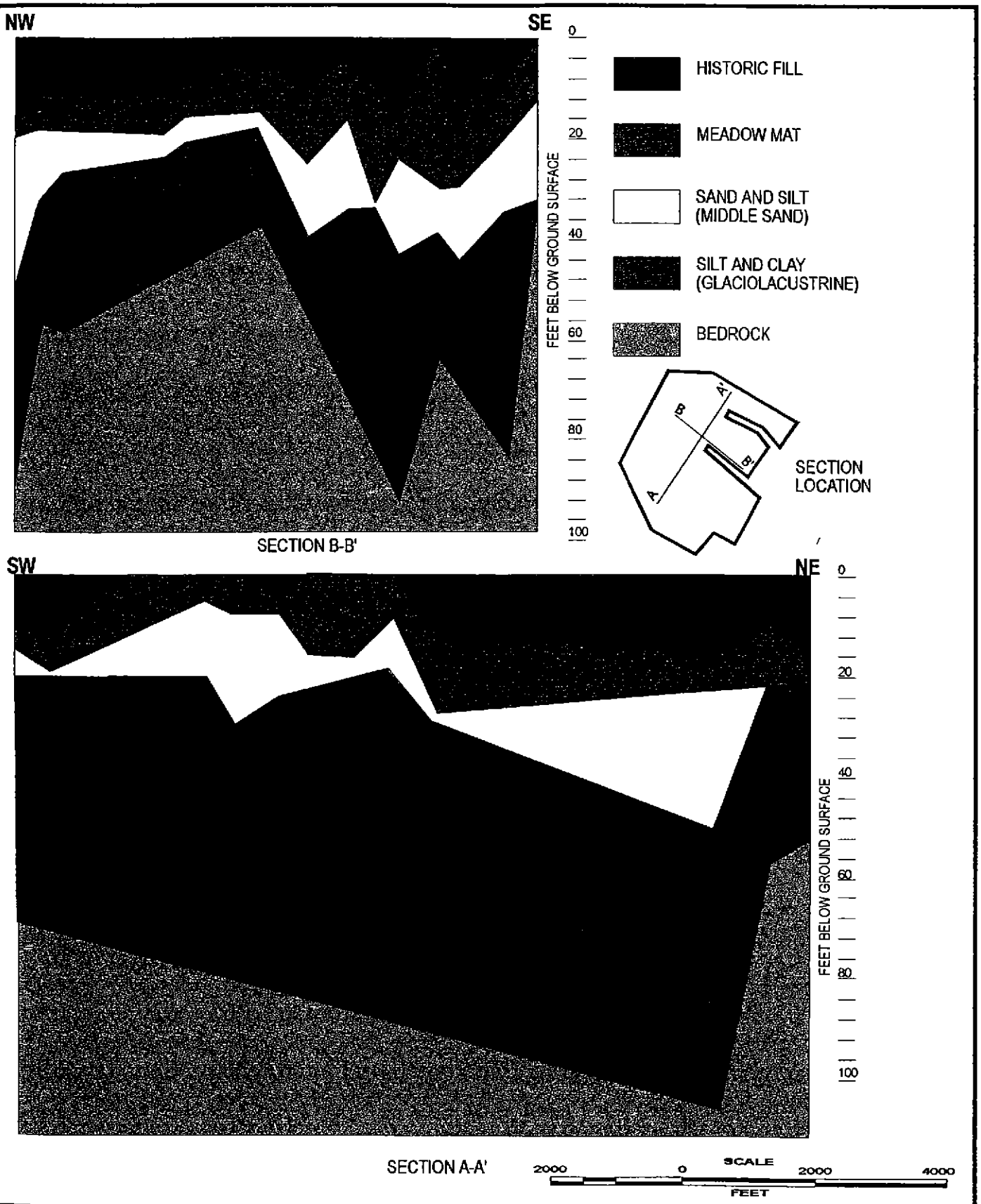
Source: "Bedrock Topography and Thickness of Pleistocene Deposits in Union County and Adjacent Areas, New Jersey" (USGS - B. Nemickas)

WESTON MANAGERS DESIGNERS/CONSULTANTS	PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION	BEDROCK ELEVATION CONTOUR MAP
	CLIENT NAME: THE PORT AUTHORITY OF NY & NJ	DATE: September 1997 / FIGURE #: 4-1



Source. "Bedrock Topography and Thickness of Pleistocene Deposits in Union County and Adjacent Areas, New Jersey" (USGS - B. Nemickas)

WESTON MANAGERS DESIGNERS/CONSULTANTS	PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION	PLEISTOCENE SEDIMENT THICKNESS CONTOUR MAP
	CLIENT NAME: THE PORT AUTHORITY OF NY & NJ	DATE: September 1997 / FIGURE #: 4-2



WESTON MANAGERS DESIGNERS/CONSULTANTS	PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION	GEOLOGIC CROSS-SECTIONS	
	CLIENT NAME: THE PORT AUTHORITY OF NY & NJ	DATE: SEPTEMEBR 1997	FIGURE #: 4-3



KEY

- LAKE-BOTTOM SEDIMENT
- CONTINUOUS TILL
- FLUVIAL SEDIMENT
- DELTAIC SEDIMENT
- MUNICIPAL BOUNDARIES
- RECLASSIFICATION AREA

N

SOURCE:
"HYDROGEOLOGIC CHARACTER AND THICKNESS OF THE GLACIAL SEDIMENT OF NEW JERSEY" OPEN FILE MAP No.3

SCALE

9350 0 9350 18700

FEET - APPROXIMATE

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MANAGERS DESIGNERS/CONSULTANTS

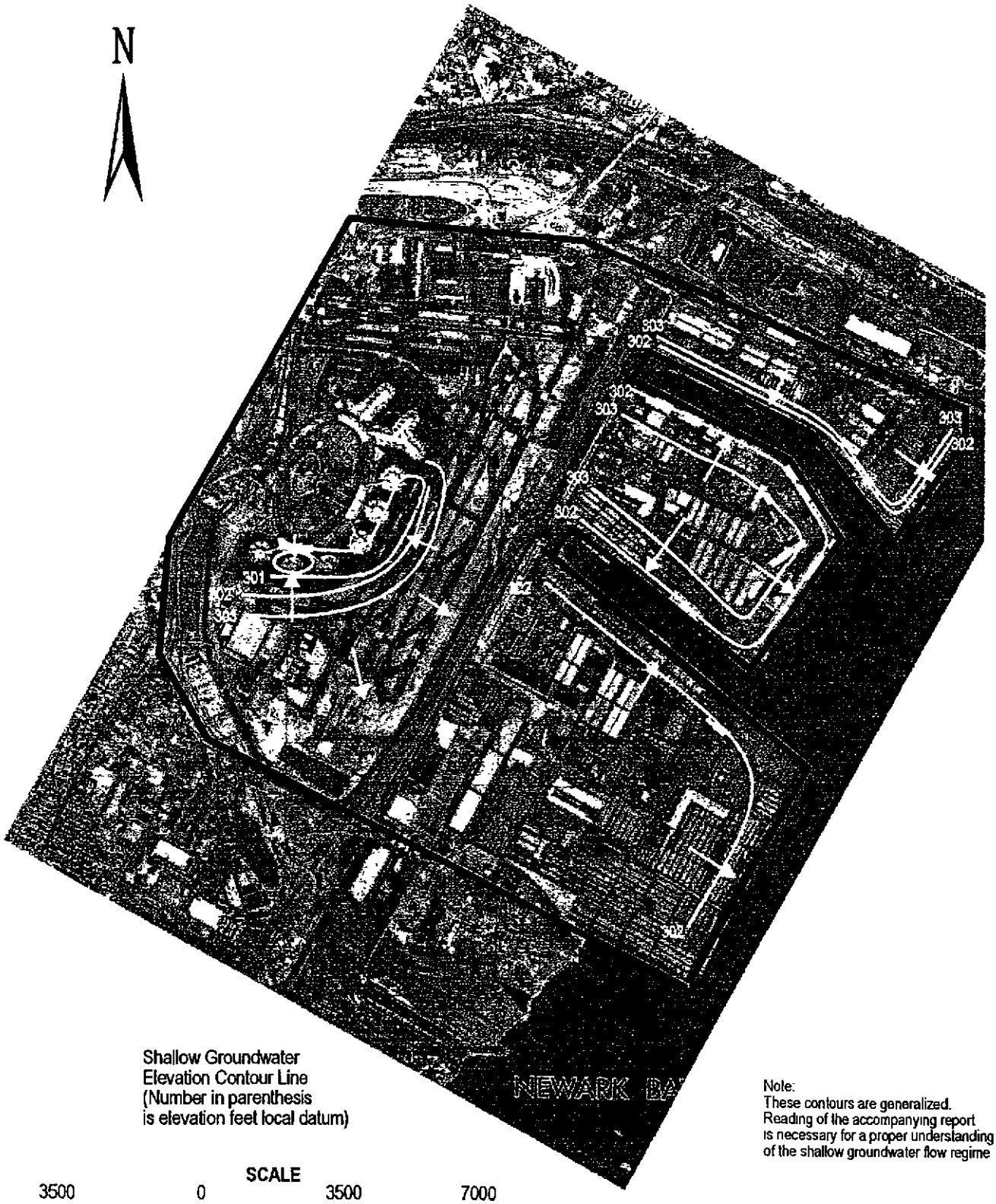
PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION

CLIENT NAME: THE PORT AUTHORITY OF NY & NJ

MAP OF GLACIAL DEPOSITS

DATE: September 1997

FIGURE #: 4-4



Shallow Groundwater
Elevation Contour Line
(Number in parenthesis
is elevation feet local datum)

Note:
These contours are generalized.
Reading of the accompanying report
is necessary for a proper understanding
of the shallow groundwater flow regime

SCALE

3500 0 3500 7000

FEET

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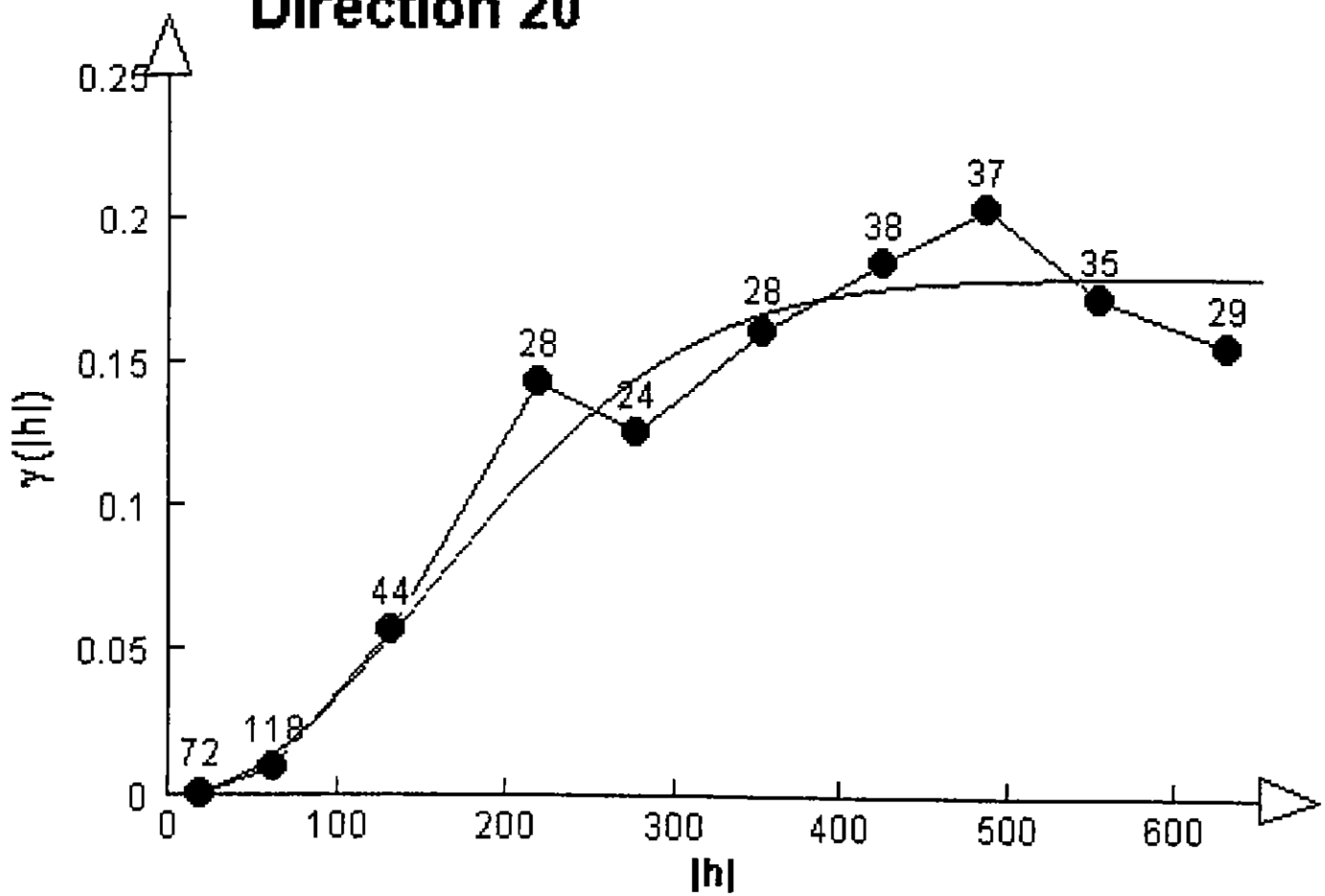
PROJECT NAME:
GROUNDWATER RECLASSIFICATION PETITION

CLIENT NAME: THE PORT AUTHORITY OF NY & NJ

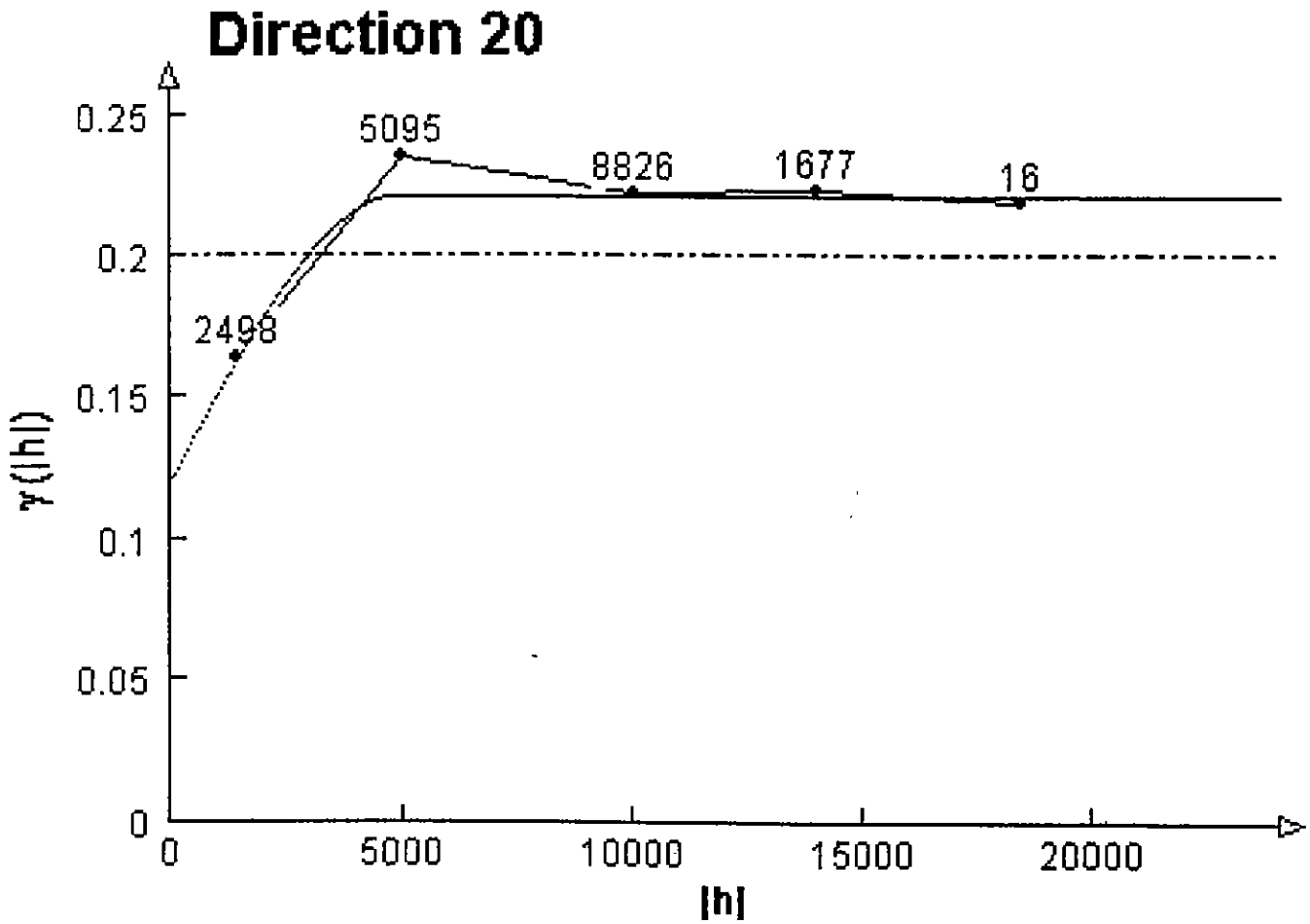
SHALLOW GROUNDWATER
ELEVATION CONTOUR MAP

DATE: September 1997

FIGURE #: 4-5



WESTON® MANAGERS DESIGNERS/CONSULTANTS	PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION	SAMPLE DIRECTIONAL VARIOGRAM FOR THE FIRST CORRELATION STRUCTURE
	CLIENT NAME: THE PORT AUTHORITY OF NY & NJ	DATE: September 1997 FIGURE #: 5-1



WESTON®
MANAGERS DESIGNERS/CONSULTANTS

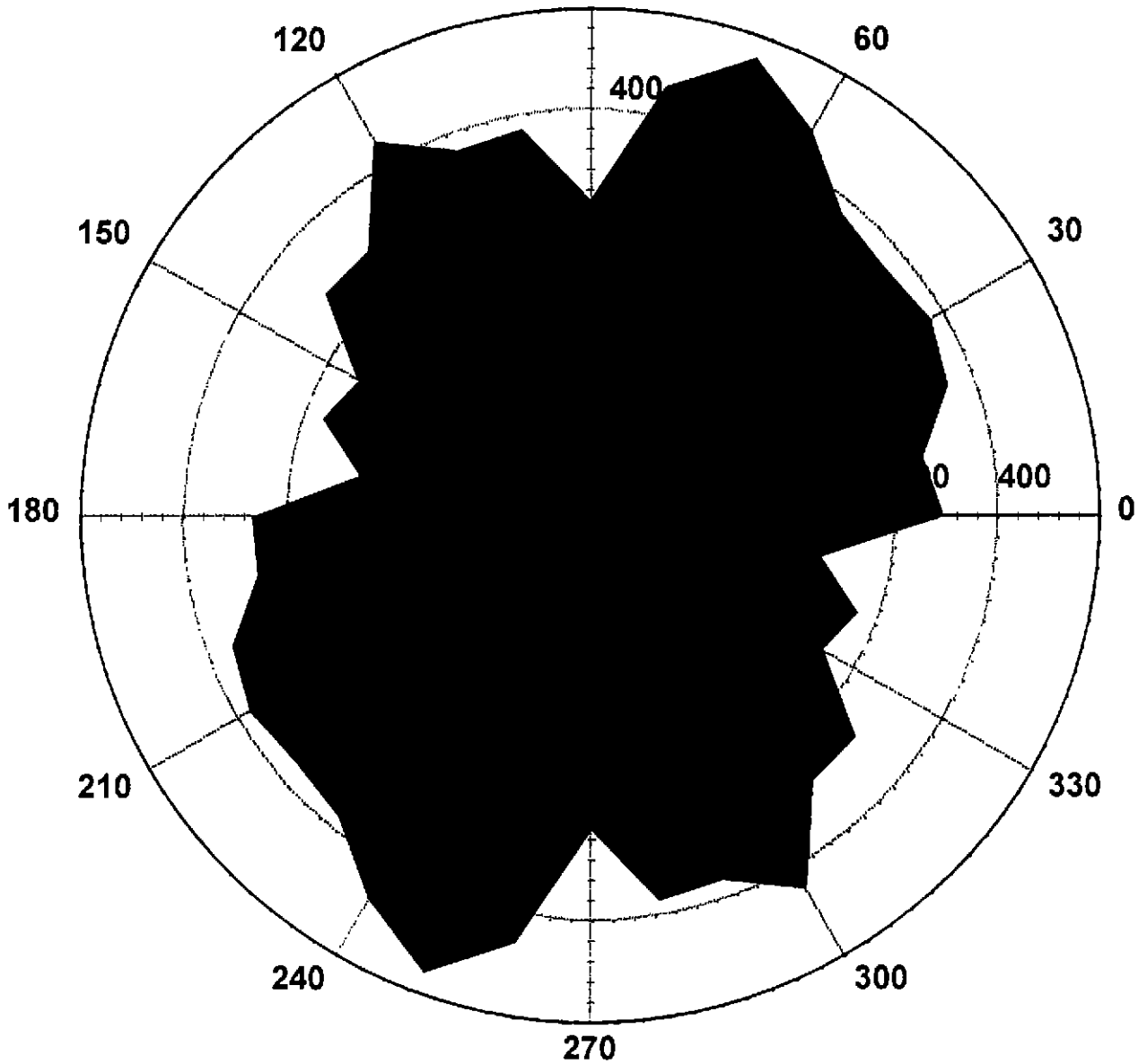
PROJECT NAME
GROUNDWATER RECLASSIFICATION PETITION

CLIENT NAME: THE PORT AUTHORITY OF NY & NJ

SAMPLE DIRECTIONAL VARIOGRAM FOR THE SECOND CORRELATION STRUCTURE

DATE: September 1997

FIGURE #: 5-2



WESTON®
MANAGERS DESIGNERS/CONSULTANTS

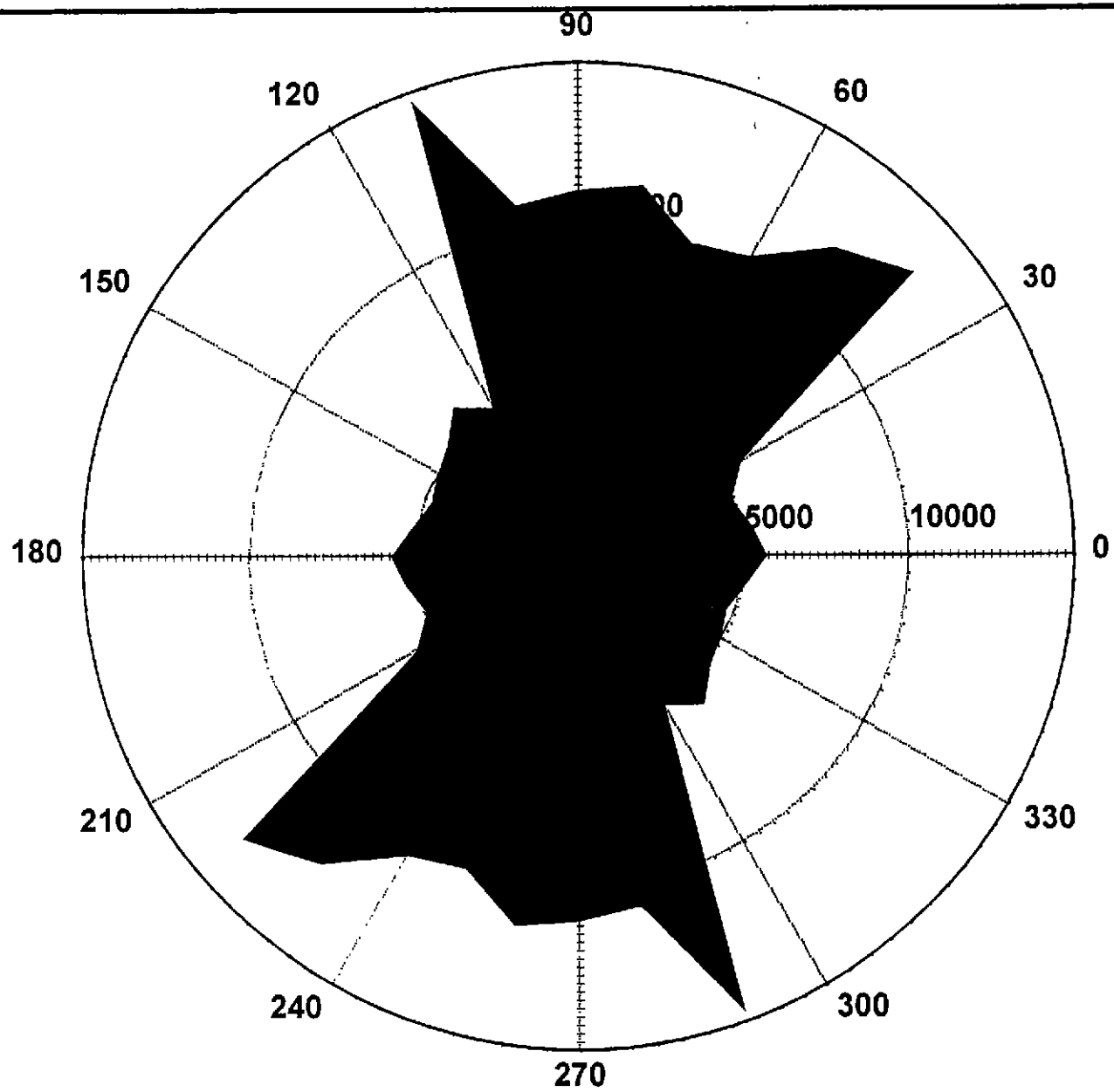
PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION

CLIENT NAME: THE PORT AUTHORITY OF NY & NJ

ROSE DIAGRAM FOR THE FIRST CORRELATION STRUCTURE

DATE: September 1997

FIGURE #: 5-3



WESTON®
MANAGERS DESIGNERS/CONSULTANTS

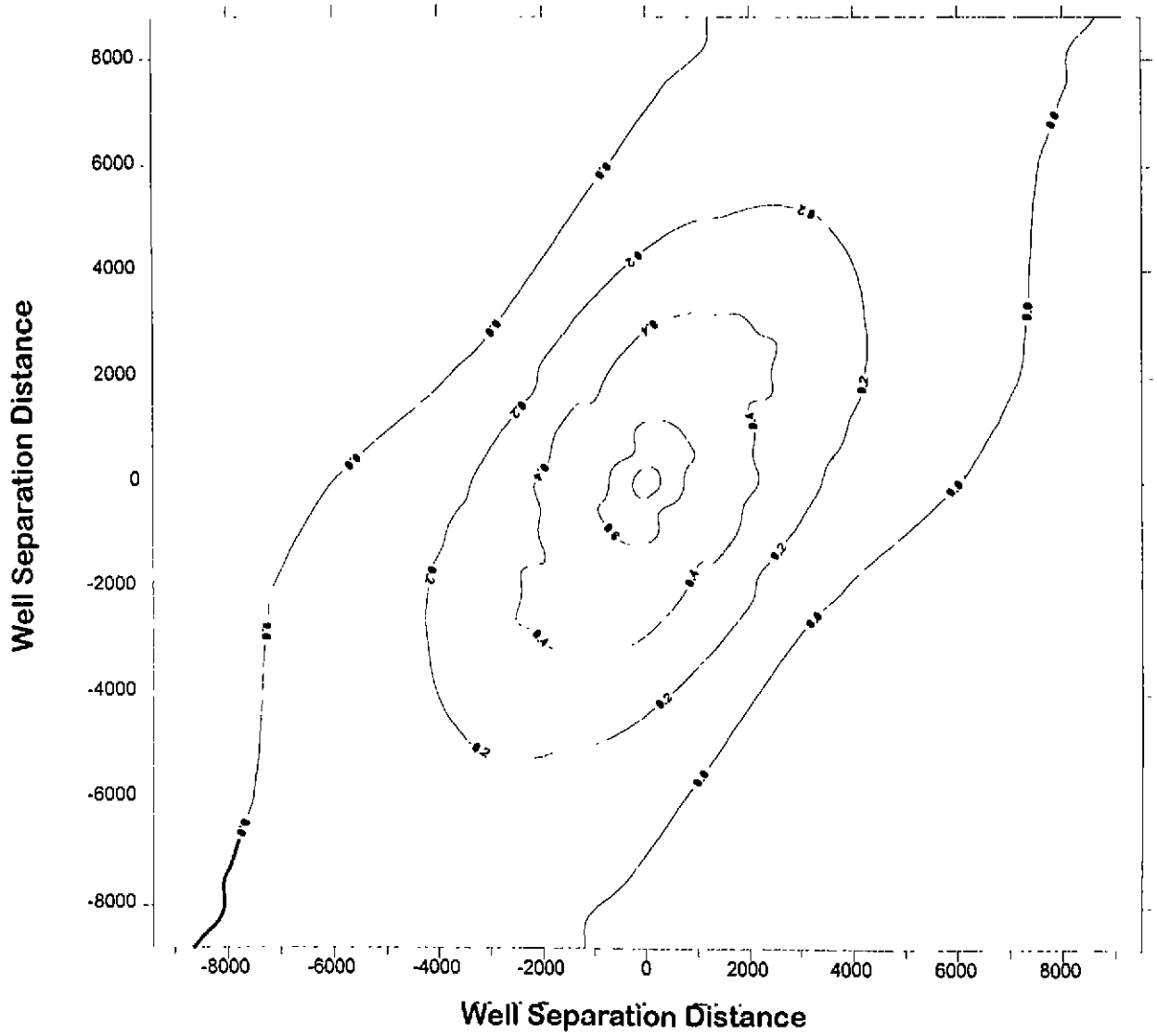
PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION

CLIENT NAME: THE PORT AUTHORITY OF NY & NJ

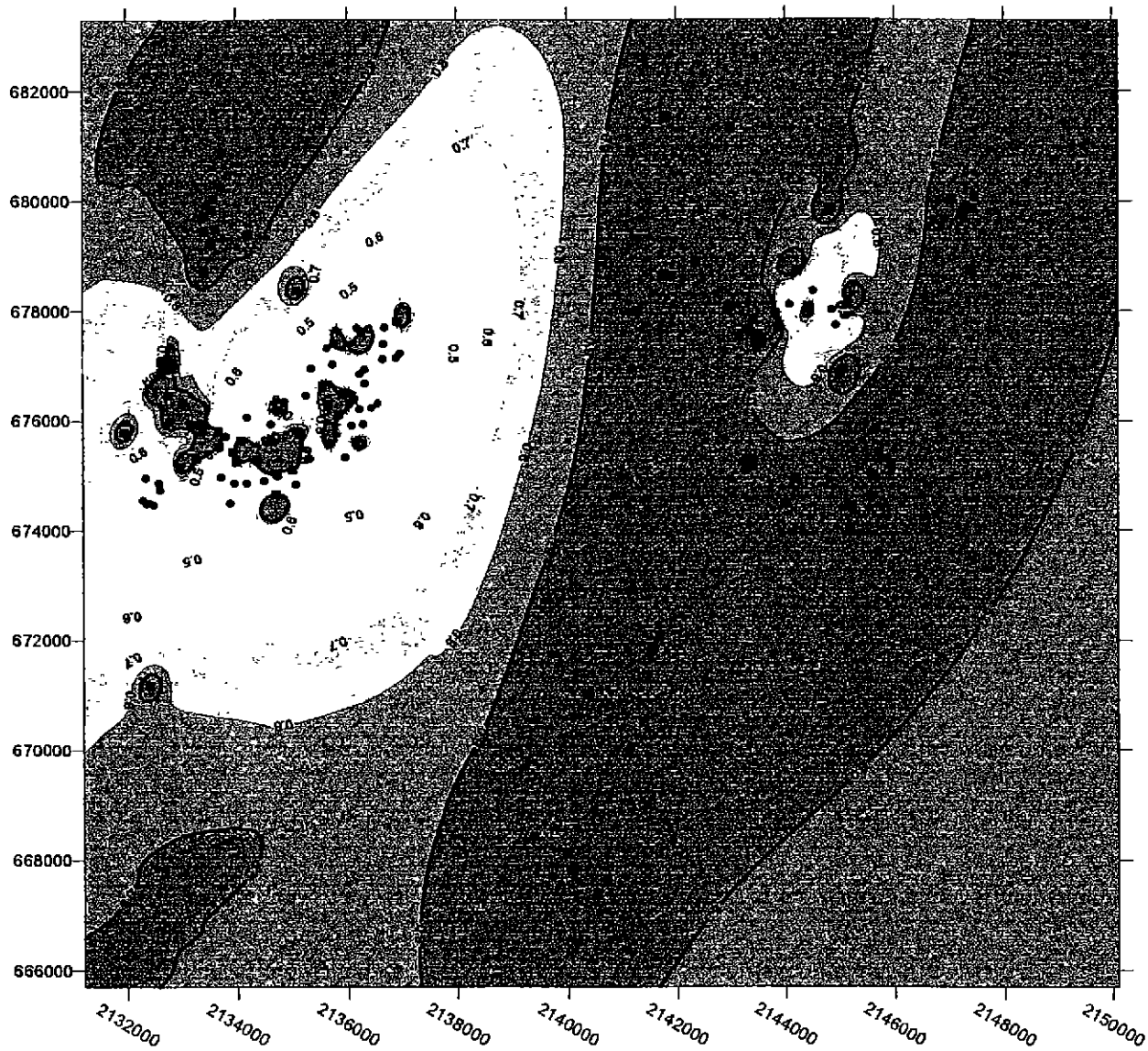
ROSE DIAGRAM FOR THE SECOND CORRELATION STRUCTURE

DATE: September 1997

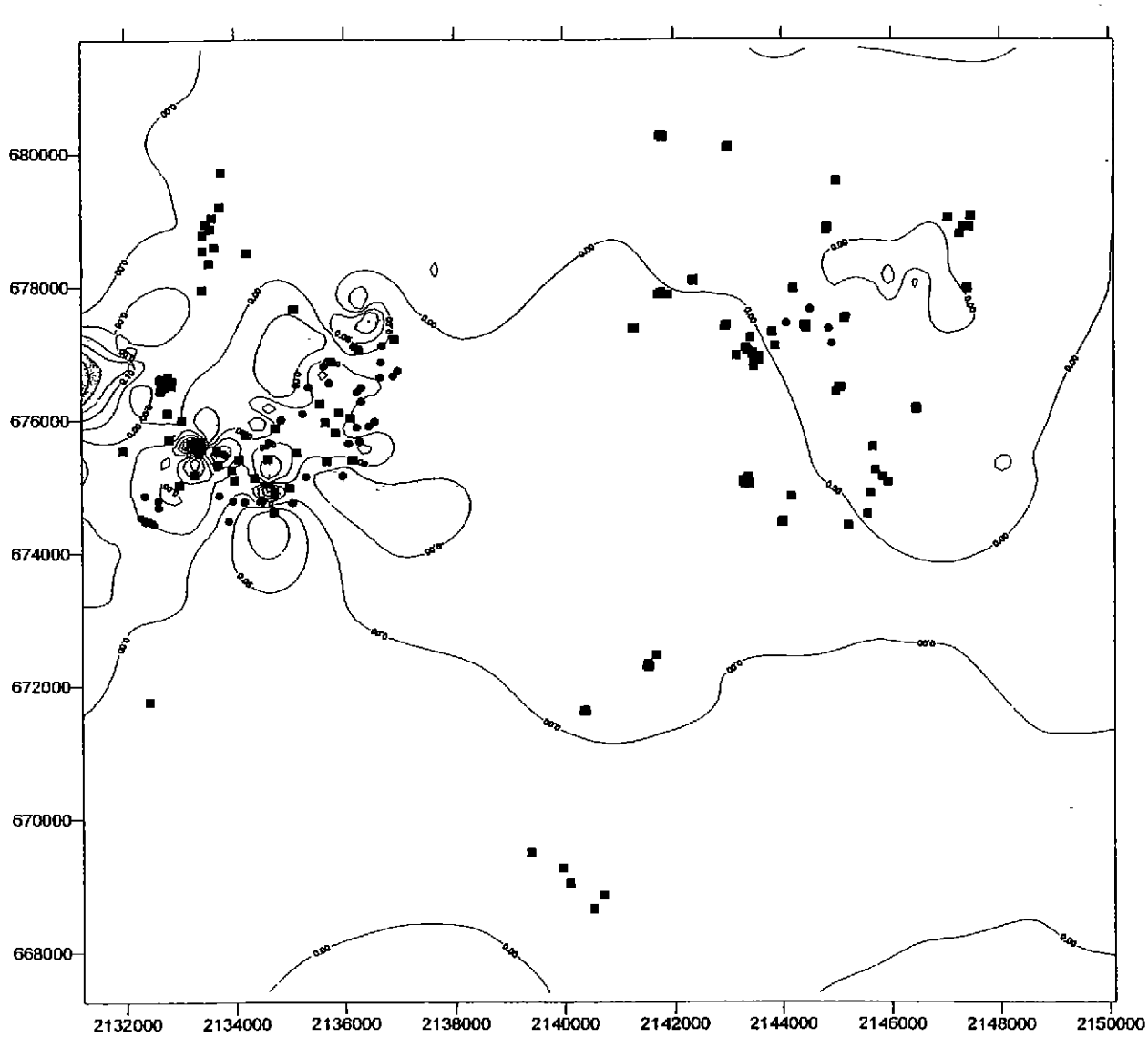
FIGURE #: 5-4



WESTON® MANAGERS DESIGNERS/CONSULTANTS	PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION	COMPOSITE SPATIAL CORRELATION PATTERN	
	CLIENT NAME: THE PORT AUTHORITY OF NY & NJ	DATE: September 1997	FIGURE #: 5-5



WESTON MANAGERS DESIGNERS/CONSULTANTS	PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION	GEOSTATISTICAL CONTOUR MAP OF THE PROBABILITY OF GROUNDWATER CONTAMINATION	
	CLIENT NAME: THE PORT AUTHORITY OF NY AND NJ	DATE: September 1997	FIGURE #: 5-6



WESTON
MANAGERS DESIGNERS/CONSULTANTS

PROJECT NAME:
GROUNDWATER RECLASSIFICATION PETITION

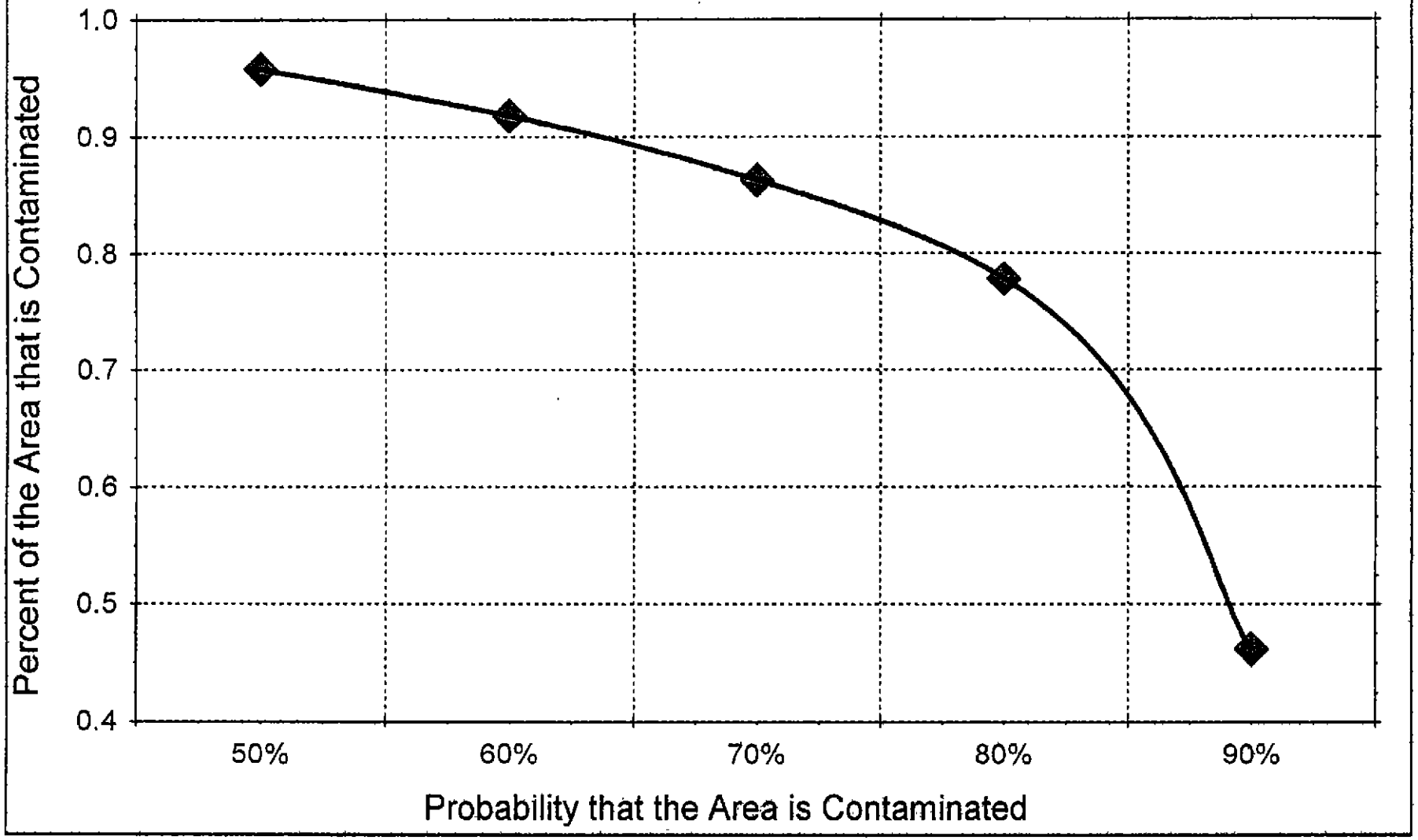
CLIENT NAME: THE PORT AUTHORITY OF NY AND NJ

CONTOUR MAP OF
DEVIATIONS IN THE GEOSTATISTICAL MAP
FROM THE ORIGINAL DATA

DATE: September 1997

FIGURE #: 5-7

Probability that a Percentage of the Area is Contaminated



WESTON®
MANAGERS DESIGNERS/CONSULTANTS

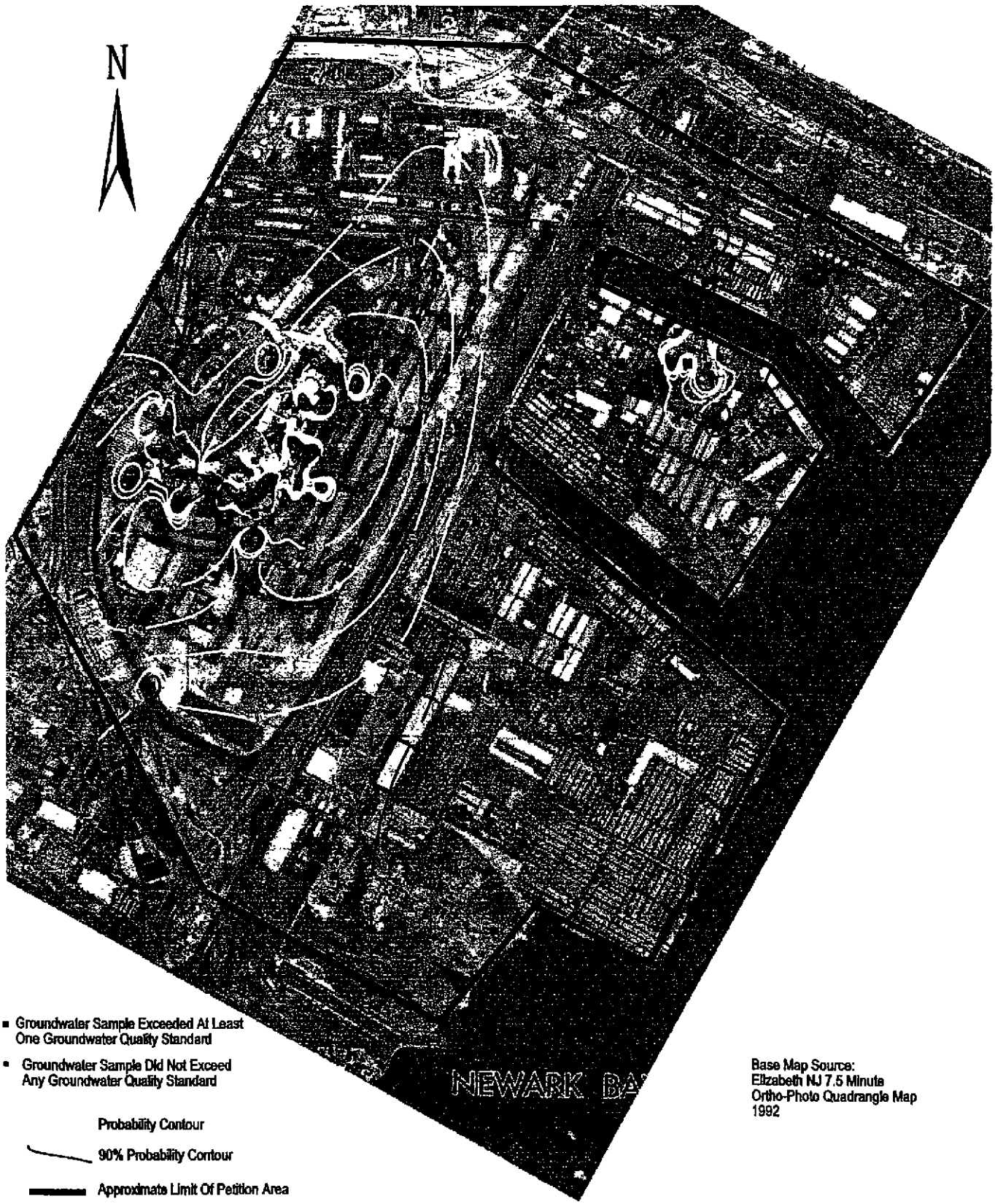
PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION

CLIENT NAME: THE PORT AUTHORITY OF NY & NJ

PROPORTION OF AREA LIKELY TO BE CONTAMINATED

DATE: September 1997

FIGURE #: 5-8



- Groundwater Sample Exceeded At Least One Groundwater Quality Standard
- Groundwater Sample Did Not Exceed Any Groundwater Quality Standard

Probability Contour

90% Probability Contour

Approximate Limit Of Petition Area

Base Map Source:
Elizabeth NJ 7.5 Minute
Ortho-Photo Quadrangle Map
1992

WESTON MANAGERS DESIGNERS/CONSULTANTS

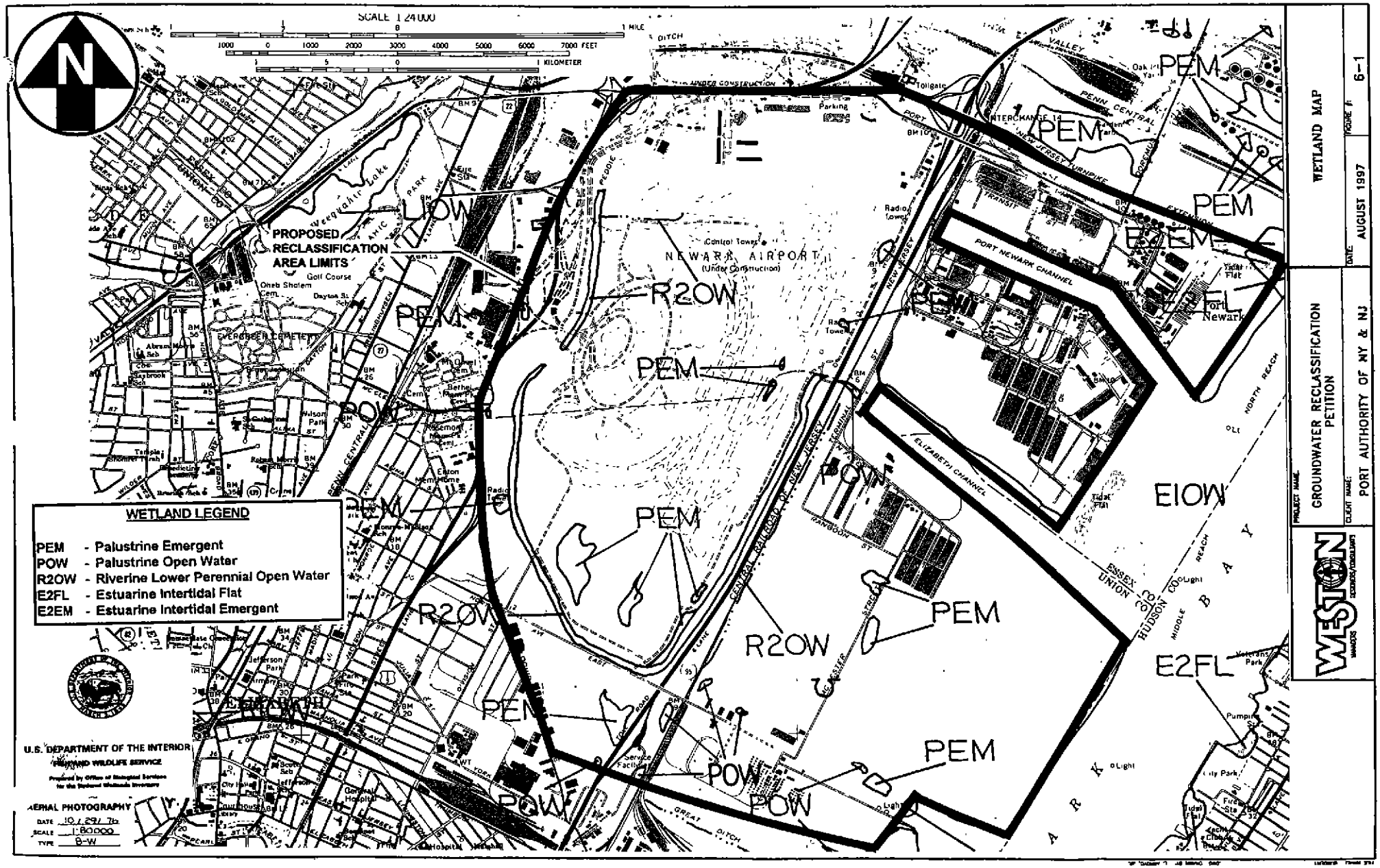
PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION

CLIENT NAME: THE PORT AUTHORITY OF NY & NJ

PROBABILITY OF GROUNDWATER CONTAMINATED ABOVE GROUNDWATER QUALITY STANDARDS

DATE: September 1997

FIGURE #: 5-9


SCALE 1:24000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER
PROPOSED RECLASSIFICATION AREA LIMITS
Golf Course
NEWARK AIRPORT
(Under Construction)
Control Tower
Radio Tower
Parking
Tollgate
INTERCHANGE 14
NEW JERSEY TURNPIKE
PENN CENTRAL
PORT NEWARK CHANNEL
ELIZABETH CHANNEL
NEWARK BAY
HUDSON CO.
ESSEX CO.
UNION CO.
Port Newark
Tidal Flat
Veterans Park
City Park
Pumping Sta.
Hospital
Evergreen Cemetery
Oheb Sholem Cem.
Berkeley Heights
Kenilworth
Weequahic Lake
PEM
POW
R2OW
E2FL
E1OW
E2EM
WETLAND LEGEND
PEM - Palustrine Emergent
POW - Palustrine Open Water
R2OW - Riverine Lower Perennial Open Water
E2FL - Estuarine Intertidal Flat
E2EM - Estuarine Intertidal Emergent
U.S. DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
AERIAL PHOTOGRAPHY
DATE 10/29/76
SCALE 1:80000
TYPE B-W
WETLAND MAP
DATE AUGUST 1997
FIGURE # 6-1
PROJECT NAME GROUNDWATER RECLASSIFICATION PETITION
CLIENT NAME PORT AUTHORITY OF NY & NJ
WESTON

Tables

WESTMEN

TABLE 2-1

LIST OF TENANTS
EWR

BUILDING NO.	TENANT	FUNCTION
1	Multi-Occupancy	Passenger Terminal
2	Multi-Occupancy	Passenger Terminal
3	None	Passenger Terminal (Partially Constructed)
5	Dr. Lotman Port Authority	Medical Clinic Locker Room
10	Port Authority	Administration Building Police Garage
11	Port Authority	Maintenance Garage
12	Butler Aviation	Aircraft Hangar
14	United Airlines	Aircraft Hangar
22	Butler Aviation	Storage
23	Hertz Corporation	Administration Building
24	Hertz Corporation	Maintenance
25	National Car Rental	Administration Building
26	National Car Rental	Maintenance
27	Avis Corporation	Administration Building
28	Avis Corporation	Maintenance
33	Port Authority	Maintenance Garage
42	Port Authority	Pumping Station
44	Port Authority	Electrical Distribution
45	Port Authority	Electrical Distribution
46	Port Authority	Heating and Refrigeration Plant
49	Port Authority	Heating and Refrigeration Plant
51	U.S. Postal Service Weather Bureau	Airmail Handling
52	Butler Aviation	Auto Repair Shop
53	Port Authority	Maintenance Shop
54	Butler Aviation	Ancillary Building to Hangar 12
55	Multi-Occupancy	Vehicle and Aircraft Maintenance
57	Port Authority	Pump House
67	Port Authority	PAF/FAA Equipment
75	Getty Oil Company	Auto Service Station
77	Port Authority	Maintenance and Storage
82	Port Authority	Maintenance and Storage
83	Port Authority	Maintenance Garage and Shops

WESTON

TABLE 2-1 (CONTINUED)

LIST OF TENANTS
EWR

BUILDING NO.	TENANT	FUNCTION
88	Port Authority/U.S. Customs	Passenger Terminal
93	Port Authority	Maintenance and Storage
94	Port Authority	PAF/FAA Equipment
95	Flagship	Commissary
102	Port Authority	Sand Storage
116	Allied Aviation	Vehicular Maintenance
117	Allied Aviation	Aircraft Fuel Control
119	Port Authority FAA	Aircraft Control Center
140	Cummins Diesel	Vehicle Engine Repairs
150	Multi-Occupancy	Air Cargo Services
151	Multi-Occupancy	Air Cargo Services
151U	United Airlines	Air Cargo Services
152	Multi-Occupancy	Air Cargo Services
153	Multi-Occupancy	Air Cargo Services
303	Multi-Occupancy	Vehicular Fueling Station
304	FAA	Maintenance Office
315	Buckeye	Fuel Metering Terminal
343	Public Service Electric and Gas	Electrical Substation

WESTON

TABLE 2-2

LIST OF TENANTS
EPAMT

BLDG NO	TENANT
102	Kent Steel Corp.
114	Apostleship of the Sea
117	Waterfront Commission of New York Harbor
118	Seaman's Church Institute
122	Vanguard Pest Control Co.
124	M.J. Rudolph
125	Port Newark Refrigerated Warehouse
126	Fleetwash
131	Aarhus, Inc.
135	Akzo Nobel Salt, Inc.
136	Universal Maritime Service
138	Ecuadorian Line
140	ECDC Environmental, L.C.
146	Naporano Iron & Metal Co.
148	M.P. Howlett, Inc.
150	Marine Transport, Inc.
151	Swift Fuel Stop
154	Interamerican Juice Co., Inc.
160	K&S Tire Service Co.
161	Dray Con Transport, Inc.
171	Commercial Carriers
173	Hudson Tank Terminals
178	Essex Cement Co./Titan Atlantic Cement
178	Minteq International, Inc.
179	Essex Cement Co./Titan Atlantic Cement
182	Essex Cement Co./Titan Atlantic Cement
185	Essex Cement Co./Titan Atlantic Cement
186	Maersk Container Service
187	M.J. Rudolph
188	International Warehouse & Distribution
189	First Union National Bank
191	Glendale Warehouse & Distribution
192	Nationwide Transport & Wholesale

WESTON

TABLE 2-2 (CONTINUED)

LIST OF TENANTS
EPAMT

BLDG NO	TENANT
194	Tyler Distribution Centers, Inc.
195	Port Elizabeth Terminal & Warehouse
196	Van Brunt Port Jersey
198	International Warehouse & Distribution
198	Port Warehouse & Distribution, Corp.
200	Eastern Warehouse Inc.
201	Port Elizabeth Terminal & Warehouse
202	International Warehouse & Distribution
202	LG Electronics
211	Akzo Nobel Salt, Inc.
212	Akzo Nobel Salt, Inc.
221	Universal Maritime Service
222	Universal Maritime Service
230	Maersk Container Service
231	Maersk Container Service
232	Maersk Container Service
233	Maersk Container Service
236	Maersk Container Service
250	FAPS, Inc.
255	Port Authority Sign Shop
257	Port Newark Tire Repair
261	Linon Imports, Inc.
262	AZ Carriers/AZ Container
262	Performance Transport Systems, Inc.
263	Asiatic Corporation (USA) Inc./Newark Commercial Warehouse
263	State Consolidating Corp.
263	Varuna Distribution & Transportation Corp.
264	Pittston Warehouse Corp.
265	Continental Gypsum Co.
266	Linon Imports, Inc.
267	Continental Gypsum Co.
268	AZ Carriers/AZ Container
269	Continental Gypsum Co.

WESTON

TABLE 2-2 (CONTINUED)

LIST OF TENANTS
EPAMT

BLDG NO	TENANT
270	Port Authority K-9 Unit
290	FAPS, Inc.
291	Visy Paper (NY) Inc.
292	Visy Paper (NY) Inc.
296	FAPS, Inc.
302	FAPS, Inc.
303	FAPS, Inc.
304	Kent Steel Corp.
305	AmRod Corporation
317	Nu Car Carrier, Inc.
318	Nu Car Carrier, Inc.
321	Banks Ship Rigging Corporation
325	FAPS, Inc.
350	B.P. Marine Americas
390	Toyota Logistics Services, Inc.
391	Toyota Logistics Services, Inc.
395	Best Transportation
400	New Jersey State Police
402	Security Park, Inc.
1010	Maher Terminals, Fleet Street
1020	Maher Terminals, Fleet Street
1030	Maher Terminals, Fleet Street
1100	Distribution & Auto Service
1130	East Coast Wholesale & Distribution Co.
1140	East Coast Wholesale & Distribution Co.
1150	East Coast Wholesale & Distribution Co.
1160	American Duty Free
1160	CA One Services, Inc.
1160	Dufrepex
1160	Oxford Organics
1160	Port Authority Human Resources Dept.
1160	Saima Avandero
1160	Viewmark USA Inc.

WESTON

TABLE 2-2 (CONTINUED)

LIST OF TENANTS
EPAMT

BLDG NO	TENANT
1170	Consotech/Pertech Industries, Inc.
1170	G.F. International Inc.
1170	Meggitt USA, Inc.
1170	Port Authority Sales Office
1170	Scaff Trucking & Warehousing
1170	Tokyo Kaneku International Corp.
1180	March Transfer Distribution Co.
1180	Mid America Overseas, Inc.
1180	Port Authority General Services
1180	Sambonet USA, Inc.
1180	Scaff Trucking & Warehousing
1180	Unistar Air Cargo
1200	Cargill-Citro America, Inc.
1210	Sea-Land Service, Inc.
1230	Maher Terminals, Fleet Street
1260	Maher Terminals, Fleet Street
1270	Maher Terminals, Fleet Street
1310	Harbor Freight Transportation Co.
1310	Sea-Land Service, Inc.
1320	P. Judge & Sons, Inc.
1320	Port Elizabeth Terminal & Warehouse
1330	Harbor Freight Transportation Co.
1340	Port Elizabeth Terminal & Warehouse
1400	Tyler Distribution Centers, Inc.
1500	Shipside Service, Inc.
2170	American Stevedoring LTD
2180	American Stevedoring LTD
2210	East Coast Wholesale & Distribution Co.
2220	ASA Apple Inc.
2230	Florence Warehouse
2230	T.R.T. International, LTD
2250	March Transfer Distribution Co.
2260	Export Transport Company

WESTON

TABLE 2-2 (CONTINUED)

LIST OF TENANTS
EPAMT

BLDG NO	TENANT
2260	Rubicon Express, Inc.
2270	Port Authority Central Auto Shop
2270	Port Authority Stockroom
2280	Babb Warehousing Corporation
2280	Coty/RPM International Transport Svcs.
2280	RPM Warehouse, Inc.
2370	Maher Terminals, Tripoli Street
2400	Port Elizabeth Terminal & Warehouse
3210	New York Shipping Association, Inc.
4010	Maher Terminals, Tripoli Street
4020	Maher Terminals, Tripoli Street
4070	Maher Terminals, Tripoli Street
4080	Maher Terminals, Tripoli Street
4090	Maher Terminals, Tripoli Street
5000	Sea-Land Service, Inc.
5010	Sea-Land Service, Inc.
5070	Sea-Land Service, Inc.
5080	Sea-Land Service, Inc.
5130	Sea-Land Service, Inc.
5140	Sea-Land Service, Inc.
N/A	AFI Food Service Dist. Inc.
N/A	American Intermodal Svc., Inc.
N/A	BMW
N/A	Conrail Trainmaster
N/A	Continential Salt
N/A	DonJon Marine
N/A	Garfield Transport Systems Inc.
N/A	Hudson Refrigerating Co.
N/A	International Terminal Operating Co.
N/A	Loma Equipment
N/A	Maher Auto Division
N/A	Marine Spill Response Corp.
N/A	Metro Metal Recycling Corp.

TABLE 2-2 (CONTINUED)

LIST OF TENANTS
EPAMT

BLDG NO	TENANT
N/A	Morton International Salt Group
N/A	Northeast Auto Terminal-CARGO
N/A	Owens New World Trucking Inc.
N/A	Sea Trux
N/A	United Transport, Inc.
N/A	Weeks Marine Inc.
N/A	Weeks Stevedoring Co., Inc.

WESTON

TABLE 2-3

ENVIRONMENTAL DATABASE SEARCH RESULTS

SITE	BUILDING NO./ADDRESS	DATABASE(S)	COMMENTS
Vehicle Processors, Inc.	390	UST, FINDS, RCRIS, LUST	Also listed as Toyota Vehicle Processors and Toyota Motor Sales. Tanks store(d) unleaded gasoline, waste oil, kerosene, and No. 2 fuel oil. RCRA small-quantity generator.
Dist. & Auto Svc.	392	RCRIS, FINDS	RCRA small-quantity generator.
Nu-Car Carriers	318	FINDS, RCRIS	RCRA large-quantity generator.
Consolidated Freightways	300	RCRIS, FINDS, UST, LUST	LUST involves medium diesel fuel No. 2. RCRA small-quantity generator.
Seaport Auto Service Inc.	151	UST	USTs store(d) leaded gasoline, unleaded gasoline, and light diesel fuel No. 1.
Highwat Freight Inc.	147	UST	Tank contents not reported.
Dobbs International Services Inc.	156	UST	Tanks store(d) leaded gasoline.
Butler Fleet Services	98-156 Port Street	FINDS, RCRIS	RCRA large-quantity generator.
Airborne Freight Corporation	98/156 Port Street	UST	Tanks store(d) unleaded gasoline and medium diesel fuel No. 2.
Emery Worldwide	100	FINDS, RCRIS, HMIRS, LUST, UST	Tanks store(d) No. 2 fuel oil. Other tank contents not reported. RCRA large-quantity generator.
Pittston Warehouse Corp.	264	FINDS, RCRIS	RCRA large-quantity generator.
Port Authority	260	UST	Tanks store(d) leaded gasoline, unleaded gasoline, alcohol-enriched gasoline, light diesel fuel No. 1, medium diesel fuel No. 2, waste oil, and No. 2 fuel oil.
T&J Landfill	70 Port Street	CERCLIS, FINDS, SWF/LF	Authorized to accept bulky waste. Preliminary Assessment completed in 1987, recommendation of No Further Remedial Action Planned (NFRAP) given.
Avis Rent A Car	30-116 Port Street	UST, FINDS, RCRIS	Tank contents not reported. RCRA large-quantity generator.
New Jersey Turnpike Authority	14 Port Street	FINDS, RCRIS	RCRA large-quantity generator.
Hudson County Chromate 148	350 Coastal Street	SHWS	
Balco Warehouse	Marsh and Maritime Streets	LUST	Tank contents not reported.
M&G Convoy	142 Marsh Street	FINDS, RCRIS, LUST	Tank contents not reported. RCRA large-quantity generator.
Commercial Carriers	142 Marsh Street	UST	Tanks store(d) waste oil.
LJN Toys LTD	135 Marsh Street	RCRIS, FINDS	RCRA small-quantity generator.

WESTON

TABLE 2-3 (CONTINUED)

ENVIRONMENTAL DATABASE SEARCH RESULTS

SITE	BUILDING NO./ADDRESS	DATABASE(S)	COMMENTS
Aarhus Inc.	131	RCRIS, FINDS	RCRA small-quantity generator. Facility has an active water discharge permit.
Employment Information Center 11	117	UST	Tanks store(d) unleaded gasoline.
Orient Chemical Corporation	121	FINDS, RCRIS, TSCA, SHWS	RCRA large-quantity generator.
Waterfront Commission of New York	117	LUST	Tank contents not reported.
Diamond Crystal Salt Co.	211	FINDS	Facility has active water discharge and air emissions permits.
International Salt Company	211	UST	Tanks store(d) hazardous substances.
Koppers Company	Maritime and Tyler Streets	SHWS, CERCLIS, FINDS, RCRIS, UST	RCRA large-quantity generator and treatment, storage, and disposal facility (TSDF). Preliminary Assessment completed in 1989; no final recommendation given. Tank contents not reported.
Maersk Container Service	231	FINDS, RCRIS, UST, LUST	Tanks store(d) unleaded gasoline, medium diesel fuel No. 2, and No. 4 fuel oil. RCRA large-quantity generator.
Universal Maritime Service Corp.	221	RCRIS	RCRA large-quantity generator.
Filo Chemical Corp.	Clipper and Calcutta Streets	FINDS, RCRIS	RCRA large-quantity generator.
Nu-Car Carriers	188 Calcutta Street	RCRIS	RCRA large-quantity generator.
Manchem Inc.	199D Panama Street	FINDS, RCRIS	RCRA large-quantity generator.
Biddle Sawyer Corp.	196 Maracaibo Street	RCRIS, FINDS	RCRA small-quantity generator. There is (was) a civil, judicial, and enforcement case against the facility.
Prmmi Inc.	North Fleet and Bombay	UST	Tank contents not reported.
Atlantic Technical Services	3220 Bay Avenue	FINDS, RCRIS	RCRA large-quantity generator.
Orient Chemical Corp.	1201 Corbin Street	FINDS	
IntermodalTech Service Inc. (Mazda Cars)	1201 Corbin Street	FINDS	
Port Authority Industrial Park Elizabeth	Bay Avenue and Corbin Street	UST	Tanks store(d) waste oil.
Atlantic Coast Express Inc.	2170	RCRIS, FINDS	RCRA small-quantity generator.
Port Authority Central Stockroom	Egypt Street and Bay Avenue	FINDS, RCRIS	RCRA large-quantity generator.

WESTON

TABLE 2-3 (CONTINUED)

ENVIRONMENTAL DATABASE SEARCH RESULTS

SITE	BUILDING NO./ADDRESS	DATABASE(S)	COMMENTS
1500 Bay Avenue	1500 Bay Avenue	HMIRS	
Sea-Land Services Inc.	Tripoli and McLester Streets	UST	Tanks store(d) unleaded gasoline, medium diesel fuel No. 2, and No. 2 fuel oil.
C&M Shell Inc.	866 Bay Circle	LUST	Tanks contents not reported.
East Coast Warehouse & Distribution Co.	1140	RCRIS, FINDS	RCRA small-quantity generator.
U.S. Customs Service	201	RCRIS, FINDS	RCRA large-quantity generator.
MTM Partners LP	201	RCRIS, FINDS	RCRA small-quantity generator.
Westfield Lumber and Home Center	700 North Avenue East	UST	Tank contents not reported.
5/61 Bay Avenue	5/61 Bay Avenue	HMIRS	
American Select Distribution Inc.	5-61 Bay Avenue	FINDS	
Distribution & Auto Service	1100	FINDS	
Silver Star Express	295 North Avenue East	FINDS, RCRIS	RCRA large-quantity generator.
New Deal Delivery	250 North Avenue East	LUST	Tanks contents not reported.
Industrial Truck Body Corp.	251 North Avenue East	FINDS, RCRIS	RCRA large-quantity generator.
Instant Air Freight Company	250 North Avenue East	UST	Tanks store(d) unleaded gasoline and light diesel fuel No. 1.
Centennial Trucking Co.	250 North Avenue East	UST	Tanks store(d) unleaded gasoline.
Northern Real Estate	225 North Avenue East	UST	Tanks store(d) light diesel fuel No. 1.
Instant Air Freight Company	225 North Avenue East	UST, LUST	Tanks store(d) leaded gasoline and light diesel fuel No. 1.
Disposal Areas Incorporated Landfill	Kapkowski Road and North Avenue	SHWS	
New England Motor Freight	171 North Avenue	LUST	Tank contents not reported.
Baron-Blakeslee	140 North Avenue	RCRIS, UST	RCRA large-quantity generator. Tank contents not reported.
Allied-Signal	140 North Avenue East	FINDS, RCRIS	RCRA large-quantity generator.
General Chemical Corporation	100 North Avenue	FINDS, RCRIS	RCRA large-quantity generator.
Elizabeth Works	100 North Avenue East	FINDS	Facility is permitted for air emissions.

WESTON

TABLE 2-3 (CONTINUED)

ENVIRONMENTAL DATABASE SEARCH RESULTS

SITE	BUILDING NO./ADDRESS	DATABASE(S)	COMMENTS
Central Railroad of New Jersey	2-330 North Avenue East	CERC-NFRAP	Preliminary Assessment completed in 1986; Site Inspection completed in 1989. NFRAP recommendation given.
Allied-Signal	10 North Avenue East	Major Facilities, FINDS, RCRIS, TRIS, TSCA, CORRACTS, CERC-NFRAP, UST	Listed as a Major Facility for the storage of 7,000 gallons of hydrochloric acid, 11,560 gallons of sodium hydroxide, and 68,200 gallons of No. 4 fuel oil. RCRA large-quantity generator and TSDF. RCRA Facility Investigation (RFI) completed, RFI Workplan approved, and stabilization measures evaluated. Facility has an active water discharge permit and air emissions permit. Tank contents not reported.
New England Motor Freight	1-71 North Avenue East	FINDS, RCRIS, UST	RCRA large-quantity generator. Tanks store(d) medium diesel fuel No. 2 and unleaded gasoline.
Tinmet Corp.	700 Kapkowski Road	RCRIS, FINDS, CERC-NFRAP	RCRA small-quantity generator and TSDF. Preliminary Assessment completed in 1992; recommendation of NFRAP given. Facility has an air emissions permit.
Elizabeth City Dump	North Avenue East and Bay Avenue	CERCLIS, FINDS	Preliminary Assessment and Site Inspection completed in 1980; recommendation of NFRAP given.
Hampton Inn	N/A	RCRIS, FINDS	RCRA large-quantity generator.
Federal Express	Building 347	RCRIS, FINDS	RCRA small-quantity generator.
AVIS Rent A Car	Building 27	RCRIS, FINDS, UST	RCRA large-quantity generator.
Newark Airport	Former Fuel Farm	RCRIS, FINDS, UST, LUST	RCRA large-quantity generator, LUST site.
Sage Aviation Svc	Hangar 55	RCRIS, FINDS	RCRA large-quantity generator.
United Airlines	Hangar 14	RCRIS, FINDS	RCRA large-quantity generator.
Butler Aviation	Hangar 12	RCRIS, FINDS, UST, LUST	RCRA large-quantity generator, LUST site.
Continental Airlines	Hangar 55A	RCRIS, FINDS, UST, LUST	RCRA large-quantity generator, LUST site.
Ogden Allied Aviation Service	N/A	RCRIS, FINDS	RCRA large-quantity generator.
Allied Aviation Service	N/A	RCRIS, FINDS	RCRA large-quantity generator.
Eastern Airlines	N/A	RCRIS, FINDS	RCRA large-quantity generator.
Hertz Rent A Car	Building 24	RCRIS, FINDS, UST, LUST	RCRA large-quantity generator, LUST site.

TABLE 2-3 (CONTINUED)

ENVIRONMENTAL DATABASE SEARCH RESULTS

SITE	BUILDING NO./ADDRESS	DATABASE(S)	COMMENTS
National Car Rental	Building 25	RCRIS, FINDS, UST, LUST	RCRA small-quantity generator, LUST site.
Continental Airlines	Terminal C	RCRIS, FINDS, UST	RCRA large-quantity generator.
Chelsea Catering	Building 30	RCRIS, FINDS	RCRA small-quantity generator.
United Airlines	Terminal A	RCRIS, FINDS, UST, LUST	RCRA small-quantity generator, LUST site.
Braniff International Airways	Terminal A	RCRIS, FINDS	RCRA small-quantity generator.
People Express Airlines	North Terminal	RCRIS, FINDS	RCRA large-quantity generator.
American Airlines	Terminal A	RCRIS, FINDS	RCRA large-quantity generator.
USAir Inc.	Terminal A	RCRIS, FINDS	RCRA small-quantity generator.
Newark Airport	Building 27	UST, LUST	--
Port Authority of NY&NJ	Building 51	UST, LUST	--
Newark Airport - Marriott Hotel	N/A	UST, LUST	--
Avis Rent A Car	Building 25	UST, LUST	--
Zantop International Airlines	N/A	UST, LUST	--

N/A - Not available

WESTON

TABLE 2-4

KNOWN CONTAMINATED SITES

SITE	LOCATION	STATUS (DATE)	NJDEP CONTACT
Airborne Express	98 156 Port Street	Pending (2/8/96)	BUST
Avis Rent A Car	EWR Building 25	Active (9/14/95)	BUST
BP North America Petroleum Incorporated	Coastal Street	Active (10/4/92) Pending (5/17/93) Active (6/7/95)	BFO-N BFO-N BUST
Consolidated Freightways	300 Port Street	Active (11/2/95)	BUST
Continental Airlines	EWR Hangar 55	Active (3/23/94)	BUST
Hertz Rent A Car	EWR Building 23	Active (10/1/88)	BUST
Hudson County Chromate 148	350 Coastal Street	Active (4/17/90)	BFCM
Kent Steel Corporation	Navy Street - Building 304	Active (10/6/95)	BUST
M&G Convoy Inc., Port Newark Shop	142 Marsh Street	Active (11/11/93)	BUST
National Car Rental	EWR	Active (12/6/93)	BUST
Newark International Airport	EWR	Active (10/14/94)	BFO-N
Orient Chemical Corporation	121 Tyler Street	Active (5/31/95)	BEECRA
Port Authority	260 Kellogg Street	Active (11/4/94)	BUST
Port Authority	Marsh Street	Pending (2/17/95)	BFO-CA
Port Authority	Corbin Street	Active (3/29/96)	BUST
Seaport Auto Service Incorporated	Corbin and Tyler Streets	Active (1/22/96)	BUST
United Airlines	EWR	Active (1/3/89)	BUST
Universal Maritime Service Corporation	231 Tyler Street	Active (11/9/93)	BUST
Zantop International Airlines	EWR Building 153	Active (1/18/88)	BUST
Buckeye Pipeline Company	EWR Building 115	Active (8/21/91)	BEECRA
Disposal Areas Incorporated Landfill	Kapkowski Road and North Avenue	Active (2/14/94)	BSCM
Federal Express Metroplex	EWR Building 347	Pending (8/27/93) Active (10/12/95)	BFO-N BFO-N
Port Authority Landfill	Bay Avenue and Kapkowski Road	Active (3/8/93)	BSCM
Port Authority Regional Fill	EPAMT	Pending (9/23/94)	BUST
Reality Transfer Corporation	987 to 1176 McLester Street	Pending (9/9/92)	BFO-N

WESTON

TABLE 2-5

ENVIRONMENTAL DATABASE SEARCH RESULTS
NEARBY FACILITIES

SITE	ADDRESS	DATABASE(S)	COMMENTS
Toys "R" Us	888 Doremus Avenue, Newark	UST	Tanks store(d) medium diesel fuel No. 2-D and waste oil
Firmenich, Inc./Chem-Fleur Processing Facility	928-964 Doremus Avenue, Newark	FINDS, Major Facilities, RCRIS, TRIS, TSCA	Listed as a major facility for the storage of 8,500 gallons of dimethyl sulfate, 27,500 of assorted finished product and raw materials, 9,600 gallons of acetic acid, 9,500 gallons of methyl formcel, 9,600 gallons of methanol, 4,300 gallons of dimethyl sulfate residue, and 10,000 gallons of hazardous waste. RCRA large-quantity generator. Facility is monitored or permitted for air emissions.
New Jersey Galvanizing Tinning Works	139 Haynes Avenue, Newark	RCRIS, FINDS	RCRA large-quantity generator. Facility has a civil and administrative enforcement case and is monitored or permitted for air emissions.
United Airlines	146 Haynes Avenue, Newark	SHWS	Case status is pending.
Bessemer Processing Company Inc.	135 Haynes Avenue, Newark	SHWS, RCRIS	Case status is pending. Facility has a civil and administrative enforcement case and is monitored or permitted for air emissions.
Waverly Yards	Bessemer Street/Haynes Avenue, Newark	SHWS	Case status is active.
Dollar Rent-A-Car	162 U.S. Highway 1, Newark	LUST	Tank contents not reported.
Penick Corp.	158 Mount Olivet Avenue, Newark	Major Facilities, RCRIS, TRIS, TSCA, CORRACTS, CERC-NFRAP	Listed as a major facility for the storage of 275 gallons of diesel fuel, 95,000 gallons of No. 6 fuel oil, 1,500 gallons of ammonium hydroxide, 60,000 gallons of methanol, 1,000 gallons of ammonia, 1,500 gallons of sodium hydroxide, 1,500 gallons of ammonium hydroxide, 275 gallons of gasoline, and 8,000 gallons of various bases and solvents. RCRA large-quantity generator and treatment, storage, and disposal facility. Preliminary Assessment completed in 1992, NFRAP recommendation given. Facility is involved with pesticide production and has a civil and administrative case.

WESTON

TABLE 2-5 (CONTINUED)

ENVIRONMENTAL DATABASE SEARCH RESULTS
NEARBY FACILITIES

SITE	ADDRESS	DATABASE(S)	COMMENTS
Leaseway Transp	1000 Jefferson Avenue, Elizabeth	FINDS, RCRIS	RCRA large-quantity generator.
Sears Roebuck and Company	1000 Jefferson Avenue, Elizabeth	UST	Tanks store(d) medium diesel fuel No. 2-D.
Papettis Hygrade Egg Products Inc.	847 North Avenue East, Elizabeth	RCRIS, FINDS, UST	RCRA small-quantity generator. Tanks store(d) unleaded gasoline, medium diesel fuel No. 2-D, and home heating oil No. 2.
BLW Associates	901 North Avenue East	LUST	Tank contents not reported.
Metalwash Machinery Corp.	901-15 North Avenue, Elizabeth	RCRIS, FINDS	RCRA small-quantity generator. Facility is monitored or permitted for air emissions.
Aloyco Inc.	879 North Avenue, Elizabeth	FINDS, RCRIS	RCRA large-quantity generator.
Wakefern Food Corporation	610-620 Spring Street, Elizabeth	UST	Tank contents not reported.
Merit Spring	623 Spring Street, Elizabeth	UST, LUST	Tanks store(d) unleaded gasoline, light diesel fuel No. 1-D, and kerosene.
Value Gasoline Station	623 Spring Street, Elizabeth	FINDS, RCRIS	RCRA large-quantity generator.
Value Spring	623 Spring Street, Elizabeth	UST	Tank contents not reported.
Bowman Transportation Inc.	700 Division Street, Elizabeth	UST, LUST	Tanks contents not reported.
Browning-Ferris Ind.	714 Division Street, Elizabeth	RCRIS, FINDS, CERC-NFRAP, UST, SWF/LF	RCRA small-quantity generator. Preliminary Assessment completed in 1985; NFRAP recommended. Tanks store(d) medium diesel fuel No. 2-D. The landfill was authorized to accept municipal, commercial, and industrial wastes, bulky wastes, vegetative waste, animal and food processing waste, and dry industrial waste and is currently closed.
Jerome Industries Corp.	730 Division Street, Elizabeth	RCRIS, FINDS	RCRA small-quantity generator.
Gavin Graham/Vacant	669 Division Street, Elizabeth	UST	Tank store(d) home heating oil No. 2.
DHL Airways Inc. EWR	675 Division Street, Elizabeth	RCRIS, FINDS	RCRA small-quantity generator.
Columbia Cheese Co.	631 Division Street, Elizabeth	UST, LUST	Tanks store(d) medium diesel fuel No. 2-D and home heating oil No. 2.
Stone Container Corp.	750 Dowd Avenue, Elizabeth	FINDS, RCRIS, UST	RCRA large-quantity generator. Tanks contents not reported.

TABLE 2-5 (CONTINUED)

ENVIRONMENTAL DATABASE SEARCH RESULTS
NEARBY FACILITIES

SITE	ADDRESS	DATABASE(S)	COMMENTS
Walker Manufacturing	614 Progress Street, Elizabeth	UST	Tanks store(d) home heating oil No. 2.
BASF Corp.	731 Dowd Avenue, Elizabeth	RCRIS	RCRA small-quantity generator.
Diebold, Inc.	700 Dowd Avenue, Elizabeth	RCRIS, FINDS	RCRA small-quantity generator.
Jaynes Motor Freight Inc.	860 North Avenue, Elizabeth	FINDS, RCRIS, UST	RCRA large-quantity generator. Tanks store(d) waste oil.

TABLE 5-1
PETITION FOR GROUNDWATER RECLASSIFICATION
PORT AUTHORITY OF NY/NJ
SUMMARY OF ANALYTICAL DATA

ANALYTE NAME	NUMBER OF ANALYSES	NUMBER OF DETECTIONS	DETECTED CONCENTRATIONS			NUMBER OF DETECTIONS ABOVE GWQS	NJDEP GWQS
			MINIMUM	MAXIMUM	AVERAGE		
SVOCs							
2,4-DICHLOROPHENOL	57	1	120	120	120	1	20
2,4-DIMETHYLPHENOL	57	8	3	750	225 25	4	100
ACENAPHTHENE	143	33	1	1400	104.52	2	400
FLUORANTHENE	190	24	1	690	60.26	2	300
FLUORENE	190	35	1	880	57.13	2	300
HEXACHLOROETHANE	135	1	63	63	63	1	10
ISOPHORONE	135	1	2200	2200	2200	1	100
PYRENE	190	19	1	440	48.04	2	200
INORGANICS							
CYANIDE, TOTAL	25	8	0.088	240	47.89	1	200
METALS							
ARSENIC, TOTAL	74	43	2	5100	214.49	34	8
BARIUM, TOTAL	10	7	57	3140	565.29	1	2000
CADMIUM, TOTAL	64	19	0.79	228	21.29	16	4
CHROMIUM, TOTAL	75	34	12.1	1280	353.26	20	100
COPPER, TOTAL	65	34	3.6	3390	250.93	2	1000
LEAD, TOTAL	127	75	2	22500	799.79	65	10
MERCURY, TOTAL	58	15	0 3	432	31.44	5	2
NICKEL, TOTAL	62	20	17 7	670	145.84	8	100
SELENIUM, TOTAL	57	8	1 4	510	69.7	1	50
THALLIUM, TOTAL	50	5	5	36	21.58	3	10
ZINC, TOTAL	65	37	4 2	10900	892.96	1	5000
PESTICIDES							
ALPHA-BHC	17	1	0.026	0.026	0.03	1	0 02
VOCs							
1,1,1-TRICHLOROETHANE	295	3	7	140	89	2	30
1,1,2,2-TETRACHLOROETHANE	292	1	2 3	2.3	2.3	1	2
1,1-DICHLOROETHANE	293	5	29	290	165.6	3	70
ACETONE	234	88	2	730	49 9	1	700
BENZENE	433	92	0.071	11000	1141.36	79	1
BROMOMETHANE	295	2	11	11	11	2	10
CHLOROBENZENE	300	4	6.8	600	158.2	1	50
CHLOROFORM	294	7	2 2	7.6	5.03	2	6
CHLOROMETHANE	295	3	1	290	193.67	2	30
HEXACHLOROBUTADIENE	57	1	3.2	3.2	3.2	1	1
METHYLENE CHLORIDE	372	205	0.7	99	6 95	148	2
STYRENE	220	1	830	830	830	1	100
TOLUENE	430	82	0.12	39000	1860.3	14	1000
XYLENES (TOTAL)	403	80	0.12	100000	3306.88	40	40

Notes:
NJDEP GWQS: New Jersey Department of Environmental Protection Groundwater Quality Standards for Class II-A Groundwater.
SVOCs: Semivolatile Organic Compounds.
VOCs: Volatile Organic Compounds
All units are in µg/L

TABLE 6-1

COMPARISON OF GROUNDWATER QUALITY DATA WITH SURFACE WATER QUALITY DATA FROM NEWARK BAY

Compound	Groundwater Concentration Range (µg/L) Multiple Studies	Surface Water Concentration Range in Newark Bay (µg/L)				EPA Ambient Marine Water Quality Criteria	
		Sample A7 - Battelle January 1991	Sample A7 - Battelle October 1991	Port Authority April 1996	SAIC/EPA July 1991, January 1992	Acute	Chronic
Antimony	23-41	NA	NA	NA	13U	NC	NC
Arsenic	2-5100	NA	NA	ND	5U	69	36
Barium	57-3140	NA	NA	NA	NA	NC	NC
Beryllium	NA	NA	NA	NA	3U	NC	NC
Cadmium	0.79-228	0.103	0.149-0.157	ND	4U	43	9.3
Chromium	12.1-1280	NA	NA	ND	NA	NC	NC
Copper	3.6-3390	4.2	5.84-5.86	ND	4U	2.9	2.9
Lead	2-22500	2.8	2.91-2.95	ND	5U	140	5.6
Mercury	0.3-432	0.036	0.037-0.09	ND	0.2U	2,136	0.025
Nickel	17.7-670	2.2	3.71	ND	8U	95	54
Selenium	1.4-510	NA	NA	NA	6U	NC	NC
Thallium	5-36	NA	NA	5.9	3U	NC	86
Zinc	4.2-10,900	14.8	20.18-21.83	ND	9U-17.1	NC	NC
Methoxychlor	NE	NA	NA	3.9	NA	NC	0.03
Total Petroleum Hydrocarbons	1.4-324	NA	NA	ND	NA	NC	NC
Methylene Chloride	0.7-99	NA	NA	ND	NA	NC	NC
Benzene	0.071-11000	NA	NA	ND	NA	NC	NC
Toluene	0.12-100000	NA	NA	ND	NA	NC	NC
Ethylbenzene	60-3000	NA	NA	ND	NA	NC	NC
Xylene	0.12-10000		NA	ND	NA	NC	NC
bis(2-ethylhexyl) phthalate	75	NA	NA	NA	NA	NC	NC
Styrene	830	NA	NA	NA	NA	NC	NC
TCE	4-5	NA	NA	ND	NA	NC	NC
Acenaphthene	1-1400	NA	NA	NA	NA	NC	NC
Fluorene	1-880	NA	NA	NA	NA	NC	NC
Anthracene	29000	NA	NA	NA	NA	NC	NC

NA - Not analyzed for
NC - No criteria established
ND - Not detected
U - Not detected at the listed concentration
ug/L - microgram per liter

TABLE 6-2

SUMMARY OF SEDIMENT SAMPLING RESULTS FOR NEWARK BAY ADJACENT TO THE PROPOSED RECLASSIFICATION AREA

Compound	Battelle, October 1991 Location A7		NOAA 1991 Locations 16, 17 (mg/kg)[1]	NOAA 1993 Locations 31, 36 (mg/kg unless otherwise noted)
	Pore Water (µg/L)	Sediment (mg/kg)		
Aluminum	NA	NA	40000 - 68000	55600 - 65200
Antimony	NA	NA	0.46 - 2.7	<5.24
Arsenic	39.4	8.83	6.9 - 21	9.83 - 13.4
Cadmium	0.028	1.38	0.8 - 3.1	1.2 - 1.46
Copper	4.97	105.3	31 - 190	82.4 - 113
Chromium	NA	NA	83 - 160	106 - 122
Iron	NA	NA	15000 - 38000	29.3 - 37.2
Lead	2.23	109	41 - 240	95.9 - 124
Manganese	NA	NA	224 - 590	NR
Mercury	0.026	1.75	1.1 - 3.9	1.51 - 1.59
Nickel	3.75	1.75	15- 54	NR
Selenium	NA	NA	< 0.16 - 34	0.55 - 0.713
Silver	0.1	4.35	0.5 - 2.2	NR
Tin	NA	NA	7.5 - 34	21.8 - 25.6
Zinc	17.8	188	77 - 400	173 - 214
Hexachlorobenzene	NA	NA	0.0033 - 0.0038	0.004 - 0.0056
Chlordane	NA	NA	0.0031 - 0.0046	0.0072 - 0.0089
Dieldrin	NA	NA	0.0016 - 0.0023	0.003 - 0.0062
2,4-DDE	NA	NA	0.0021 - 0.0033	NR

TABLE 6-2 (CONTINUED)

SUMMARY OF SEDIMENT SAMPLING RESULTS FOR NEWARK BAY ADJACENT TO THE PROPOSED RECLASSIFICATION AREA

Compound	Battelle, October 1991 Location A7		NOAA 1991 Locations 16,17 (mg/kg)[1]	NOAA 1993 Locations 31, 36 (mg/kg unless otherwise noted)
	Pore Water (µg/L)	Sediment (mg/kg)		
2,4-DDD	NA	NA	0.0316 - 0.007	NR
4,4-DDD	NA	NA	0.010 - 0.0129	NR
4,4-DDT	NA	NA	0.0146 - 0.0394	NR
Total PAHs	NA	NA	8.068 - 18.879	NR
Total DDTs	NA	NA	NR	0.142 - 0.152
Cumulative Dioxins (TEQ) (pg/g)	NA	NA	NR	97.785 - 108.77 pg/g
Total PCBs	NA	NA	NR	0.565 - 0.577

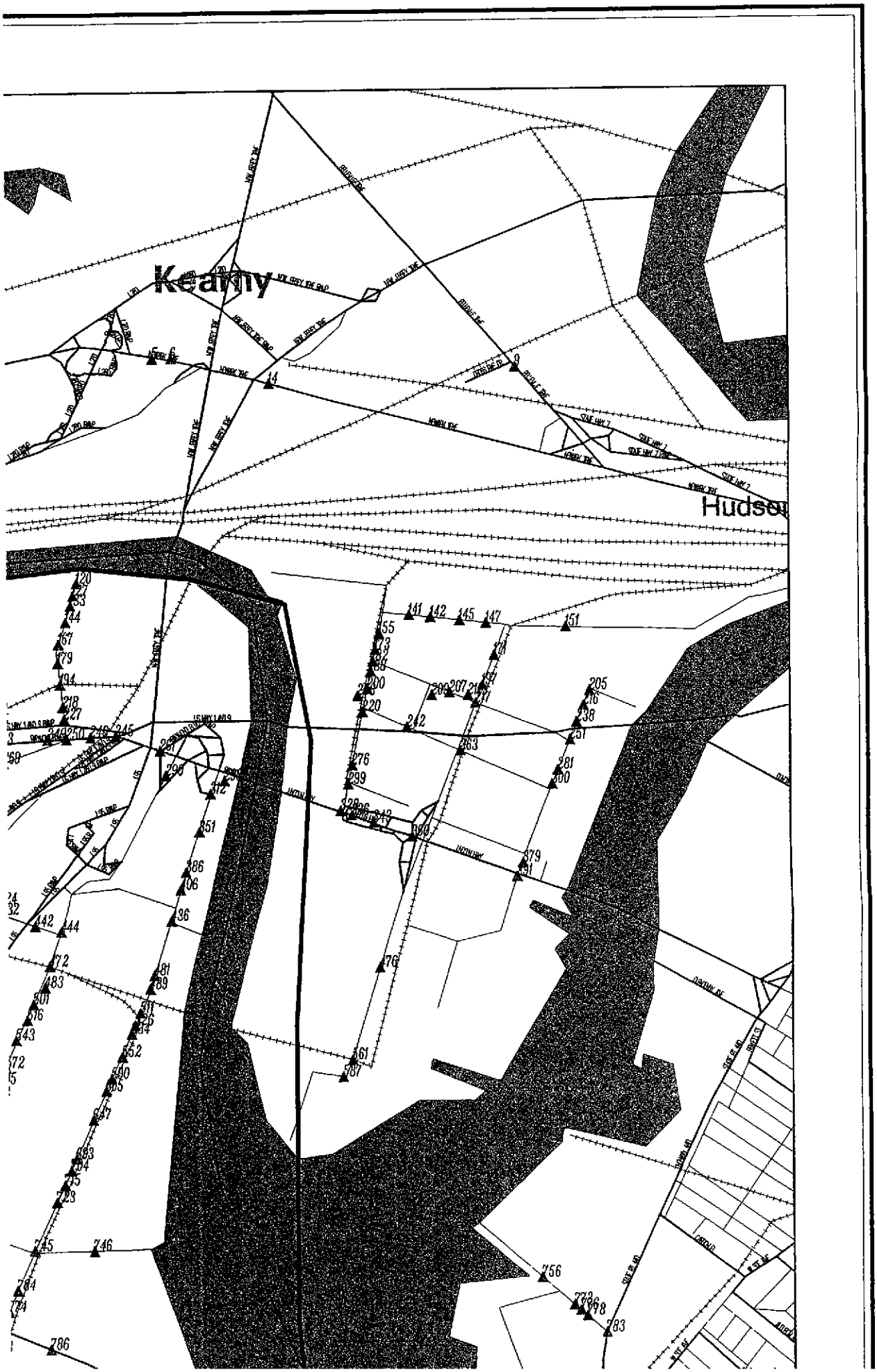
[1] Concentrations of several metals were measured by X-Ray Fluorescence and are not so accurate as 1993 data analyzed by atomic absorption spectrometry.

NOTES:
NA - Not analyzed for
NR - Not reported
PCBs - Polychlorinated biphenyls
PAHs - Polycyclic aromatic hydrocarbons
TEQ - Toxic equivalency factor
ug/L - Micrograms per liter
mg/kg - Milligrams per kilogram
pg/g - Picograms per gram

Appendix A

APPENDIX A

EDR MAP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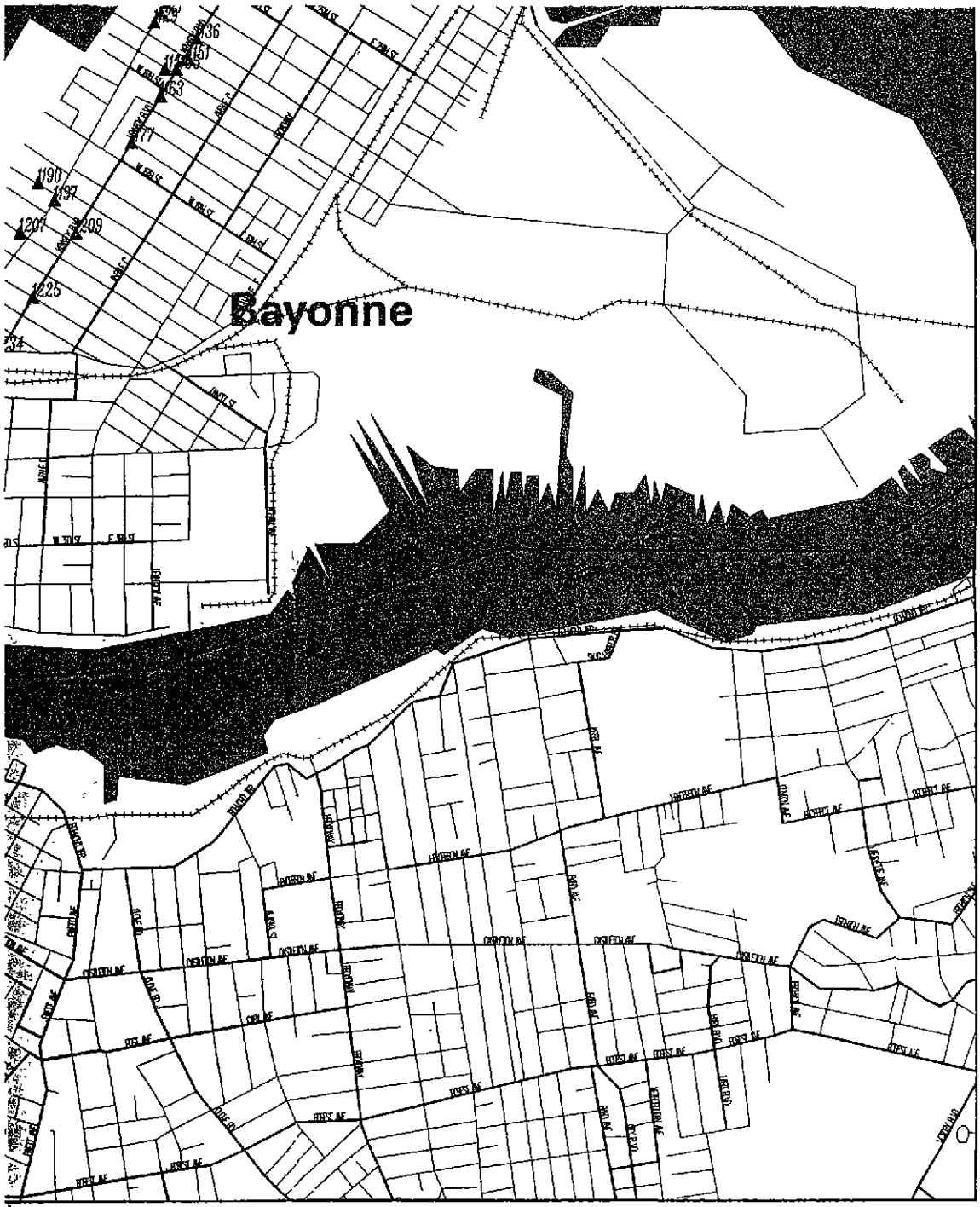
Hudson

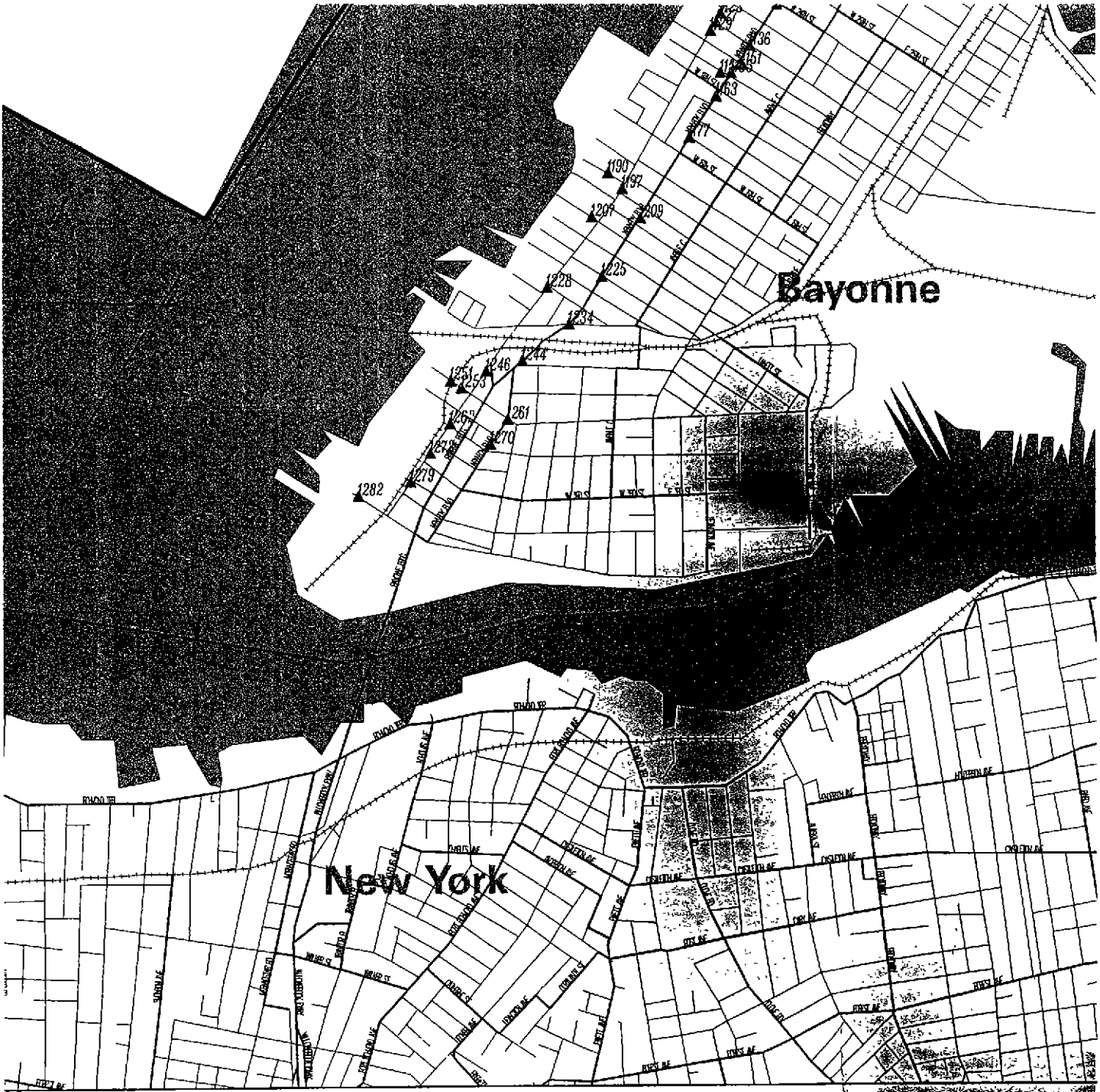
Jersey City



N

0 1/4 1/2 1

Scale in Miles



:a For

:lizabeth

Water

Superfund Sites

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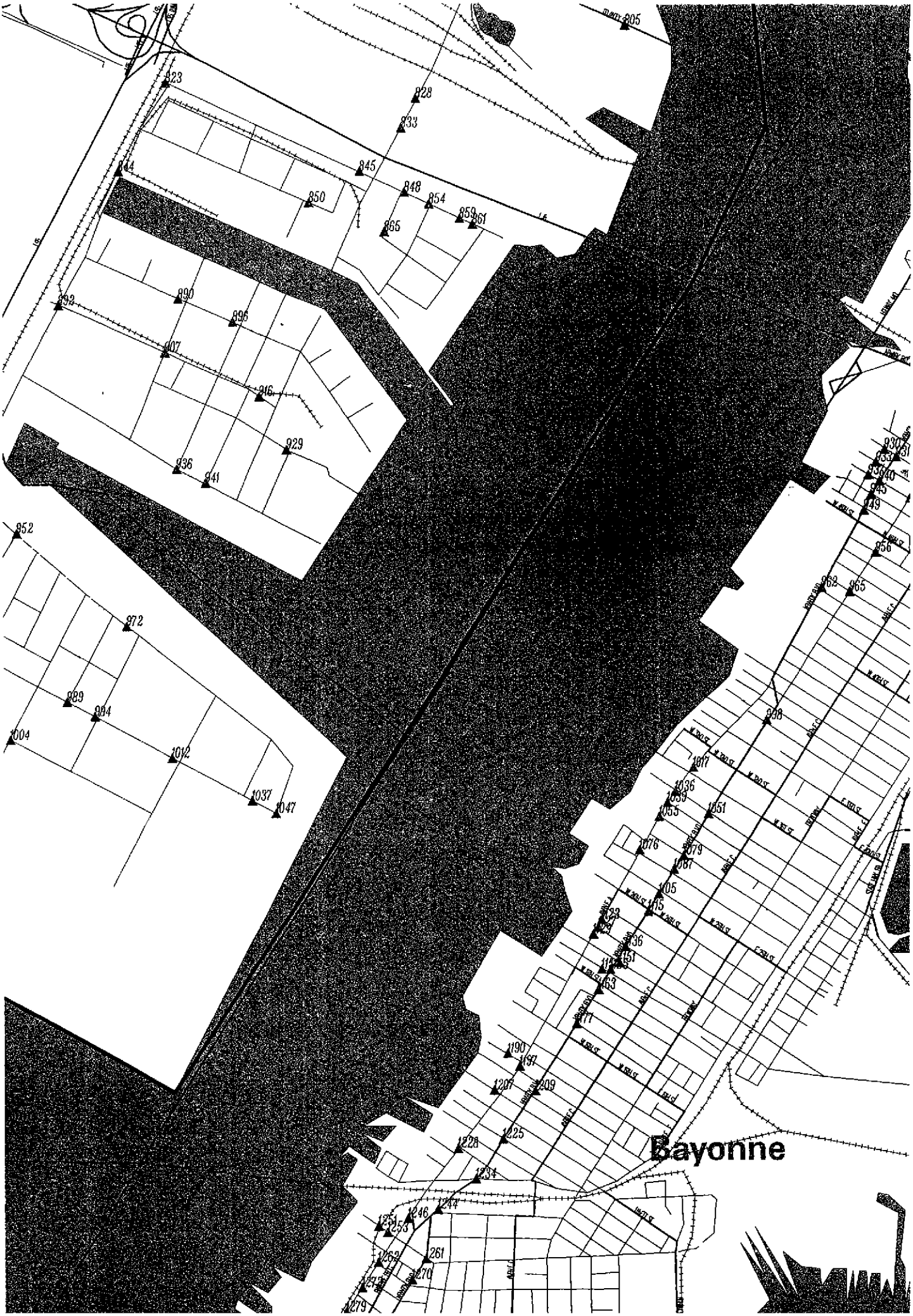
Scale in Miles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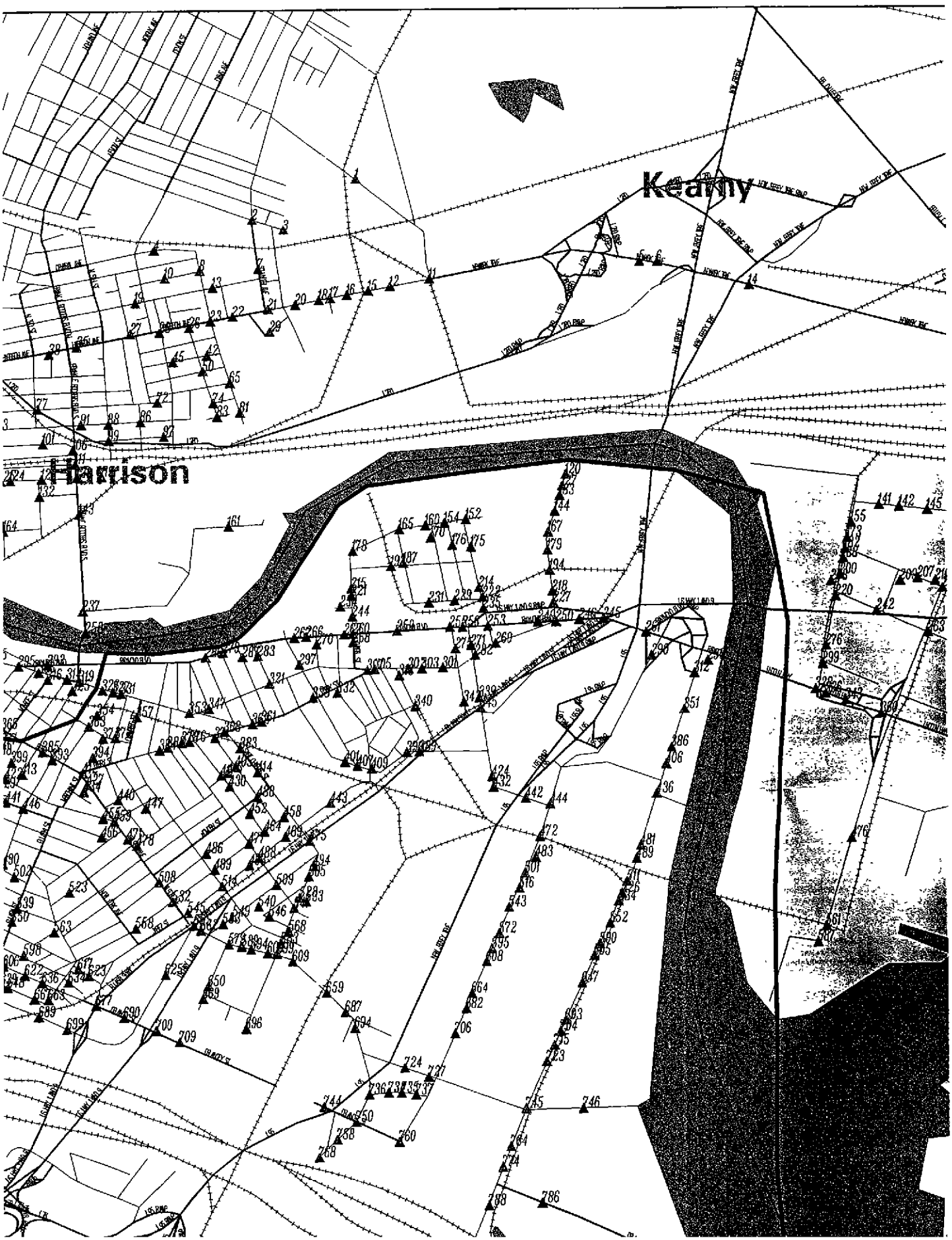
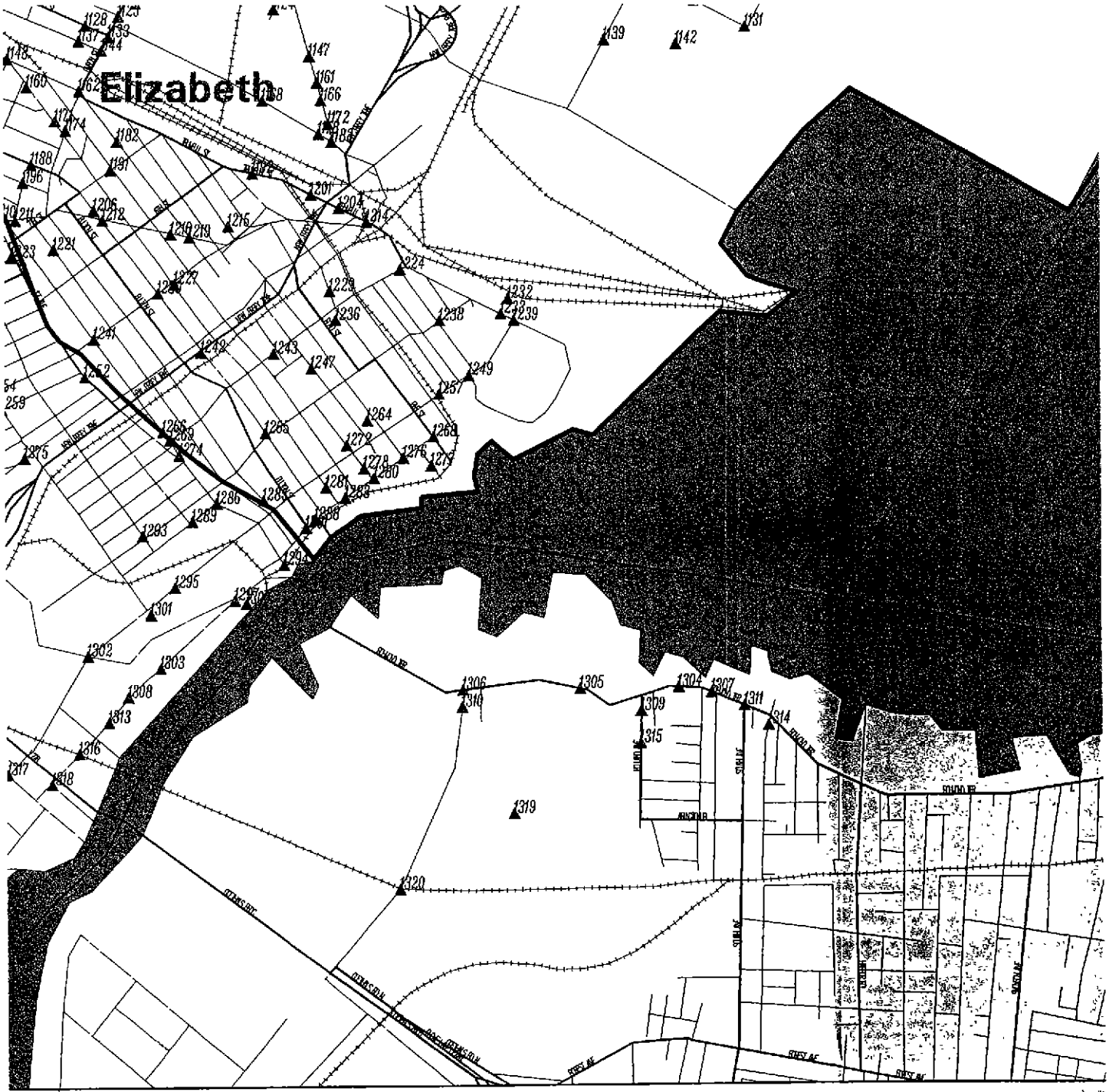

Kearny
Harrison



Study Area For

Newark & Elizabeth

2nd

- Study Area Boundary
- Roads
- Major Roads
- Waterways
- Railroads
- Contour Lines
- Pipelines
- Powerlines
- Fault Lines
- Water
- Superfund Sites

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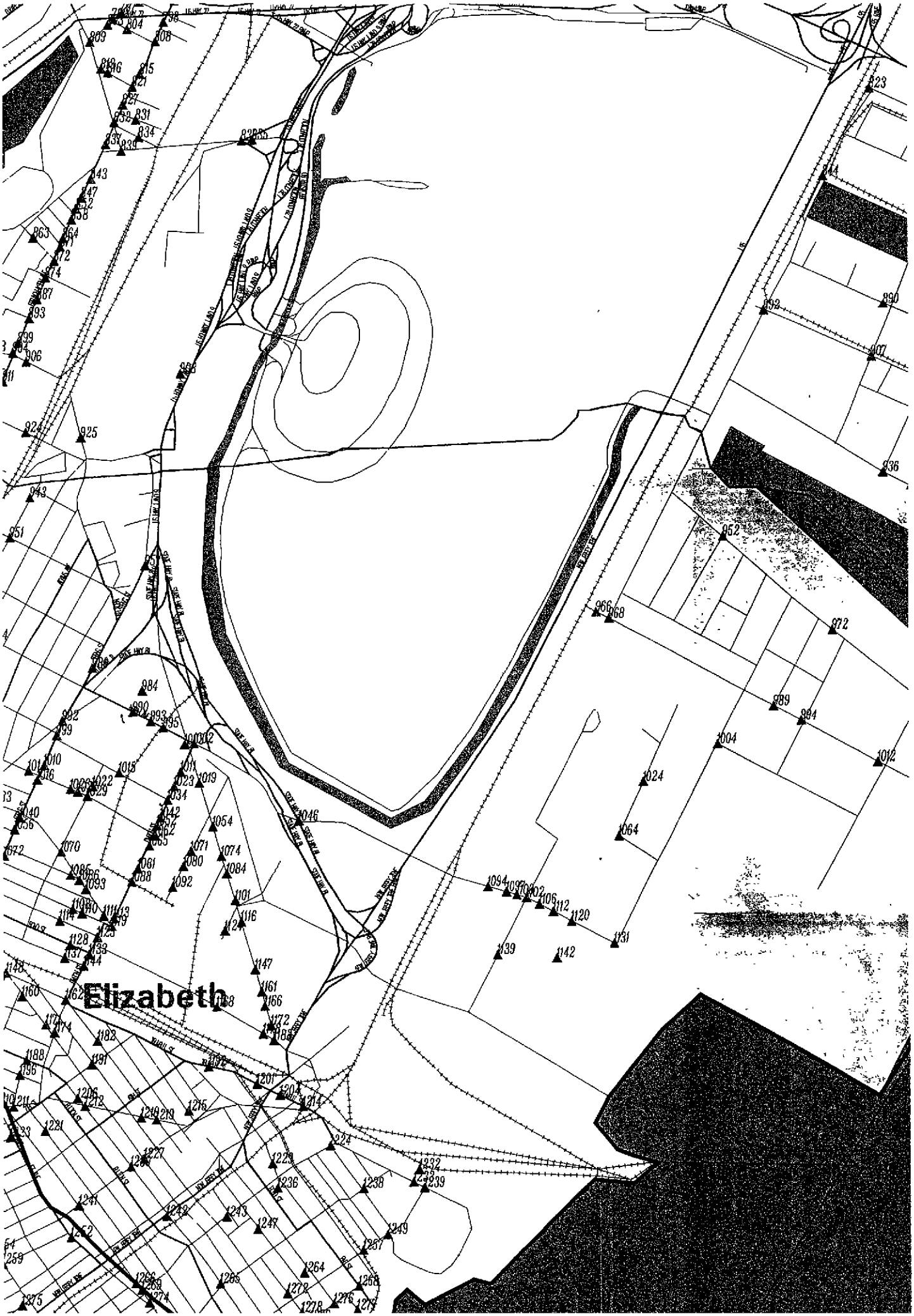
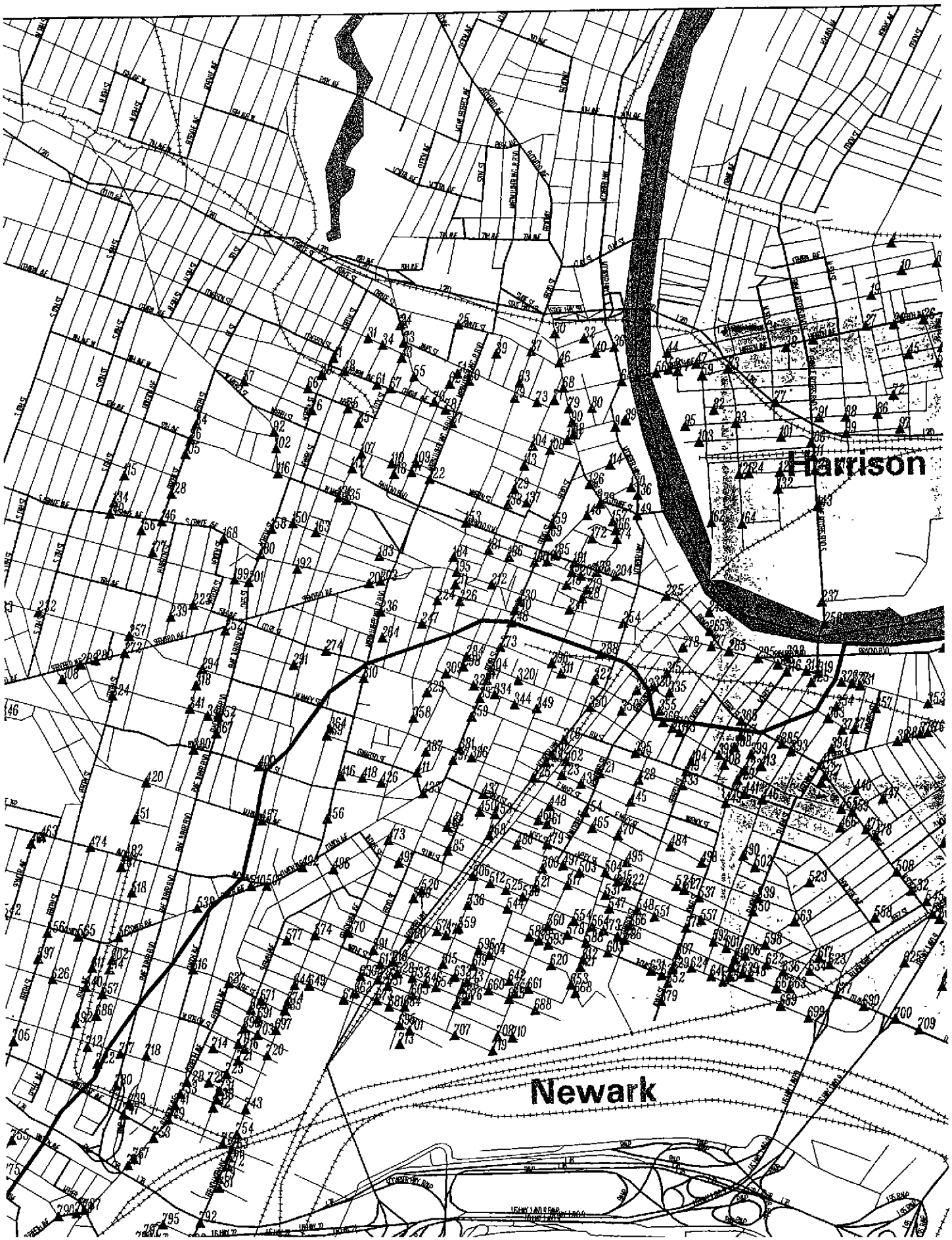

Elizabeth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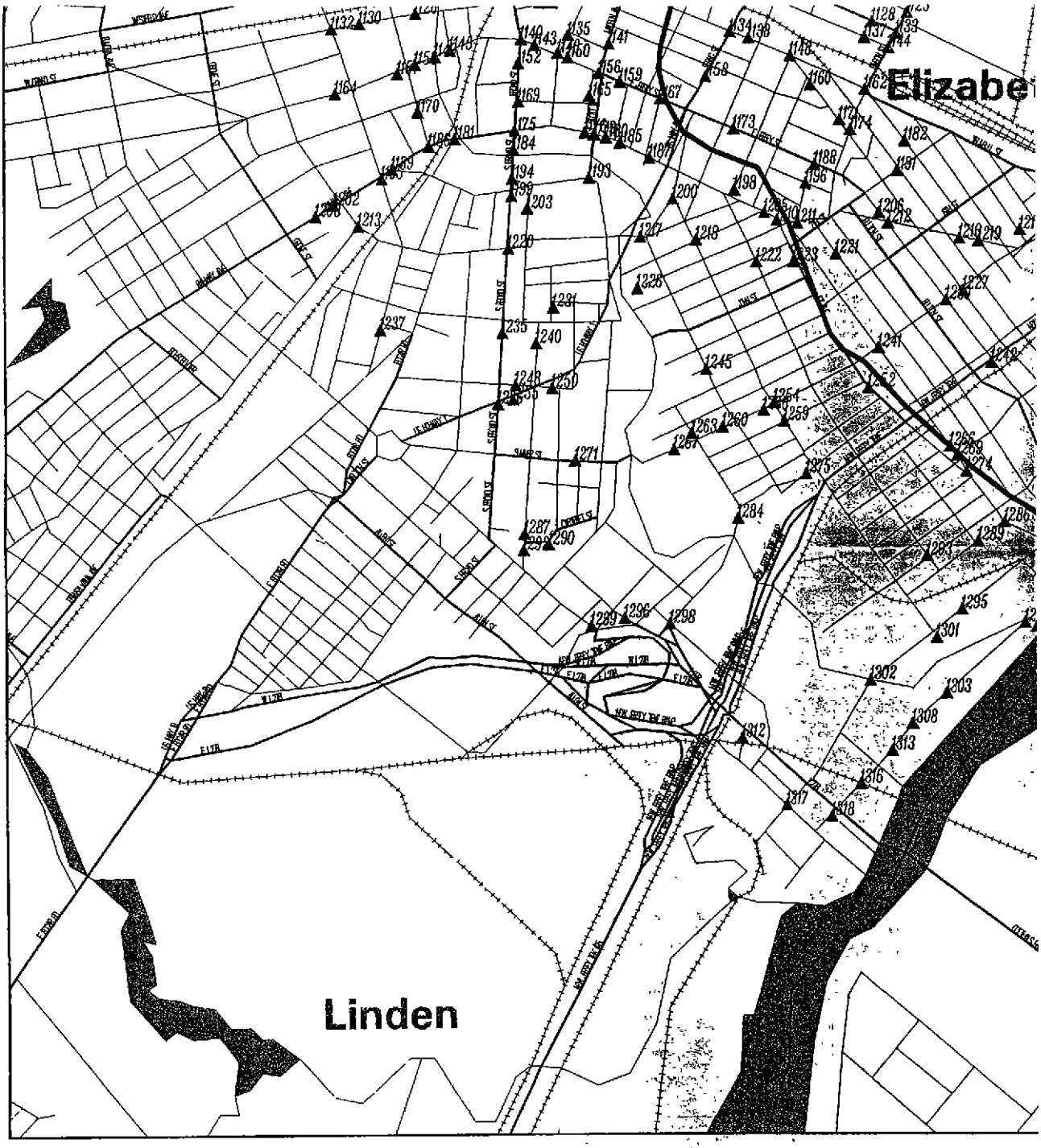


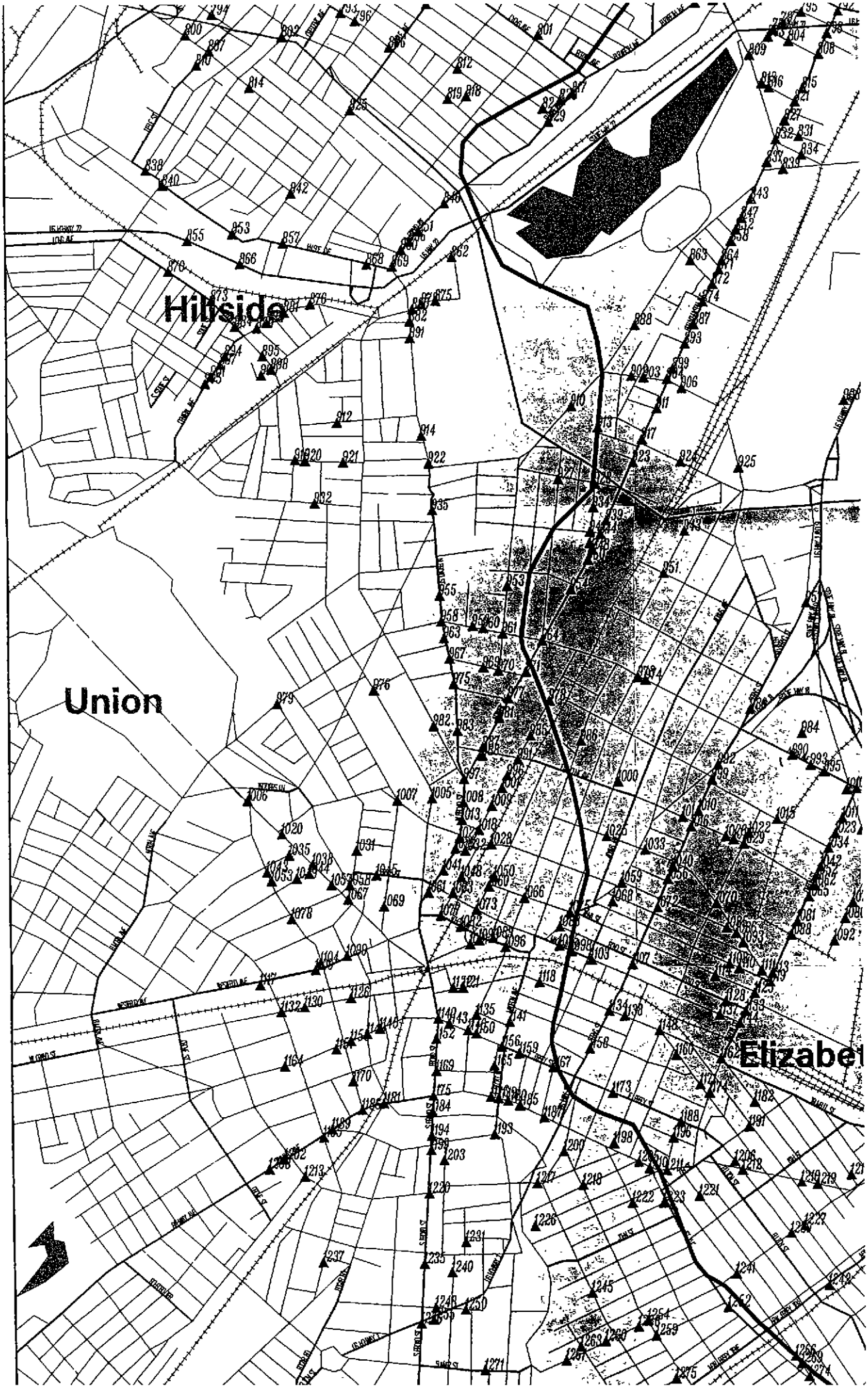
Environmental Data Resources, Inc.

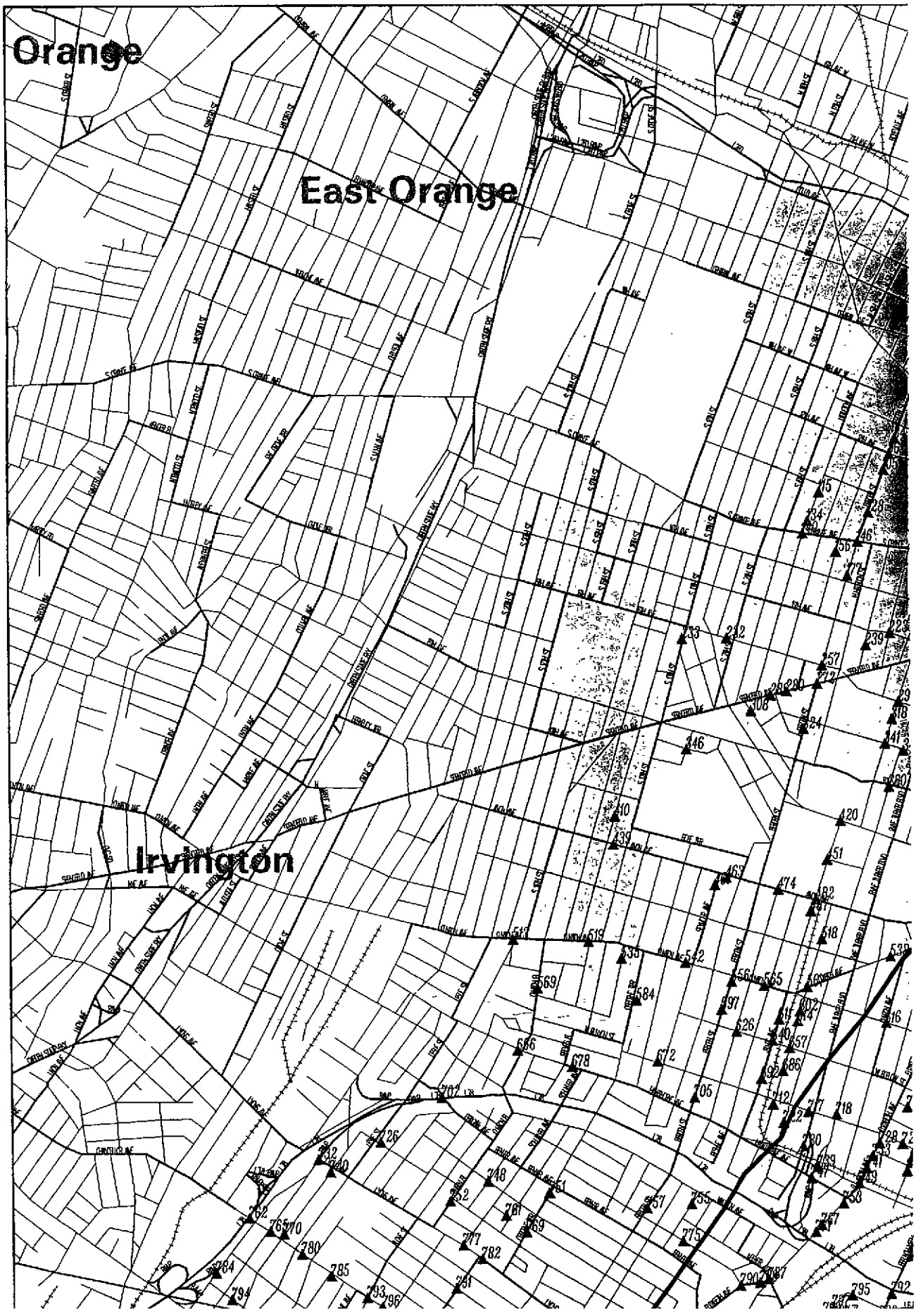
Creators of Toxicheck®

1-800-352-0050

Legend

- Listed Sites
- Earthquake Epicenters (Richter 5 or greater)
- Study A
- Roads
- Major R


Hillside
Union
Elizabe


Orange
East Orange
Irvington

Appendix B

APPENDIX B

NJDEP LETTER ON HISTORIC FILL

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

Bureau of Underground Storage Tanks
CN-028
401 East State Street
Trenton, NJ 08625

CHRISTINE TODD WHITMAN
Governor

ROBERT C. SHINN, JR.
Commissioner

Mr. Marvin Kirshner
The Port Authority of NY & NJ
Environmental Engineering Unit
One World Trade Center
NY, NY 10048

SEP 15 199[illegible]

Re: Historical Fill
NJ Marine Terminal, Port Elizabeth
Elizabeth, Union County
UST #0011026

Dear Mr. Kirshner:

During July 1994, the New Jersey Department of Environmental Protection (Department) received report(s) from The Port Authority of NY & NJ. These reports document the site investigation, remedial investigation and/or remedial action undertaken in response to the closure and/or discharges from your underground storage tank systems.

Based on our review of the information submitted, the Department finds that the presence of lead within the soil and ground water samples collected may be from historical fill associated with the site. Based upon the presence of lead from historical fill, a copy of this case is being transferred from the Division of Responsible Party Site Remediation (DRPSR), Bureau of Underground Storage Tanks to the DRPSR, Bureau of Field Operations. Please direct all correspondence regarding the historic fill to:

New Jersey Department of Environmental Protection
Bureau of Field Operations
Case Assignment Section
Attention: Mark Pederson
401 E. State Street, 4th Floor
CN 028
Trenton, NJ 08625

Please be advised that this letter only addresses the historic fill. All aspects of the site investigation, remedial investigation, and remedial action associated with the underground storage tanks remains within the Bureau of Applicability and Compliance and the Bureau of Underground Storage Tanks. This letter makes no representation regarding the environmental conditions of any other areas for the referenced property.

On April 5, 1993, the UST Fee Rule (Amendments and New Rules at N.J.A.C. 7:14B) was proposed. This rule appeared in the February 22, 1994, New Jersey Register.

Effective February 22, 1994, the Department will be billing you for the Department's oversight of all work conducted at your site. Documents submitted to the Department in accordance with the "Technical Requirements for Site Remediation" (N.J.A.C. 7:26E) will help reduce the time necessary for the Department oversight of your case. At this time, the Department intends to process bills on a semi-annual basis. Please consult the April 5, 1993 and February 22, 1994, State Registers for details. Copies can be obtained by contacting the Office of Administrative Law at (609) 588-6500. Your case manager should be contacted with any additional questions.

Thank you for your cooperation in this matter.

Sincerely,

Kevin F. Martin

for Wayne C. Howitz, Assistant Director
Industrial Site Evaluation Element

c: Mark Pedersen, BFO-SA
Joseph P Eaker, BUST,
Renee' Wright, BUST
Robert Posey, BAC
Elizabeth Health Department

Appendix C

APPENDIX C

WELL LOGS



▫ Groundwater Sample Exceeded At Least One Groundwater Quality Standard

○ Groundwater Sample Did Not Exceed Any Groundwater Quality Standard

Source:
Elizabeth NJ 7.5 Minute
Ortho-Photo Quadrangle Map
1992

SCALE

3500 0 3500 7000

FEET

WESTON MANAGERS DESIGNERS/CONSULTANTS

PROJECT NAME: GROUNDWATER RECLASSIFICATION PETITION

CLIENT NAME: THE PORT AUTHORITY OF NY & NJ

APPROXIMATE LOCATIONS OF WELLS UTILIZED IN THIS STUDY

DATE: September 1997

FIGURE #:

PA 547
6-90

THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: NJ Traverse Seemeer bldg 7 183	NAME OF CONTRACTOR: Soundings	BORING NO.: MW E 14-1	SURFACE ELEV.
LOCATION: No As drawing		CONTRACT NO.: 426-94-001	DATE: 4/11/94

SPOON: 3" O.D. 3/8" I.D.	CASING SIZE: 10" Rigos	HOLE TYPE: Mud Rotary	
HAMMER: 140 # FALL 30"	HAMMER: — # FALL —		
DRILLER: C. Le Tourneau			
INSPECTOR: R M Lebrun			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
4/15/94	11.55	9.0	NOTE- Perched water below topsoil - unless continue to rise use hole.
			water level assumed at 9.0 (BH MW C 13-1)

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D[1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
Collect ST	0				Asphalt	0.0'
Hand Auger					Brick Graded aggregate base & gravel	0.3'
		Hand Auger	24"	1	Fill. Br M F sand & Silt, cy gravel (OIL ODOR)	1.0'
		Hand Auger	24"	2	Fill Same (OIL ODOR)	
	5	3 4 6 4	16	3	Fill Same (OIL ODOR)	
10" H.S. Augers		2 5 3 2	14"	4	Fill Same	
	10	2 2 2 3	13"	5A	Fill Lime	7.5'
				B	grey Organic Silty Clay, tr peat	11.0'
					Bottom of Boring	
	15				NOTE Perched water found in caliche thru gravel pavement. Water contained thin films of product.	
	20					
	25					

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

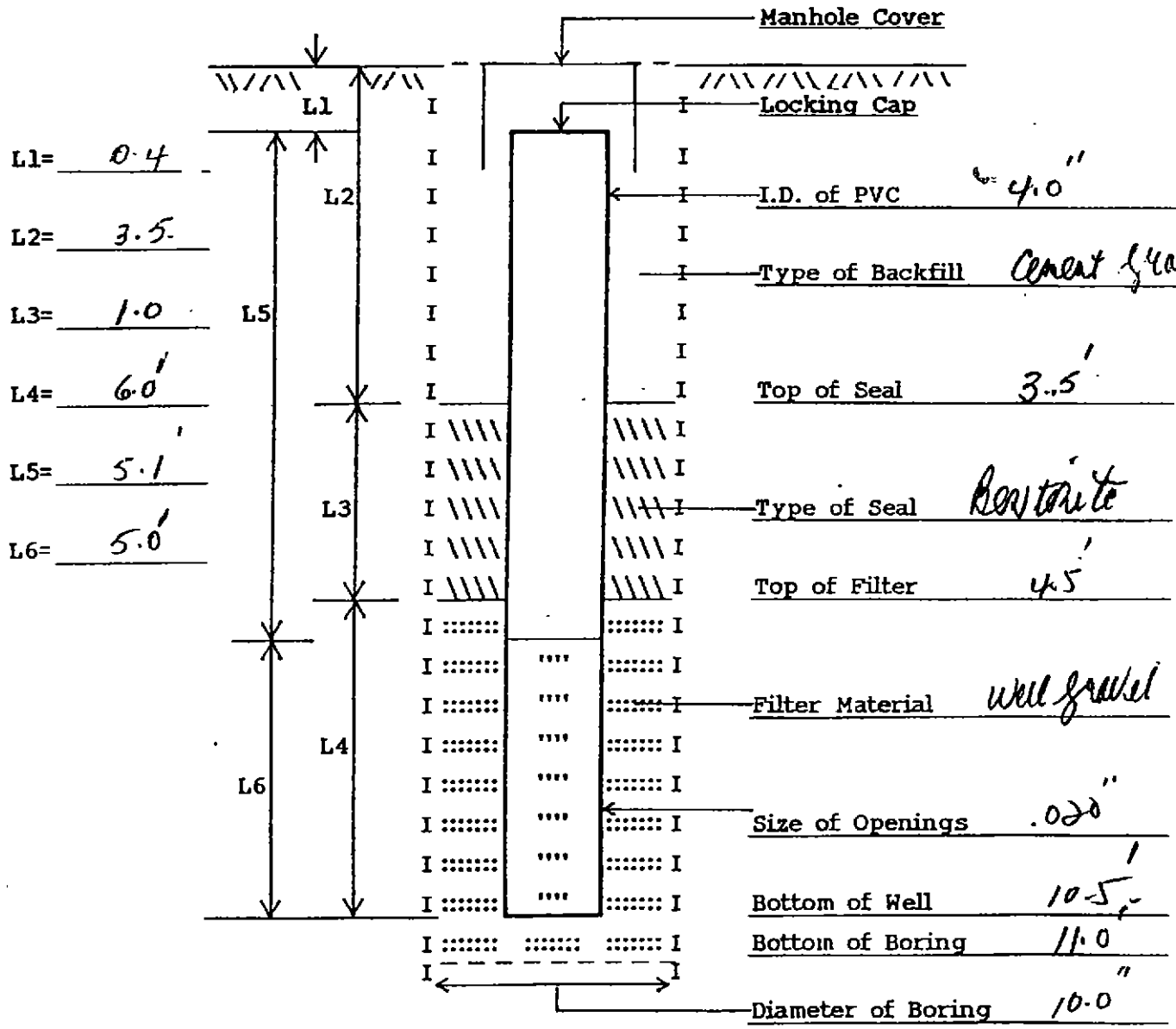
THE P(.T AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ Avenue Services Bldg # 183		Contract No.: 46-94-001	
Location: Ref drawing		Contractor: Lyng	
Driller: C Le Maine	Inspector: R M Libert		
Well No.: MW E 14-1	Type of Well: Monitor A	Date: 4/15/94	

Well Development

Date: 4/18/94	Water Level Before: 5'5	Water Level After: 7.5'
Note: Water level readings from top of PVC	Taken 15 min. After Development	



Remarks: 10.5' to 11.0' Back filled with well gravel

NJ Well Permit No. 26-37273

PA 547
6-90

THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT N.J. Marine Terminal Bldg #183	NAME OF CONTRACTOR Craig	BORING NO. MW C 12-1	SURFACE ELEV.
LOCATION Ho Ave Roadway		CONTRACT NO. 426-94-001	DATE 4/15/94

SPOON 3 O.D. 2 3/8 I.D.	CASING SIZE 11" Auger	HOLE TYPE Monitor A	
HAMMER 140 # FALL 30	HAMMER — # FALL —		
DRILLER C. LeMaire			
INSPECTOR R. M. Libert			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
4/15/94	2.0'	9.0'	

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS LINE LOCATES CHANGE OF PROFILE
Keller DT	0				Asphalt 0.0 Dense graded Aggregate Base Course 0.3' Fill br m-f Sand, tr Silt, tr Gravel 1.0
Hand Auger		Hand Auger	24"	1	
					Fill Same (Product in sample) 5.0
	5	Hand Auger	24"	2	
18" NS Auger		7 4 3 6	20"	3	Fill br m-c Sand and Red br clayey Silt (Product in sample)
		5 6 11 13	18	4	Fill Same (Product in sample)
	10	4 3 2 2	19"	5A 5B	Fill br m-f Sand, tr Silt, tr Red br Clayey Silt (Product in sample) 10.5' Same Gray Sand, Silt, Clay 11.0'
					Bottom of Boring
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

THE P[illegible]T AUTHORITY OF N.Y[illegible] & N.J.

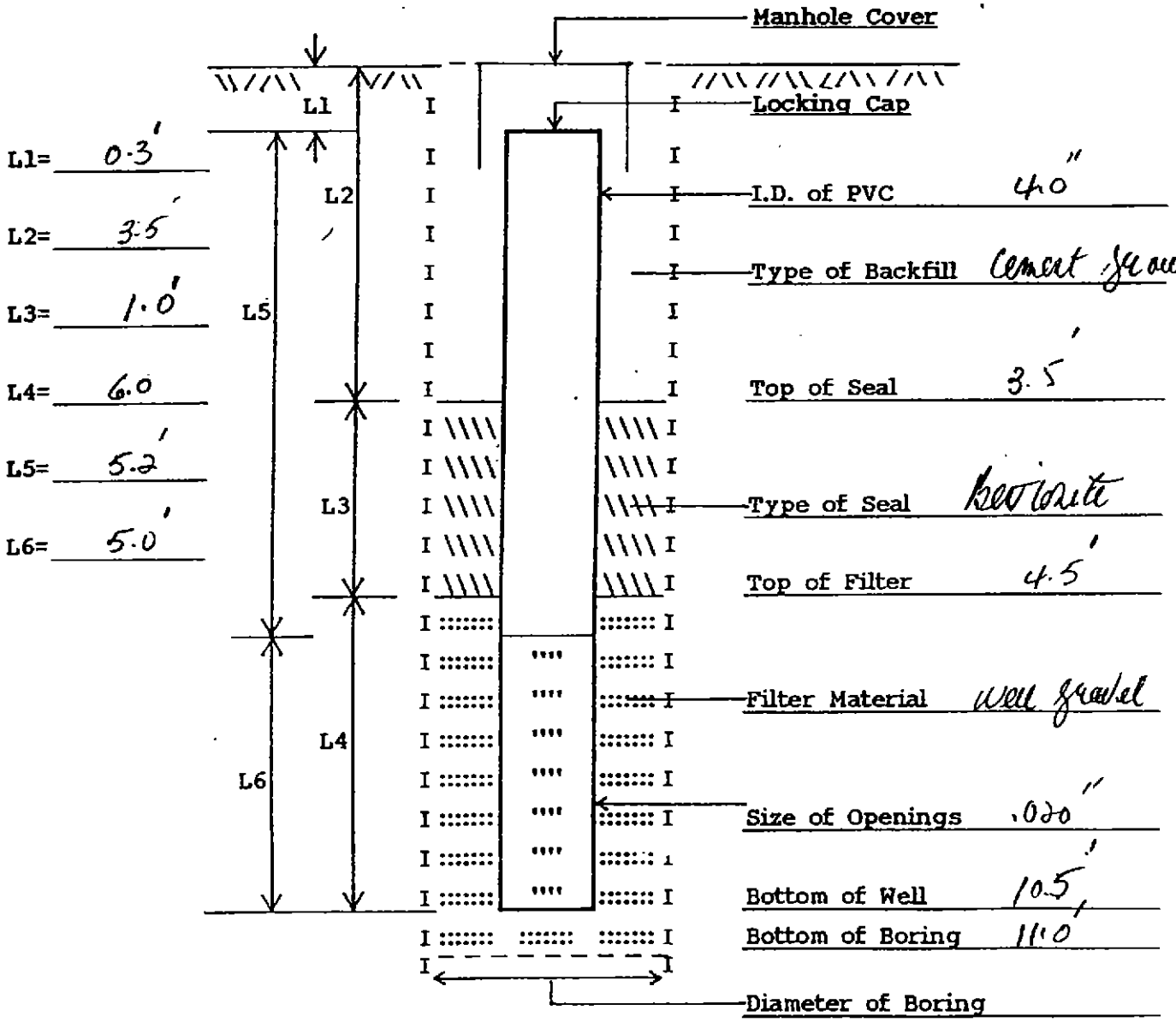
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Sheet 2 of 4

Project: NJ Marine Terminals			Contract No.: 426.94.001
Location: As per drawing			Contractor: Various
Driller: C. Le Manke		Inspector:	R. M. Libell
Well No.: MW C-12-1	Type of Well: Monitor 'A'		Date: 4/15/94

Well Development

Date: 4/18/94	Water Level Before: 6.5	Water Level After: 7.5
Note: Water level readings from top of PVC	Taken 15	min. After Development



Remarks: 10.5 - 11.0 Backfilled with well gravel
NJ Well Permit No. 26-37270

PA 547
90

THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: NJ Marine Terminal Bldg # 183	NAME OF CONTRACTOR: Berg	BORING NO.: MW C13-1	SURFACE ELEV.
LOCATION: Ref drawing		CONTRACT NO.: 450-94-001	DATE: 4/15/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	4" Auger	Monitor A

HAMMER	HAMMER
140 # FALL 30"	— # FALL "

DRILLER: C. LeGrave
INSPECTOR: R. Mr Lahoil

GROUND WATER LEVEL

Date	Time	Depth	Remarks
4/15/94	10:00 hr	9.0'	Water in sample # 4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Roller Bit / Mud Rotary / 10" H.S. Augers	0				ASPHALT 0.0' / ASPHALT Gravel Asphalt Base Course 0.2 / 1.0'
		Hand Auger	24"	1	Fill Br m-f sand, tr silt, tr gravel
			24"	2	Fill Tan (oil odor)
	5	Hand Auger 7 26 31	15"	3	Fill Tan "
		18 27 21 21	12"	*4	Fill Br m-f sand, tr silt, tr gravel, tr Red/Br clayey silt (oil odor)
	10	2 3 3 4	16"	5	Fill Br m-f sand, tr silt, tr gravel " 10.5'
				6	Grey Organic silty clay " 11.0'
					Bottom of Boring
	15				* DUPLICATE SAMPLE TAKEN
	20				
	21				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

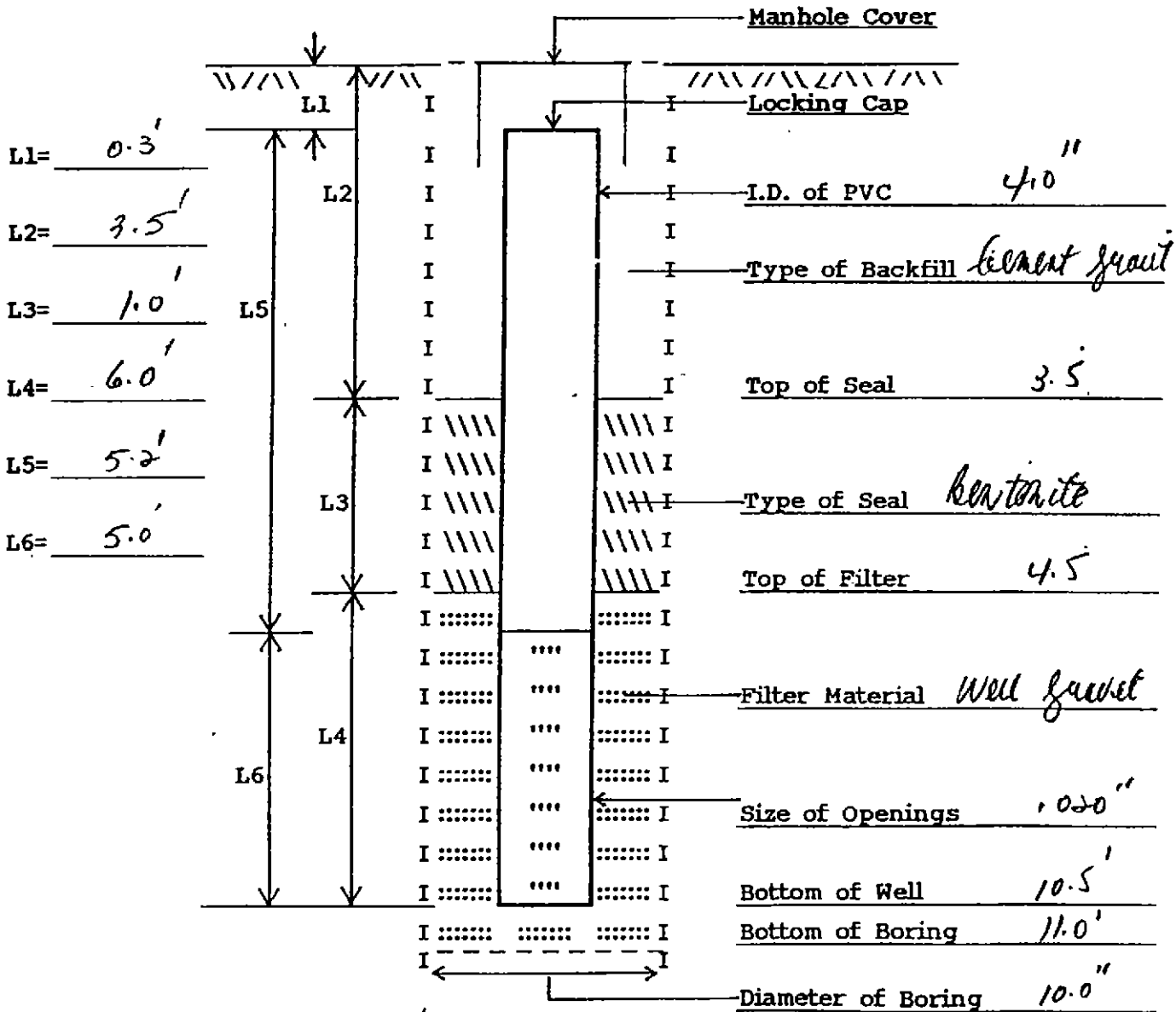
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ Marine Terminal bldg #183			Contract No.: 456-94-001
Location: Rt 440 Driveway			Contractor: Bruno
Driller: C Le Moine		Inspector: R. M. Liberti	
Well No.: MW C 13-1	Type of Well: Monitor		Date: 4/15/94

Well Development

Date: 4/18/94	Water Level Before: 5.5	Water Level After: 7.0
Note: Water level readings from top of PVC	Taken 20 min. After Development	



Remarks: 10.5' to 11.0' sock filled with well gravel

NJ Well Permit No. 26-37272

PA 547
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THE PORT AUTHORITY OF NY & NJ
ENGINEERING DEPARTMENT
MATERIALS AND RESEARCH DIVISION

BORING REPORT

SHEET 1 OF 4

PROJECT: EWR - 2000 - AIRPORT PROPERTY	NAME OF CONTRACTOR: TESTWELL - CRAIG	BORING NO: E-MW-1	SURFACE ELEV.
LOCATION: SOUTH FUEL FARM - AS LAID OUT BY P.A. SURVEY		CONTRACT NO.: 410-90-24	DATE: 2/19/90

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	4 AUGERS	I

HAMMER	HAMMER
140 # FALL 30"	— # FALL —"

DRILLER: R. SILVERMAN

INSPECTOR: L. [illegible]

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/19/90	12:15 PM	8'0	OBSERVED WHILE SAMPLING
2/19/90	13:30 PM		TYPE II MONITORING WELL INSTALLED
2/20/90	8:00 AM	8'0"	WELL PT. RDG.

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP.[2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
		2-6	22"	1	TOP 1' RED BROWN SILT - TRACE CLAY - TRACE FINE SAND - SOME GRAVEL (FILL) 2.0
		11-1			BOT 1' BROWN FINE SAND - TRACE SILT - TRACE GRAVEL (FILL)
		9-10	20"	2	GREY SILT - TRACE CLAY - TRACE GRAVEL (FILL) 4.0'
	5	45-40			
		14-20	24"	3	CINDERS - GLASS - BRICK - GRAVEL (FILL)
		12-8			
		4-4	2"	4	"SAME"
		5-5			
		3-3	16"	5	"SAME" 10.0'
	10	3-3			
		1-5	6"	6	TOP CINDERS - SAND - GRAVEL 11.0'
		3-2			BOT GREY ORGANIC SILT - TRACE VEGETATION 13.0'
					BOTTOM OF BORING
	15				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

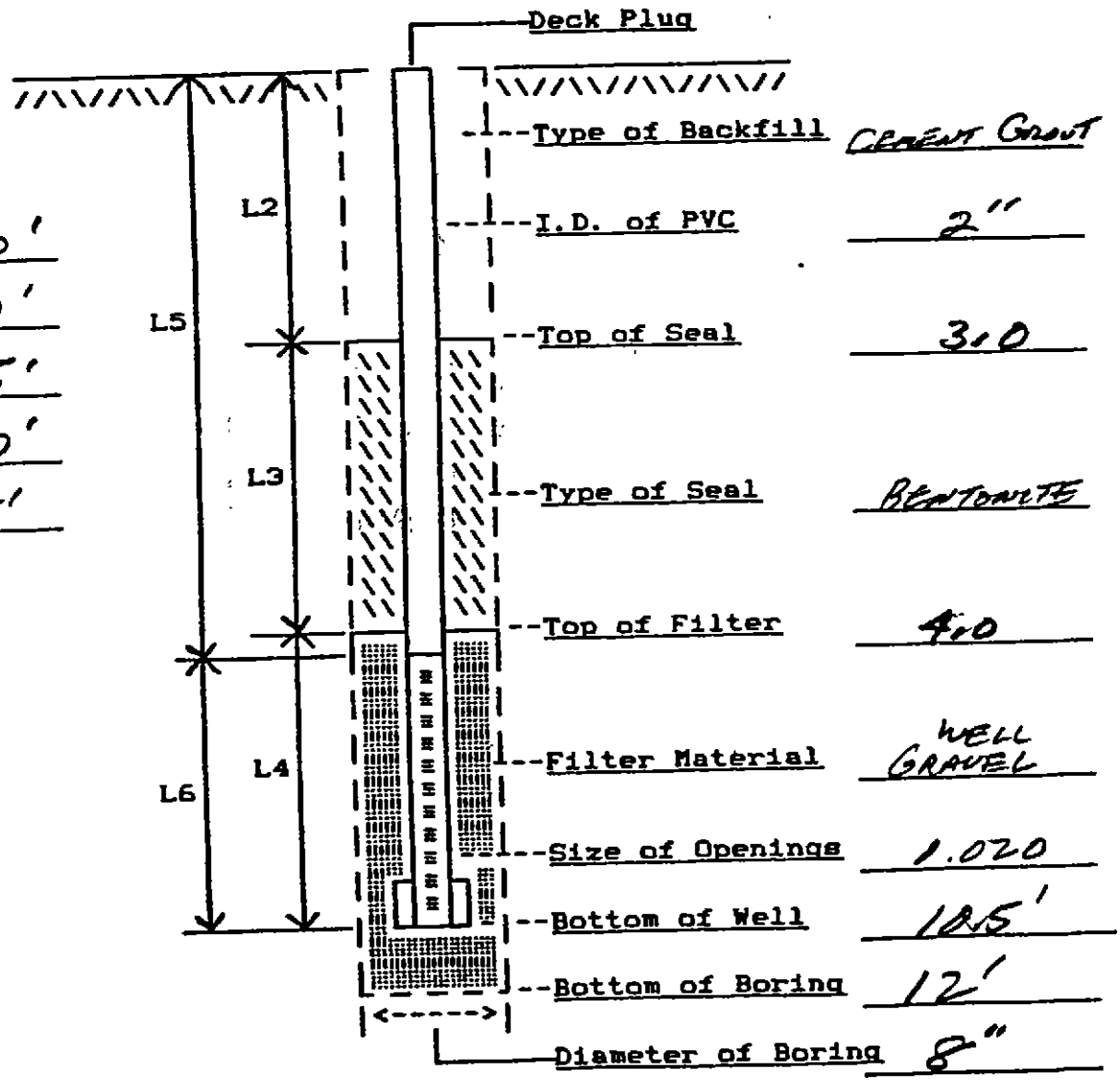
The Por uthority of New York and v Jersey
Engineering De, artment - Materials and Re_earch Division

Well Installation Report

Project: EWR - 200		Contractor TESWELL CORP
Location AIRPORT PROPERTY - FUEL FARM		Contract No. 410-90-201
Driller R. SILVERMAN	Inspector	
Well No. MW 1	Type of Well D	Date 2/19/90

Well Development

Date 2/19/90	Water Level Before 8.0'	Water Level After 8.0'
Note: Water level readings from top of PVC		Taken 15 min. After Development



L2 = 3.0'
L3 = 1.0'
L4 = 6.5'
L5 = 5.0'
L6 = 5.5'

Type of Backfill	CEMENT GROUT
I.D. of PVC	2"
Top of Seal	3.0
Type of Seal	BENTONITE
Top of Filter	4.0
Filter Material	WELL GRAVEL
Size of Openings	1.020
Bottom of Well	18.5'
Bottom of Boring	12'
Diameter of Boring	8"

emarks

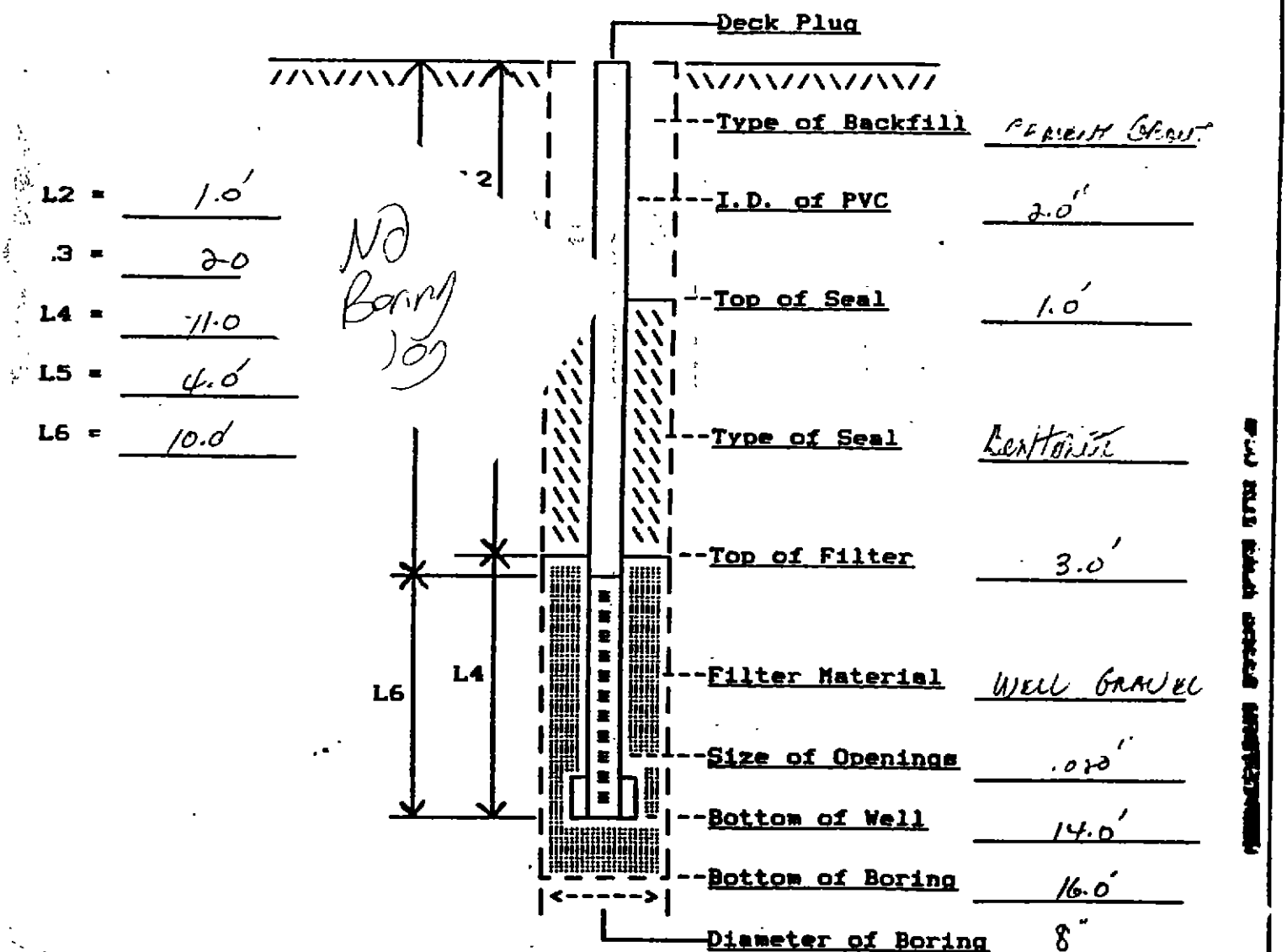
The Port Authority of New York and New Jersey
Engineering Department - Materials and Research Division

Well Installation Report

Project: N.A OFF RAMP - Roadway Reconstruction		Contractor Jacobus Range	
Location 1.2' ± of Diesel Fuel Tank		Contract No. C-10-90-84	
Driller T. Gaulke	Inspector K.M. LIBERT		
Well No. MW2	Type of Well Monitor 'A'	Date 5/17/90	

Well Development

Date 5/18/90	Water Level Before 8.6'	Water Level After
Note: Water level readings from top of PVC	Taken _____ min. After Development	



Remarks 14.0'-16.0' Bentonite

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BORING REPORT

SHEET 1 OF 2

PROJECT: Newark 2000, STage I	NAME OF CONTRACTOR: Tec Twell Corp	BORING NO.: MW 3-184	SURFACE ELEV.: 305.52
LOCATION: 7' South of BM-3-184		CONTRACT NO.: MRF-1	DATE: 10/27/88

SPOON: 2" O.D. 1 3/8" I.D. — CASING SIZE: Hollow Stem Augers

HAMMER: 140 6 FALL 30" — HAMMER 6 FALL "

DRILLER: R Silverman

INSPECTOR: D Howe

GROUND WATER LEVEL

Date	Time	Depth	Remarks
10/27/88	1245	7.5'	in sample

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. NO. [2]	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
	0					0.0'
Hollow					Asphalt	0.3'
Stem					CF	+2'
Augers		12-20-20	18"	1	Hyd Fill - M-F Brown Sand, Tr gravel, Tr Silt	
		13-18-20	15"	2	Same as above	
	5					
		7-11-12	18"	3	Same as above	
		6-7-7	6"	4	Hyd Fill - M-F Brown Sand, Tr gravel, Tr Silt, Tr Mix Fill	10.0
	10					
		2-1-3	7"	5	Misc Fill - Wood, Sand, glass, Silt, Etc	
						13.0'
		1-0-1	8"	6 A	Misc Fill - Sand wood, Silt Gravel Etc	
				B	Gray Organic clay, Silt, Tr Vg. T. Tr wood	14.0'
	15					
					Bottom of Boring	
					See well sheet for	
					Installation of Monitor well	
	20					
	25					
	30					

NOTES: 1 - Length recovered; 3"- Loss of Sample, T - Trap used
2 - U = undisturbed; A = auger; OER = open end rod; V = vane
3 - Log change of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

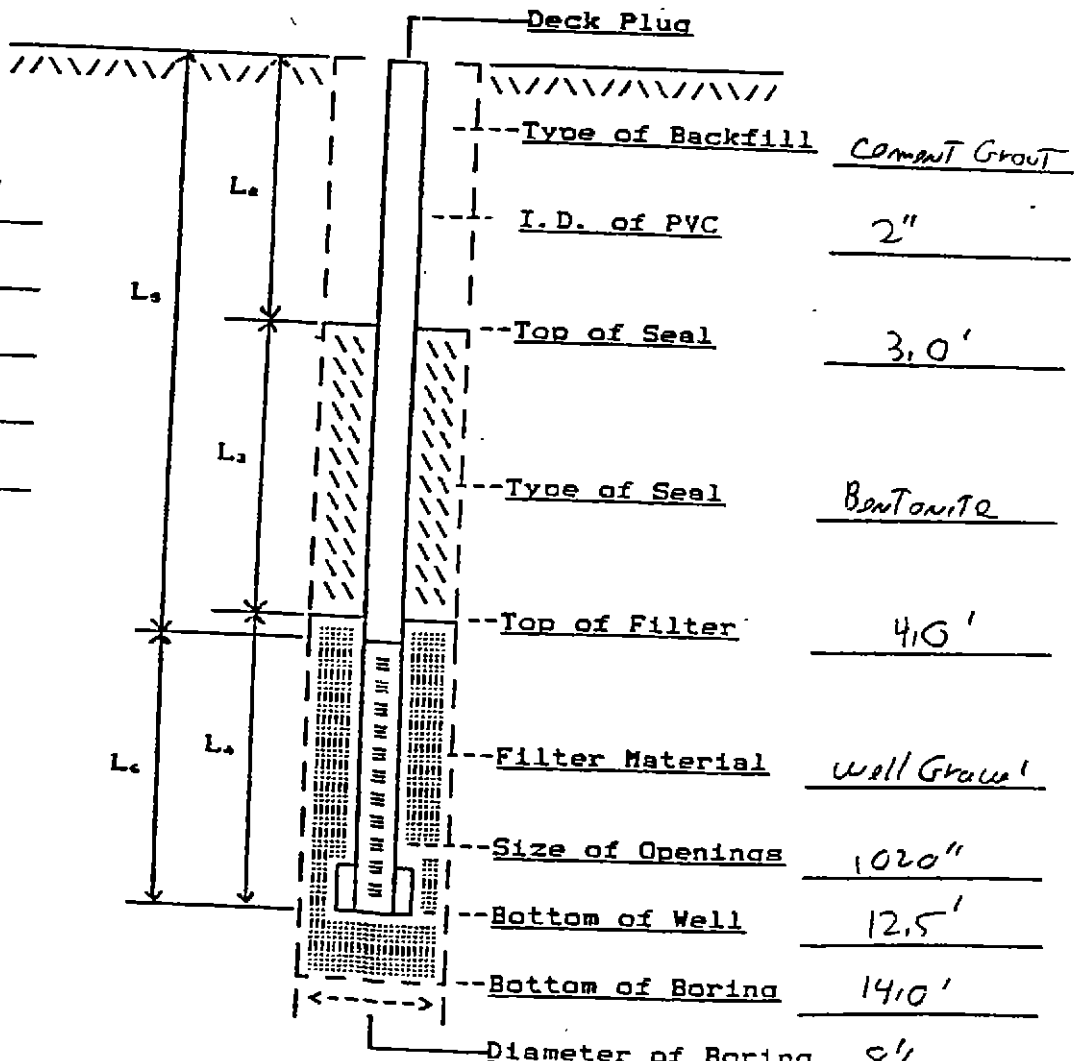
The Port Authority of New York and New Jersey
Engineering Department - Materials and Research Division

Well Installation Report

Project: Newark 2000, Stage I		Contractor Tostwall Cranes
Location: 7' South of BH-3-184, hourly Parking Tram C		Contract No. M884
Driller R. Silverman	Inspector D Howe	
Well No. MW 3-184	Type of Well 'A' Monitor	Date 10/27/88

Well Development

Date 10/27/88	Water Level Before 7.5'	Water Level After 7.6'



L_1 = 3.0'
L_2 = 1.0'
L_3 = 8.5'
L_4 = 5.0'
L_5 = 7.5'

Remarks Hole Back Filled 13-14 with Bentonite
" " " 12.5-13 with Well Gravel

BORING REPORT

SHEET 1 OF 2

PROJECT: Newark 2000, Stage I	NAME OF CONTRACTOR: TesTwell Craig	BORING NO.: MW-3-189	SURFACE ELEV.: 30.5.12
LOCATION: ±9' EAST of BH-3-189		CONTRACT NO.: M88-1	DATE: 10/21/88
SPOON: 2 O.D. 1 3/8 I.D.	CASING SIZE: Hollow Stem Augers		
HAMMER: 140 # FALL 30 "	HAMMER: # FALL "		
DRILLER: R Silverman			
INSPECTOR: D Howe			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
10/21/88	Noon	7.5	in sample
10/21/88	Install	Monitor Well	

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. NO. [2]	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
	0				Asphalt Expansion	0.0' 0.4' 1.0'
Hollow Stem Augers		7-9-15	18"	1	Hyd Fill - F Brown Sand, Tr Silt, Tr Gravel	
		16-13-20	18"	2	Same as above	
	5	28-21-27	18"	3	Same as above	
		9-9-6	16"	4	Hyd Fill - M-F DK Grey Sand, Tr Gravel, Tr Silt	10.0'
	10	1-1-1	18"	5	Gray & Black organic Silty Clay, Layers of F Gray Sand, Tr Peaty Pt	11.5'
	15				Bottom of Boring	
					See well installation Report For MW installation	
	20					
	25					
	30					

NOTES: 1 - Length recovered; 0" - Loss of Sample, T - Trap used
2 - U = undisturbed; A = auger; OER = open end rod; V = vane
3 - Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

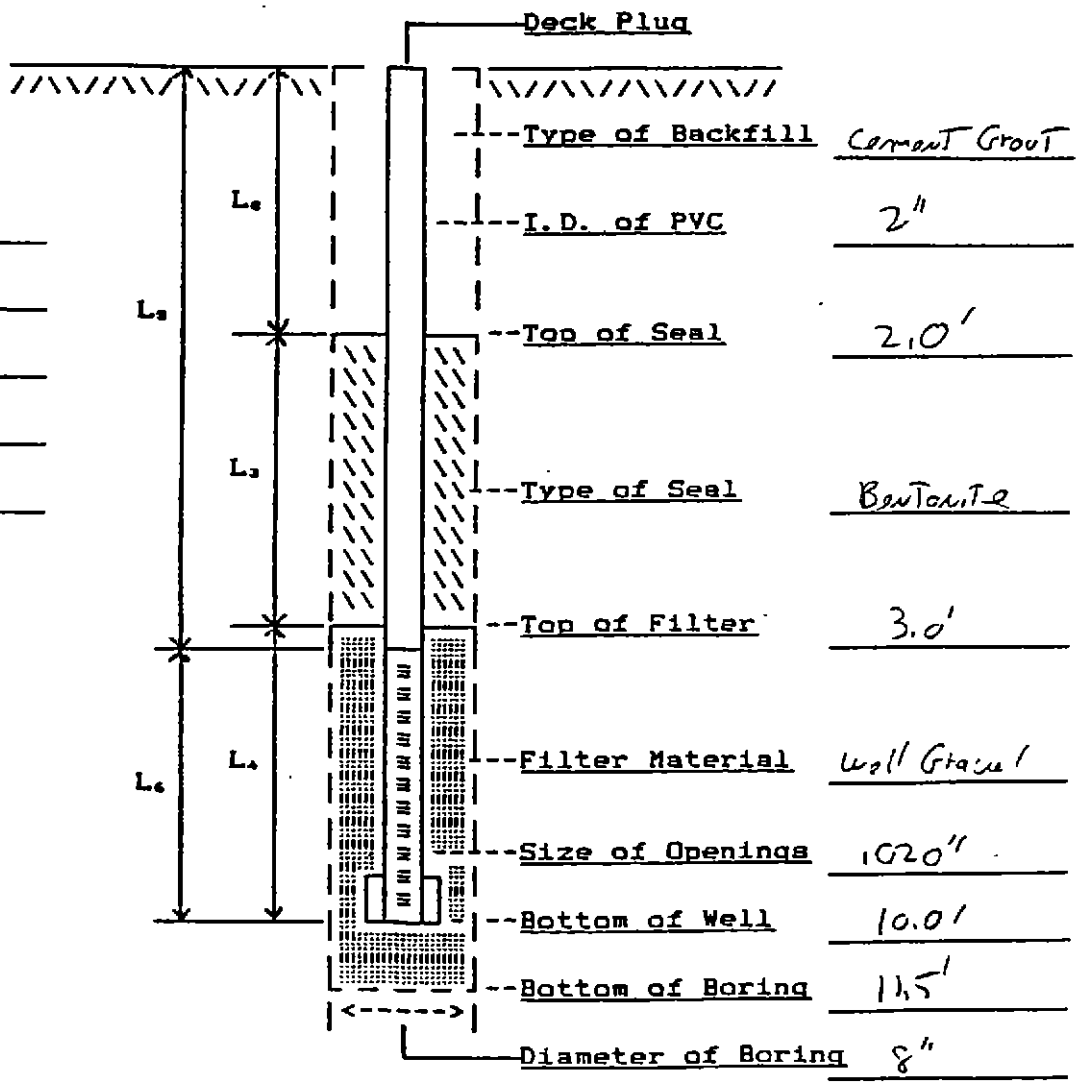
The Port Authority of New York and New Jersey
Engineering Department - Materials and Research Division

Well Installation Report

Project: Newark 2000, Stage I		Contractor Tastwell Crane
Location ±9' East of BH-3-189		Contract No. M88-1
Driller R Silverman	Inspector O. Howe	
Well No. 3-189	Type of Well "A" Monitor	Date 10/21/88

Well Development by LaTor

Date 10/25/88	Water Level Before 8.2	Water Level After 8.2



Remarks Backfilled hole 11.5' to 10.5' with Well Gravel

BORING REPORT

SHEET 1 OF 1

PROJECT: Nyack 2000, Stage I	NAME OF CONTRACTOR: TesTwell Chris	BORING NO.: 3-192	SURFACE ELEV.: 307.18
LOCATION: 1' N of Thoe orig. Location Ice Lay car		CONTRACT NO.: M88-1	DATE: 10/14/88

SPOONS: 2 — CASING SIZE: 2 3/8 O.D. 1 3/8 I.D. Hollow Type I Stem Augers — HAMMER: 140 # FALL 30 — # FALL

DRILLER: R Silverman

INSPECTOR: D Howe

GROUND WATER LEVEL

Date	Time	Depth	Remarks
10/14/88	8:15 AM	10.0'	In Casing @ HT
10/17/88	Install	Temp up	Inst at 10', 10'S1oTted PVC
10/18/88	3 PM	9.4'	In well

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. NO. [2]	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
	0				Asphalt	0.0'
Hollow					Screening	0.3'
Stem		10-16-23	18'	1A	Hyd Fill - MI-F Brown Sand, Tr gravel, Tr Silt	1.5'
Augers		13-20-30	15"	2A	Same as above	4.0'
	5	13-20-20	15'	3A	Misc Fill - Cinders, glass, wood, metal, ETC	
		10-15-25	18"	4A	Same as above	
		12-13-23	18"	5A	Same as above	
		5-12-16	16"	6A	Misc Fill - Cinders, S.T, Ashes, Sand, organic clays, Silt, ETC	
	10	4-7-16	16"	7A	M-F Black + Gray Sand, Little Black organic clay, Silt, Tr gravel	
		4-7-14	16"	8A	Misc Fill, Silt, Cinders, glass, Sand, ETC	
		6-8-6	18"	9A	A Same as above	13.5'
					B Black Peat	14.5'
	15	3-3-5	18"	10A	Brown Peat, Little Gray organic Clayey Silt	
		2-3-6	18"	11	Brown Peat	17.5'
		1-2-5	18"	12	Dk Gray organic clayey Silt, Little Sand, Tr Peat	19.0'
Roller					F Gray Sand in Tip of spoon	
Bit	20	3-6-8	14"	13	F Gray Sand, Little Silt	
Wash						22.5'
with		9-15-18	10"	14	F Brown Sand, Little Silt	
Mud						
	25	12-16-24	12"	15	E Reddish Brown Sand, Some Silt	
	30					

Δ = 3" O.D. Split Spoon Used

NOTES: 1 - Length recovered; 0" - Loss of Sample, T - Trap used
2 - U = undisturbed; A = auger; OER = open end rod; V = vane
3 - Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

PA 347
11-80

BORING REPORT

SHEET 1 OF 2

PROJECT: Newark Zoo, Stage I	NAME OF CONTRACTOR: TesTwell Crait	BORING NO.: MW-3-192	SURFACE ELEV.: 7.30
LOCATION: ±9' South of BH-3-192		CONTRACT NO.: M82-1	DATE: 10/27/88
SPOON: 2" O.D. 1⅜" I.D.	CASING SIZE: Hollow Stem Augers		
HAMMER: 140 # FALL 30"	HAMMER: # FALL "		
DRILLER: R Silverman			
INSPECTOR: D. Howe			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
10/27/88	9:25	8.5	in sample
10/27	Install	Mon Tor	Well, See well sheet
10/27/88	12:35	9.6'	

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
Hollow Stem Augers	0				Asphalt	0.0'
					Screenings	0.3'
		6-10-7	15"	1	Hyd Fill- F Brown Sand, Tr Silt, Tr gravel	1.0'
		13-16-12	15"	2	Hyd Fill- M-F Brown Sand, Tr Gray & Dk Brown Sand, Tr silt, Tr gravel	
	5	12-13-10	14"	3	Misc Fill- Cinders, Silt, Glass, Gravel, Shale, Etc	
		6-5-3	15"	4	Misc Fill- Cinders, glass, gravel, Silt, wood, Etc	
	10	1-0-1	13"	5	Misc fill- Sand, Gravel, Cinders, metal, Etc	
		7-3-5	6"	6	Misc Fill - wood, Sand, Gravel, Silt, Etc	
	15	2-3-5	18"	7	Brown Black Root, Tr Gray organic clayey Silt	15.0'
					Bottom of Boring	16.5'
	20				See well sheet for Monitor well installation	
	25					
	30					

NOTES: 1 - Length recovered; 0" - Loss of Sample, T - Trap used
2 - U = undisturbed; A = auger; OER = open end rod; V = vane
3 - Log depth of change in color of wash water, loss of water, artesian water, sand [illegible] casing, etc.

547
89

THE PORT AUTHORITY OF NY & NJ
ENGINEERING DEPARTMENT
MATERIALS AND RESEARCH DIVISION

BORING REPORT

SHEET 1 OF 4

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
EWR- Bldg 79	Testwell Craig	MW-1	
LOCATION		CONTRACT NO.	DATE
E 3' SW of BH-1		440-91-2M	12/17/91

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Augers	8" Mayhew
HAMMER	HAMMER	
140 # FALL 30	# FALL -	
DRILLER		
R Silverman		
INSPECTOR		
D Howe		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
12/17/91	12:45 PM	7.0'	Top of Sample #3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. NO. [2]	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Hollow	0				Asphalt 0.4
Stem					Concrete 1.0
		7-14		1	Fill- Red Brown Clayey Silt, Little Cinders, Brick,
Augers		24-15	15"		Little F Sand
		13-17		2	(Two Attempts for Recover Sample)
	5	29-7	3"		Same as above
		7-11		3	
		5-5	18"		Fill- Red Brown clayey Silt, Little F Sand
		2-3		4	
		20-11	17"		Same as above 9.0'
	10	4-4		5	
		5-6	19"		F Gray Sand, Layers of Dk Organic silty Clay & Peat 10.0'
					Bottom of hole, See well Sheet
					for monitor well installation
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

The Port Authority of New York and New Jersey
Engineering Department - Materials and Research Division

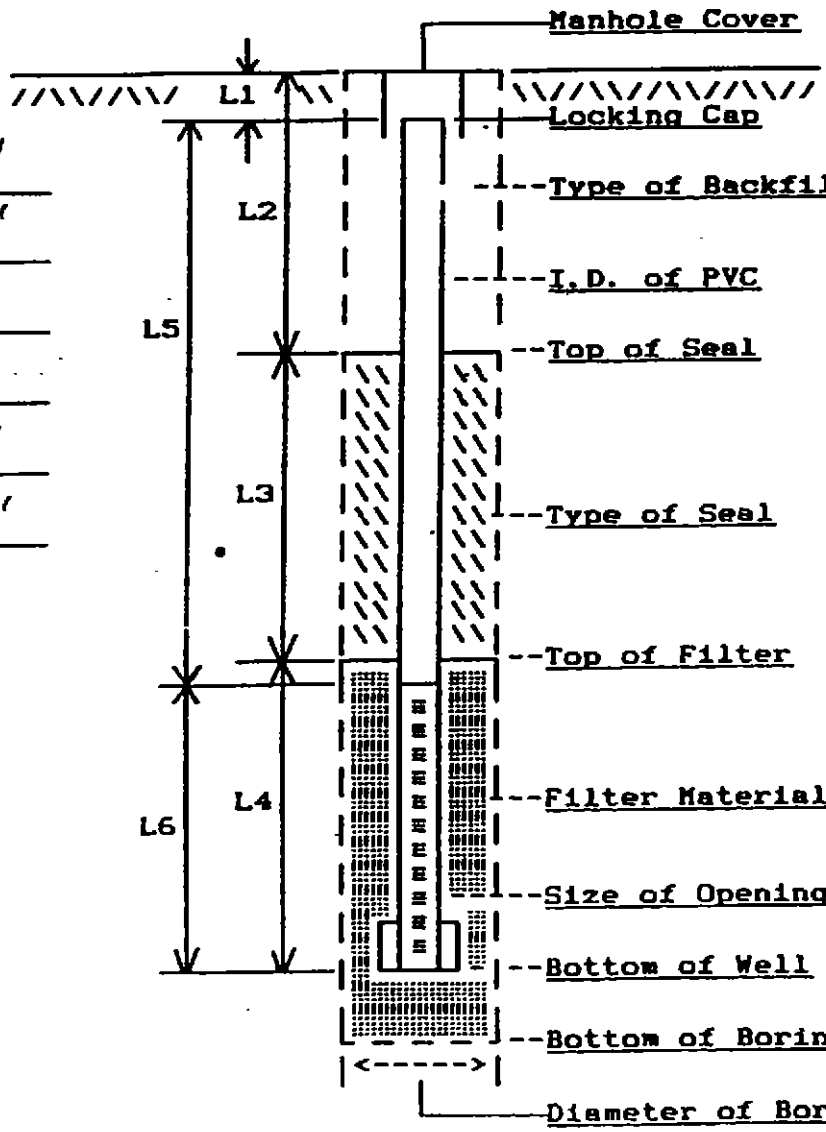
Well Installation Report

Project: EWR - Bldg 79		Contractor Joe Turnell Const
Location ± 3' SW of BH-1		Contract No. 410-91-214
Driller R Silverman	Inspector D Howe	
Well No. MW-1	Type of Well 'A' Monitor	Date 12/17/91

Well Development

Date 12/18/91	Water Level Before 6.0	Water Level After 6.0
Note: Water level readings from top of PVC	Taken 45 min. After Development	

L1 = 0.3'
L2 = 0.7'
L3 = 1.0'
L4 = 9.0'
L5 = 3.7'
L6 = 7.0'



Remarks

THE PORT AUTHORITY OF NY & NJ
ENGINEERING DEPARTMENT
MATERIALS AND RESEARCH DIVISION

BORING REPORT

SHEET 1 OF 4

PROJECT: WR- Bldg 79
NAME OF CONTRACTOR: Tos Jewell Civil
BORING NO.: MW-2
SURFACE ELEV.:
LOCATION: 5' North of Concrete Pad at Fishing Pump
CONTRACT NO.: 410-91-2M
DATE: 12/18/91

SPOON: 3" O.D. 2 3/8" I.D.
CASING SIZE: Augers
HOLE TYPE: "A" Monitor
HAMMER: 140 # FALL 30"
HAMMER: # FALL
DRILLER: R Silverman
INSPECTOR: D Howe

GROUND WATER LEVEL

Date	Time	Depth	Remarks
12/18/91	10 AM	7.0'	In Tip of Sample #3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				Asphalt 0.0'
Hollow					Concrete 0.4'
Stem		18-54		1	1.0'
Augers		95-59	13"		Misc Fill - Brick, Sand, Shale, Cinders, Etc
		14-19			
		55-70	7"	2	Fill - Sand, Silt, Gravel, Brick, Etc
	5	4-6		3	(Two Attempts To Recover Sample)
		6-4	12"		Same as above 7.0'
		WOH-4		4	Fill - Red Brown clayey Silt, Little F Sand
		4-7	13"		F. To F Gray Sand 9.0
		2-2		5	
	10	6-7	19"		F Gray Sand, Layers of Dk Gray organic Silty Clay & Peat 11.0
					Bottom of hole, See well
					Sheet for Monitor well
					Installation
	15				
	20				
		1			
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

The Port Authority of New York and New Jersey
Engineering Department - Materials and Research Division

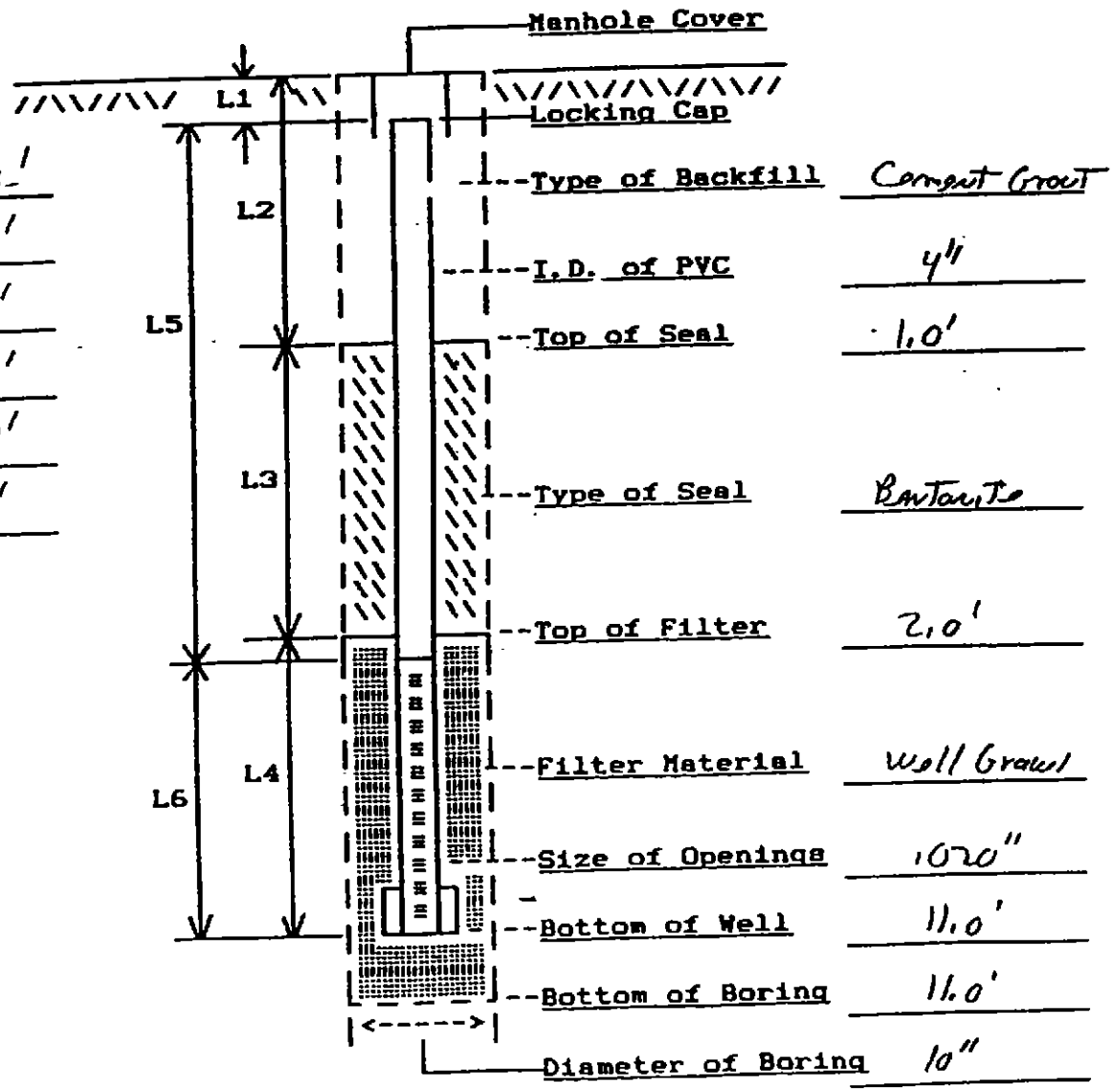
Well Installation Report

Project: EWR- Bldg 79		Contractor Testwell Craig
Location ±5' North of Concrete Pad at Fishy Pump		Contract No. 410-91-2M
Driller R Silverman	Inspector D Howe	
Well No. MW-2	Type of Well "A" Monitor	Date 12/18/91

Well Development

Date 12/18/91	Water Level Before 5.0'	Water Level After 5.0'
Note: Water level readings from top of PVC	Taken 45 min. After Development	

L1 = 0.3'
L2 = 0.7'
L3 = 1.0'
L4 = 9.0'
L5 = 3.7'
L6 = 7.0'



Remarks

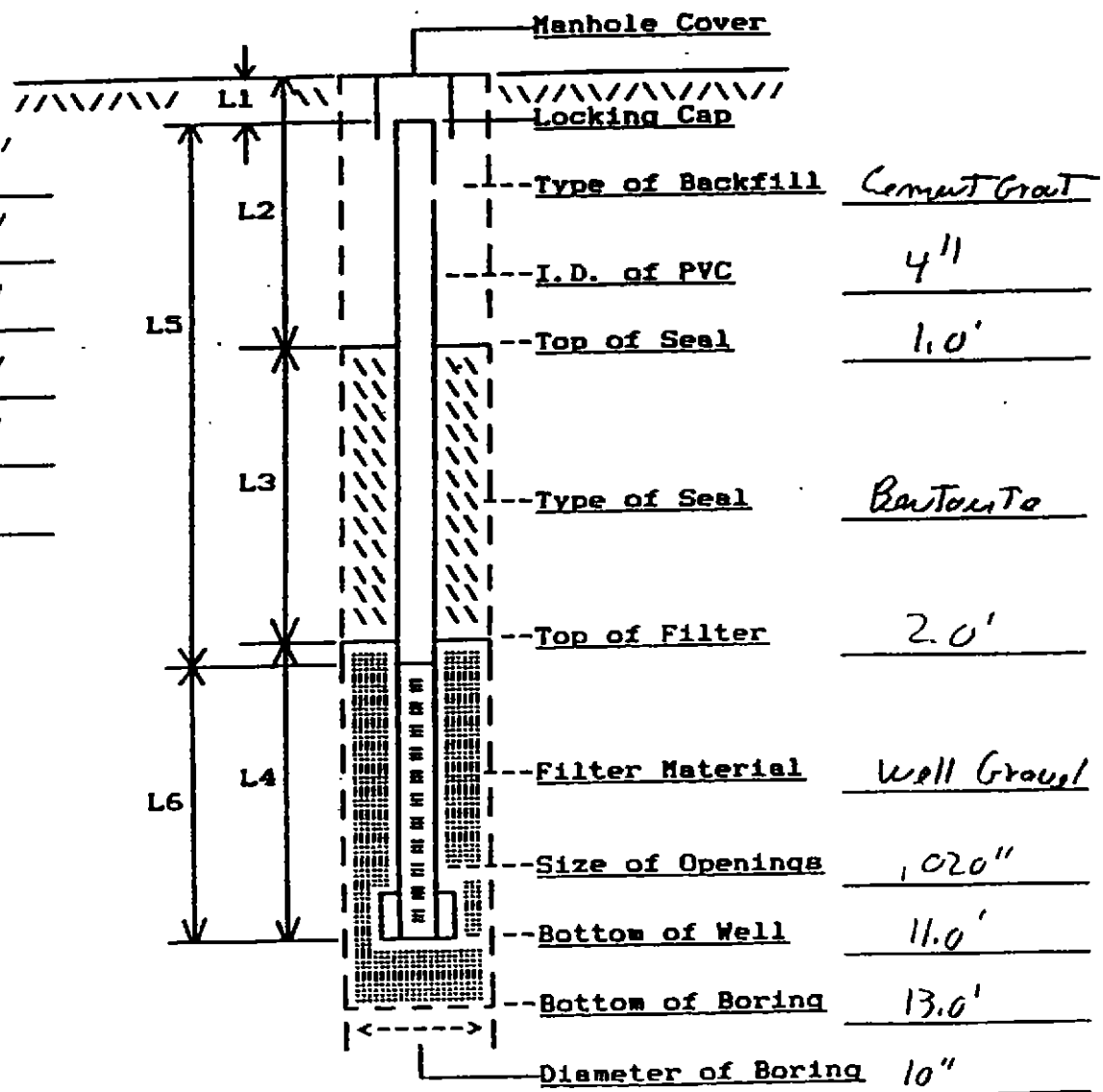
The Port Authority of New York and New Jersey
Engineering Department - Materials and Research Division

Well Installation Report

Project: EWR - Bldg 79		Contractor Tay Dwell Craig
Location: 5' South of concrete Pad at Fueling Pump		Contract No. 410-9+2M
Driller R Silverman	Inspector D Howe	
Well No. MW-3	Type of Well "B" MonTor	Date 12/17/91

Well Development

Date 12/18/91	Water Level Before 5.0	Water Level After 5.0
Note: Water level readings from top of PVC	Taken 45 min. After Development	



L1 = 0.3'
L2 = 0.7'
L3 = 1.0'
L4 = 9.0'
L5 = 3.7'
L6 = 7.0'

Type of Backfill: Cement Grout
I.D. of PVC: 4"
Top of Seal: 1.0'
Type of Seal: BenTonTo
Top of Filter: 2.0'
Filter Material: Well Gravel
Size of Openings: .020"
Bottom of Well: 11.0'
Bottom of Boring: 13.0'
Diameter of Boring: 10"

Remarks: Hole Backfilled 11.0'-13.0' with BenTonTo

THE PORT AUTHORITY OF NY & NJ
ENGINEERING DEPARTMENT
MATERIALS AND RESEARCH DIVISION

BORING REPORT

SHEET 1 OF 4

ECT: WR- Bldg 79	NAME OF CONTRACTOR: Tetra Tech Craig	BORING NO.: MW-3	SURFACE ELEV.
		CONTRACT NO.: 410-91-2M	DATE: 12/17/91

ATION: 5' South of Concrete Pad at Fuel Pumps

ON: O.D. 2 3/4" I.D.	CASING SIZE: Augers	HOLE TYPE: A Monitor
IMER: 140 # FALL 30	HAMMER # FALL	
LLER: R Silverman		
PECTOR: D Howe		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
12/17/91	10 am	7.0'	Top of Samp #3

ASING OWS/FT.	DEPTH	SPOON BLOWS/6"	RE- COV'D [1]	SAMP.[2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
ollow	0				0.0
Stem					Asphalt over Concrete 1.5'
Augers		20			
		45-47	12"	1	Fill Red Brown clayey SILT, Little F Sand
		9-13		2	
		13-15	10"		Same as above
	5	5-7		3	
		6-12	10"		Same as above
		WOH-3		4	9.0'
		4-7	14"		Same as above
		5-5		5	
	10	6-9	14"		F Grey Sand, Layers of Dk Grey organic SILTY Clay 11.0'
		3-4		6	
		5-5	18"		Brown Peat 13.0'
					Bottom of Boring, See Well Sheet for monitor well installation
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

THE PORT AUTHORITY OF NY & NJ
ENGINEERING DEPARTMENT
MATERIALS AND RESEARCH DIVISION

BORING REPORT

SHEET 1 OF 4

OJECT: EWR – Bldg 79	NAME OF CONTRACTOR: Testwell Craig	BORING NO.: MW-4	SURFACE ELEV.:
		CONTRACT NO.: 410-91-2M	DATE: 12/18/91

CATION: ~3' west of BH-4

SPOON	CASING SIZE	HOLE TYPE
2 "O.D. 2 3/8 "I.D.	Augers	'A' Mountain
HAMMER: 140 # FALL 30	HAMMER # FALL	

ILLER: R Silverman

SPECTOR: D Howe

GROUND WATER LEVEL

Date	Time	Depth	Remarks
12/18/91	816	5.0'	in Type of Sample No. 2

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				Asphalt 0.0' to 0.4'
follow					Concrete 0.4' to 1.0'
Steam		7–13		1	
Augers		85–59	13"		Fill – Red Brown clayey Silt, Little F Sand, Little Rd Shale
		6–26		2	
		28–10	13"		Same as above
	5	6–6		3	7.0
		4–13	16"		Same as above
		1–1		4	9.0
		2–3	16"		Fill – C-F Brown Sand, Little Clayey Silt,
		4+11+2		5	
	10	2–7	19"		F Gray Sand, Layers of Dk Gray organic Silty clay & Br Peat 11.0
					Bottom of Boring, See well sheet for Monitor well installation
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

The Port Authority of New York and New Jersey
Engineering Department - Materials and Research Division

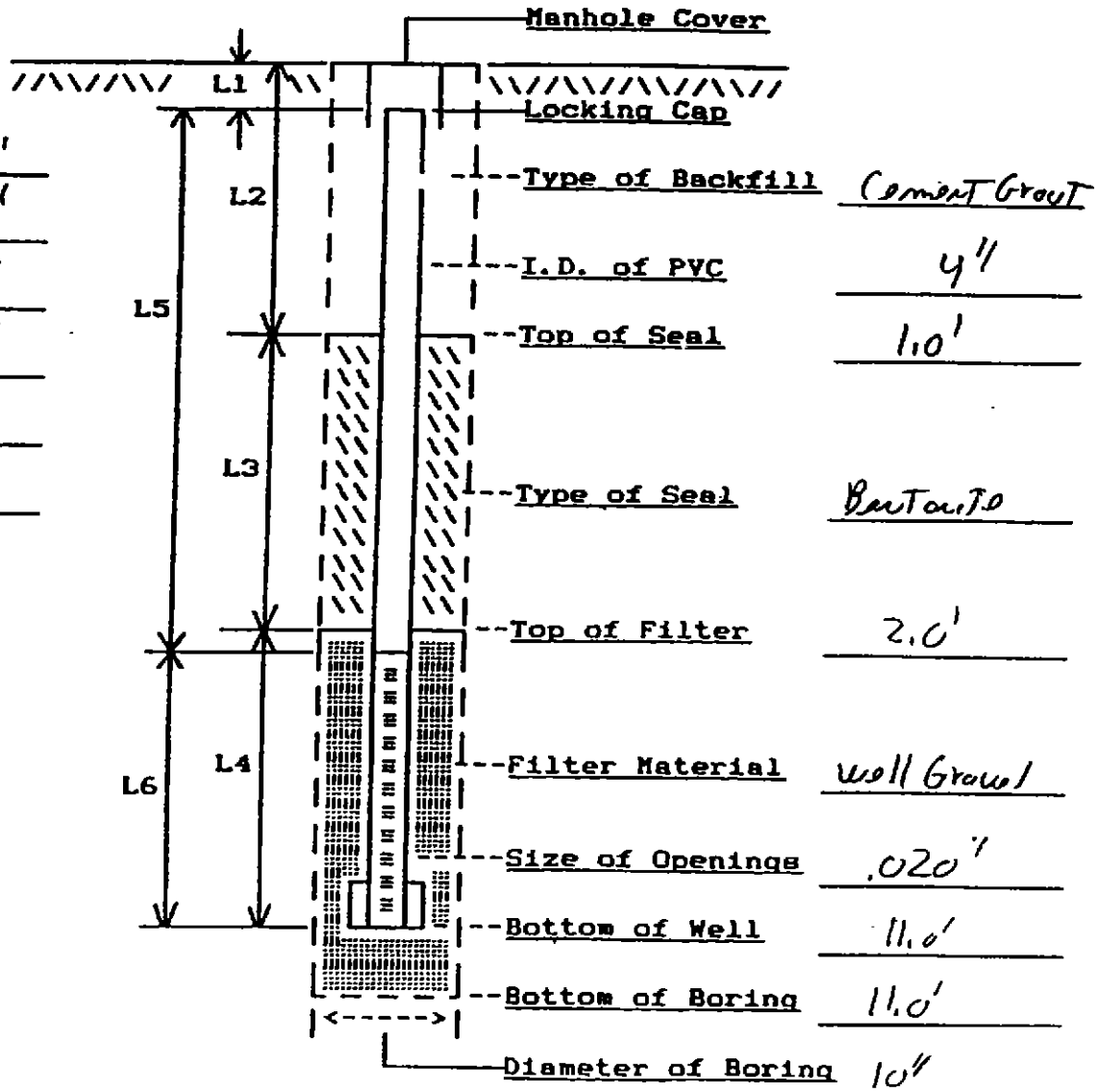
Well Installation Report

roject: EWR - Bldg 79		Contractor Testwell Craig
cation # 3 westof Bldg 4		Contract No. 410-91-2M
riller R Silverman	Inspector D Howe	
ll No. MW-4	Type of Well "B" Monitor	Date 12/18/91

Well Development

te 12/18/91	Water Level Before 5.3'	Water Level After 5.4
ote: Water level readings from top of PVC	Taken 45 min. After Development	

L1 = 0.3'
L2 = 0.7'
L3 = 1.0'
L4 = 9.0'
L5 = 3.7'
L6 = 7.0'



emarks

MW-9

SECOR

Science & Engineering Analysis Corporation

WELL : MW-9

CLIENT: GM National Holding Co.
PROJECT NAME: National Car Rental Facility
LOCATION Newark Int'l Airport

BORING DEPTH _____ BORING DIAMETER 8¼"
WELL DIAMETER 4" TOP OF CASING ELEV. _____
FIRST WATER DEPTH ~8 ft
CASED FROM 0.25 TO 5 WITH 4" sch 40 PVC
SCREENED FROM 5 TO 15 WITH 4" sch 40 PVC
SCREEN SLOT SIZE 0.020-inch FILTER PACK No. 2 Sand
OTHER _____

DRILLER Summit Drilling (John Vogt & Brandon Reed)
DATE(S) DRILLED 11-28-95
DRILL RIG/METHOD B-57 6⅝" ID HOAs
LOGGED BY S. Cooke
GEOLOGIST S. Cooke

WELL DETAIL	DEPTH (FEET)	GRAPHIC LOG & USCS CODE	BLOWS/ 6 INCH	% RECOVERY	SAMPLE INTERVAL	AIR MONITORING HEADSPACE	AIR MONITORING AMBIENT	DESCRIPTION [Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%]
	0							Gravel area (construction area)
	1							Sand, medium to fine grained, medium brown, slightly moist to moist
Bentonite granules	5							
			25/31 20/31		6-8 ft	1.2		Same, wet
No. 2 Sand	10							
	15							End of boring at 15 ft
	20							(6) SO-16 bags of No 2 Sand (2-15 ft) (1) SO-16 bag of bentonite granule (1-2 ft) Locking cap installed and flush mount with cement ring and bolland marker painted orange
	25							
	30							

Summit DRILLING CO., INC.
ENVIRONMENTAL SPECIALISTS
1801 Union Avenue
Bridgewater, NJ 08807
Telephone (908) 725-1766
Toll Free (800) 242-6648
FAX (908) 526-1005

WELL LOG

LL: MW9 DATE DRILLED: 11/28/1995 COORD #1: 26.22.298 PERMIT #1: 26-42897
COORD #2: PERMIT #2:
COUNTY: Essex
XSTREET:
USE: Monitor

TE: National Car Rental Syste, Newark Int'L Airport, (buildings 25 & 26), Newark, NJ 07114
WNER: GM National Holding Co., 7700 France Avenue South, , Minneapolis, MN 55435

INER CASING: PVC
IAMETER: 4"
ENGTH: 5'

OUTER CASING:
DIAMETER:
LENGTH:

SCREEN TYPE 1: PVC
SCREEN TYPE 2:
DIAMETER: 4"
LENGTH 1: 10'
LENGTH 2:
SLOT SIZE: .020

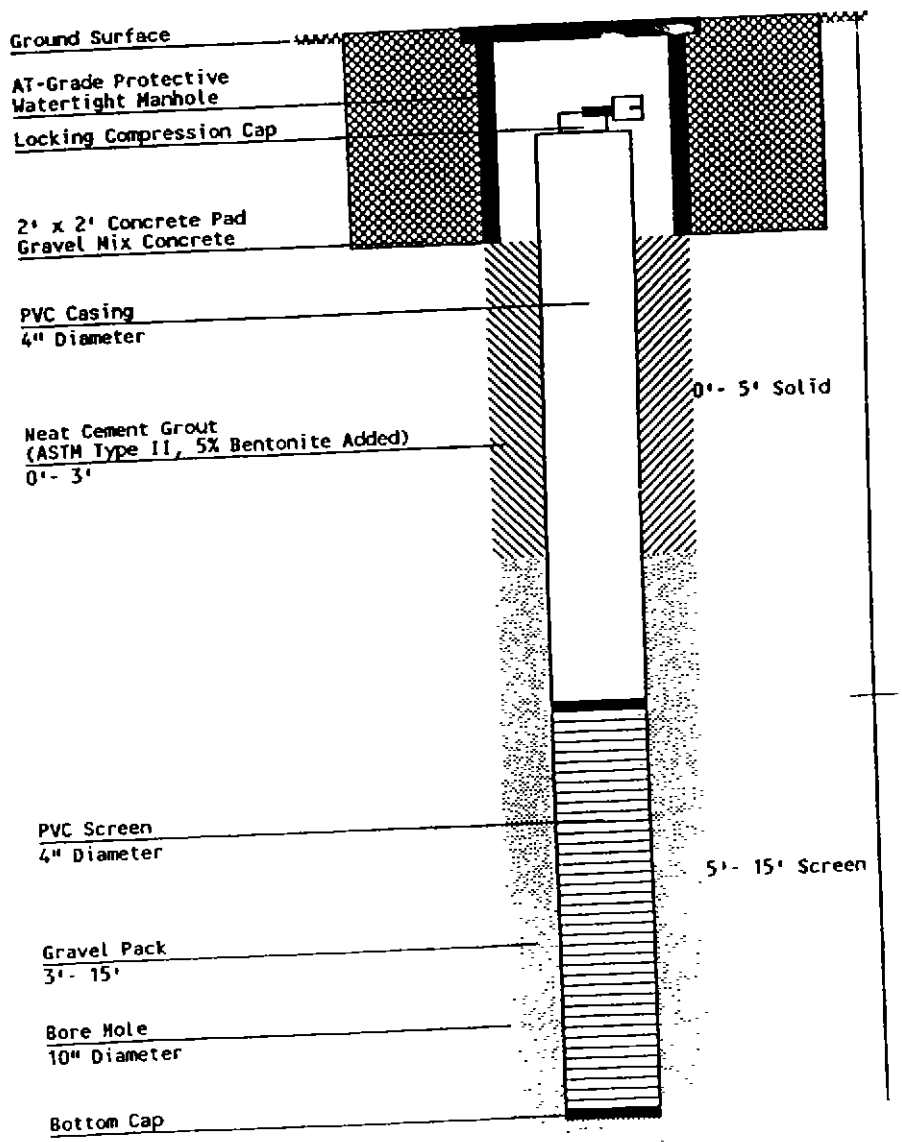
DRILLING METHOD: Auger
SAMPLING METHOD: S/S
HOLE DIAMETER: 10"
TOTAL DEPTH: 15'

T WELL: 15'
RAVEL PK SZ: Morie #1
RILLER: John Vogt
SURFACE COMPLETION: M

GAL PER MIN: 1
STAT H2O LVL: 8'
DEVELOPMENT METHOD: Pump
DEVELOPMENT TIME: 1/2 Hour

CASING SEAL: Portland
OPEN HOLE:

DEPTH BELOW SURFACE FROM - TO	BLOWS PER 6" ON SAMPLER	REMARKS / SOILS IDENTIFICATION
		0' - 5' Brown sand fill.
		5' - 10' Tan fine sand.
		Meadow mat.



DWR-138 M
11/94

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER ALLOCATION

MONITORING WELL RECORD

Well Permit No. 20 - 42897
Atlas Sheet Coordinates 26 : 22 : 208

OWNER IDENTIFICATION - Owner GENERAL MOTORS NAT'L HOLD
Address 7700 FRANCE AVE. SOUTH
City MINNEAPOLIS State MN Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. MW9
County ESSEX Municipality NEWARK CITY Lot No. N/A Block No. N/A
Address NEWARK INTERNATIONAL AIRPORT

TYPE OF WELL (as per Well Permit Categories) MONITORING Date well completed 11/28/95
Regulatory Program Requiring Well UST Case I.D. # 92-05-31-0856

CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Nine Springs Environmental Consultants Tele. #

WELL CONSTRUCTION

Total depth drilled 15 ft.
Well finished to 15 ft.
Borehole diameter:
Top 10 in.
Bottom 10 in.
Well was finished: ☐ above grade ☒ flush mounted
If finished above grade, casing height (stick up) above land surface ____ ft.
Was steel protective casing installed? ☐ Yes ☒ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.) [From land surface]	Diameter (inches)	Type and Material
Inner Casing	0	5	4	Sch 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	5	15	4	Sch 40 PVC .020
Tail Piece				
Gravel Pack	3	15		Morie #1
Annular Seal/Grout	0	3		Portland
Method of Grouting				Gravity

Static water level after drilling 8 ft.
Water level was measured using tape
Well was developed for 1/2 hours at 1 gpm
Method of development pump
Was permanent pumping equipment installed? ☐ Yes ☒ No
Pump capacity ____ gpm
Pump type: ____
Drilling Method Auger Type of Rig B-57
Drilling Fluid ____
Name of Driller John Vogt
Health and Safety Plan submitted? ☒ Yes ☐ No
Level of Protection used on site (circle one) None D C B A
N.J. License No. 000279
Name of Drilling Company SUMMIT WELL DRILLING

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

See attached

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature John Vogt Date 12/4/95

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

MW-10

SECOR

Science & Engineering Analysis Corporation

WELL : MW-10

CLIENT: GM National Holding Company
PROJECT NAME: National Car Rental System Facility
LOCATION: Newark Int'l Airport

BORING DEPTH 15 ft BORING DIAMETER 8¼"
WELL DIAMETER 4" TOP OF CASING ELEV.
FIRST WATER DEPTH ~8 Ft
CASED FROM 0.25 TO 5 WITH 4" sch 40 PVC
SCREENED FROM 5 TO 15 WITH 4" sch 40 PVC
SCREEN SLOT SIZE 0.020-inch FILTER PACK No. 2 Sand
OTHER

DRILLER Summit (John Vogt & Brandon Reed)
DATE(S) DRILLED 11-28-95
DRILL RIG/METHOD B-57 6⅝" ID HOAs
LOGGED BY S. Cooke
GEOLOGIST S. Cooke

WELL DETAIL	DEPTH (FEET)	GRAPHIC LOG & USCS CODE	BLOWS/ 6 INCH	% RECOVERY	SAMPLE INTERVAL	AIR MONITORING HEADSPACE	AIR MONITORING AMBIENT	DESCRIPTION (Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%)
	0		21/31	18/24	0.5-2.5	0.9		Gravel roadway (construction area
			45/47					Sand, medium to fine grained, very dense, medium tan/brown, slightly moist
			39/48	21/24	2.5-4.5	0.9		same
	5		55/93					
			31/42	19/24	4.5-6.5	1.5		same, moist
			47/42					
			47/48	2/24	6.5-8.5	2.0		same, wet
			56/51					
	10							
	15							Bad of boring at 15 ft
								(6) 50-lb bags of No 2 Sand (2 to 15 ft)
								(1) 50-lb bag of bentonite granules (1-2 ft)
	20							Locking cap installed and flush mount with donut ring and bollard marker painted orange.
	25							
	30							

Bentonite Granules

No 2 Sand

Summit DRILLING CO., INC.
ENVIRONMENTAL SPECIALISTS
1801 Union Avenue
Bridgewater, NJ 08807
Telephone (908) 722-4786
Toll Free (800) 242-6648
FAX (908) 526-1044

WELL LOG

LL: MW10 DATE DRILLED: 11/28/1995 COORD #1: 26.22.298 PERMIT #1: 26-42898
COORD #2: PERMIT #2:
COUNTY: Essex
XSTREET:
USE: Monitor

TE: National Car Rental Syste, Newark Int'L Airport, (buildings 25 & 26), Newark, NJ 07114
NER: GM National Holding Co., 7700 France Avenue South, , Minneapolis, MN 55435

INER CASING: PVC
AMETER: 4"
NGTH: 5'

OUTER CASING:
DIAMETER:
LENGTH:

SCREEN TYPE 1: PVC
SCREEN TYPE 2:
DIAMETER: 4"
LENGTH 1: 10'
LENGTH 2:
SLOT SIZE: .020

DRILLING METHOD: Auger
SAMPLING METHOD: S/S
HOLE DIAMETER: 10"
TOTAL DEPTH: 15'

T WELL: 15'
RAVEL PK SZ: Morie #1
RILLER: John Vogt
URFACE COMPLETION: M

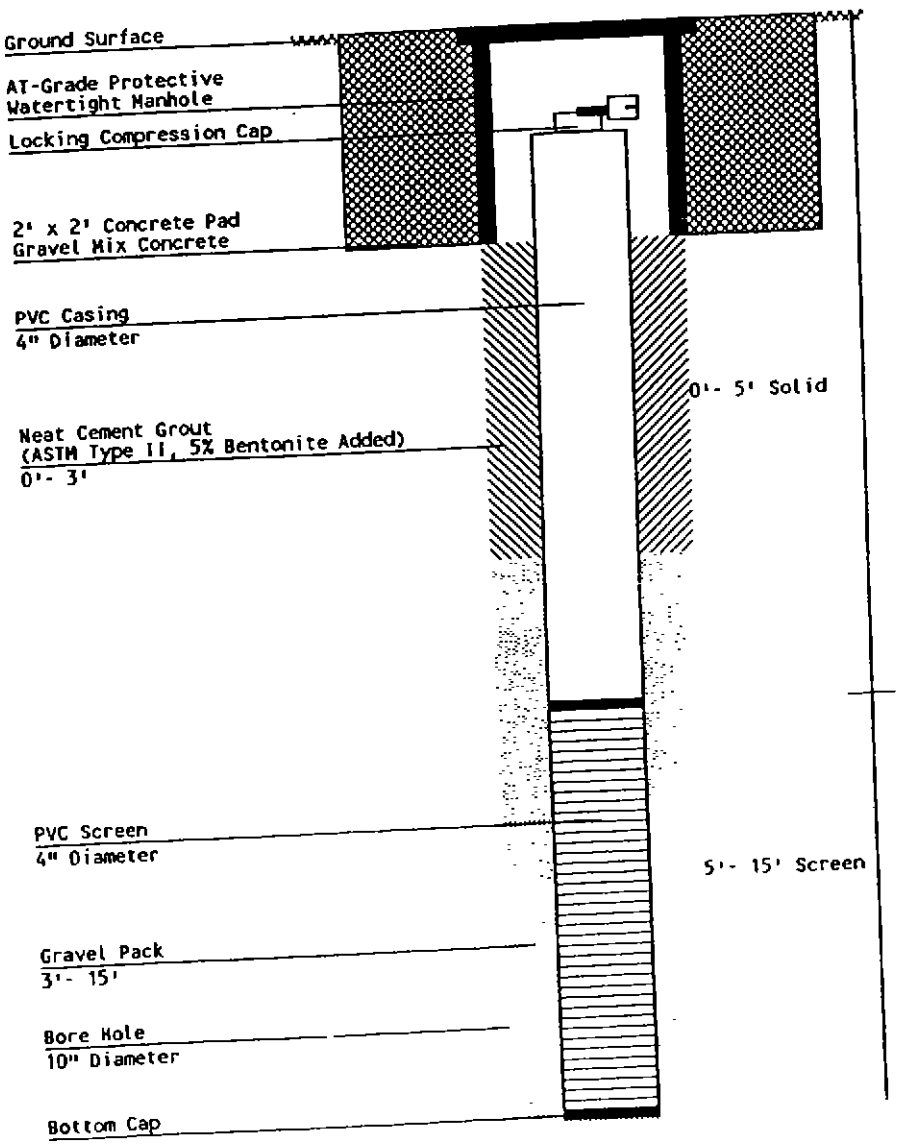
GAL PER MIN: 1
STAT H2O LVL: 8'
DEVELOPMENT METHOD: Pump
DEVELOPMENT TIME: 1/2 Hour

CASING SEAL: Portland
OPEN HOLE:

DEPTH BELOW SURFACE FROM - TO	BLOWS PER 6" ON SAMPLER
6' - 8'	None Recorded

EMARKS / SOILS IDENTIFICATION

- 5' Brown sand fill.
10' Tan fine sand.
leadow mat.



11/94

BUREAU OF WATER ALLOCATION

MONITORING WELL RECORD

Well Permit No. _____

Atlas Sheet Coordinates _____

OWNER IDENTIFICATION - Owner _____

Address _____

City _____ State MH Zip Code _____

WELL LOCATION - If not the same as owner please give address. Owner's Well No. MW10

County ESSEX Municipality _____ Lot No. _____ Block No. _____

Address _____

TYPE OF WELL (as per Well Permit Categories) MONITORING Date well completed 11/28/95

Regulatory Program Requiring Well _____ Case I.D. # _____

CONSULTING FIRM/FIELD SUPERVISOR (if applicable) New Jersey Environ. Cons Tele. # _____

WELL CONSTRUCTION

Total depth drilled 15 ft.

Well finished to 15 ft.

Borehole diameter:
Top 10 in.
Bottom 10 in.

Well was finished: ☐ above grade ☒ flush mounted

If finished above grade, casing height (stick up) above land surface _____ ft.

Was steel protective casing installed? ☐ Yes ☒ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	0	5	4	Sch 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	5	15	4	Sch 40 PVC .010
Tail Piece				
Gravel Pack	3	15		Sinoue #1
Annular Seal/Grout	0	3		Portland
Method of Grouting	Gravity			

Static water level after drilling 8 ft.

Water level was measured using tape

Well was developed for 1/2 hours at 1 gpm

Method of development pump

Was permanent pumping equipment installed? ☐ Yes ☒ No

Pump capacity _____ gpm

Pump type: _____

Drilling Method Auger

Drilling Fluid _____ Type of Rig B-57

Name of Driller John Vest

Health and Safety Plan submitted? ☒ Yes ☐ No

Level of Protection used on site (circle one) None (D) C B A

N.J. License No. 000127

Name of Drilling Company _____

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

Log attached

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature John Vest Date 12/4/95

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

SECOR

SECOR International, Incorporated

WELL : MW-11

CLIENT: Pine Springs Environmental
PROJECT NAME: National Car Rental
LOCATION: Newark Airport

BORING DEPTH 15' BORING DIAMETER
CASED FROM 0 TO 5' TYPE/DIAM. 4" PVC
SCREENED FROM 5' TO 15' TYPE/DIAM. 4" PVC
SCREEN SLOT SIZE 0.020" FILTER PACK sand
SURFACE ELEV. — TOP OF CASING ELEV. —
OTHER

DRILLER Summit Drilling, John Voigt
DRILL RIG/METHOD Hollow stem auger
SAMPLING METHOD N/A
DATE(S) DRILLED 28 November 1995
PERMIT NUMBER
LOGGED BY SECOR, H. Borchardt

WELL DETAIL	DEPTH	USCS SYMBOLS	GRAPHIC COLUMN	SAMPLE INTERVAL	% RECOVERY	PID (ppm)	DESCRIPTION (Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%)
	0					0	Asphalt, gravel
		SW					Brown medium-coarse SAND, loose, moist
	5						
							Wet at 8'
	10						
							same as above
	15						End of boring @ 15'
	20						
	25						

Summit DRILLING CO., INC.

ENVIRONMENTAL SPECIALISTS

WELL LOG

MW11 DATE DRILLED: 11/28/1995 COORD #1: 26.22.298 PERMIT #1: 26-42899 COUNTY: Essex
COORD #2: PERMIT #2: XSTREET:
USE: Monitor

National Car Rental Syste, Newark Int'L Airport, (buildings 25 & 26), Newark, NJ 07114
GM National Holding Co., 7700 France Avenue South, , Minneapolis, MN 55435

CASING: PVC
TER: 4"
H: 5'

OUTER CASING:
DIAMETER:
LENGTH:

SCREEN TYPE 1: PVC
SCREEN TYPE 2:
DIAMETER: 4"
LENGTH 1: 10'
LENGTH 2:
SLOT SIZE: .020

DRILLING METHOD: Auger
SAMPLING METHOD: S/S
HOLE DIAMETER: 10"
TOTAL DEPTH: 15'

ELL: 15'
L PK SZ: Morie #1
ER: John Vogt
ICE COMPLETION: N

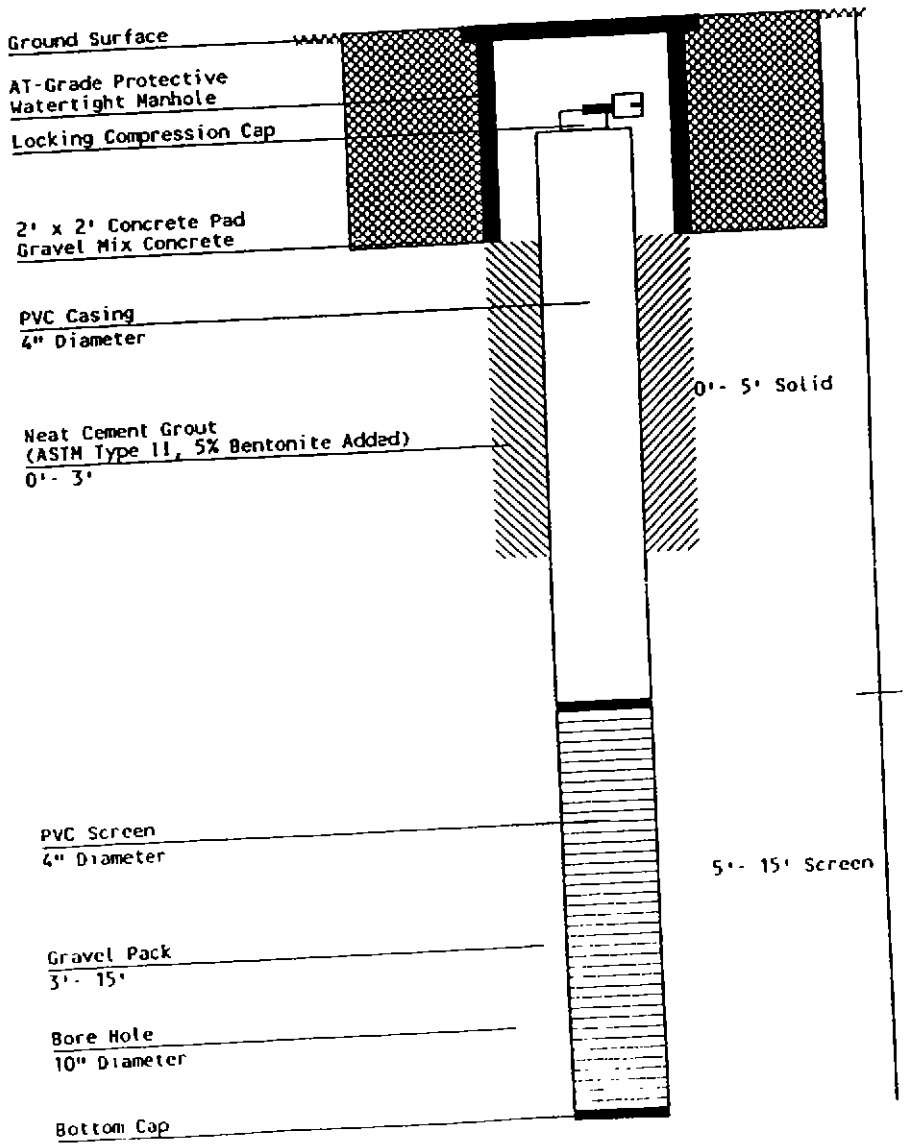
GAL PER MIN: 1
STAT H2O LVL: 8'
DEVELOPMENT METHOD: Pump
DEVELOPMENT TIME: 1/2 Hour

CASING SEAL: Portland
OPEN HOLE:

DEPTH BELOW SURFACE FROM - TO	BLOWS PER 6" ON SAMPLER
0' - 2'	None Recorded
2' - 4'	
4' - 6'	
6' - 8'	

SOILS IDENTIFICATION

- 5' Brown sand fill.
- 10' Tan fine sand.
Meadow mat.



DWR-138 M
11/94

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER ALLOCATION

MONITORING WELL RECORD

Well Permit No. _____
Atlas Sheet Coordinates _____

OWNER IDENTIFICATION - Owner _____
Address _____
City _____ State _____ Zip Code _____

WELL LOCATION - If not the same as owner please give address. Owner's Well No. MW11
County _____ Municipality _____ Lot No. _____ Block No. _____
Address _____

TYPE OF WELL (as per Well Permit Categories) _____ Date well completed 11/28/95
Regulatory Program Requiring Well _____ Case I.D. # _____
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) _____ Tele. # _____

WELL CONSTRUCTION

Total depth drilled 15 ft.
Well finished to 15 ft.
Borehole diameter:
Top 10 in.
Bottom 10 in.
Well was finished: ☐ above grade ☑ flush mounted
If finished above grade, casing height (stick up) above land surface _____ ft.
Was steel protective casing installed? ☐ Yes ☑ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	0	5	4	S.40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	5	15	4	S.40 PVC ....
Tail Piece				
Gravel Pack	3	15		Morie #1
Annular Seal/Grout	0	3		Portland
Method of Grouting	Gravity			

Static water level after drilling 8 ft.
Water level was measured using tape
Well was developed for 1½ hours at 1 gpm
Method of development pump
Was permanent pumping equipment installed? ☐ Yes ☑ No
Pump capacity _____ gpm
Pump type: _____
Drilling Method Auger
Drilling Fluid _____ Type of Rig _____
Name of Driller J. Lucas
Health and Safety Plan submitted? ☑ Yes ☐ No
Level of Protection used on site (circle one) None D C B A
N.J. License No. _____
Name of Drilling Company _____

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

See attached

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature _____ Date _____

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

SECOR

SECOR International, Incorporated

WELL : MW-12

CLIENT: GM NATIONAL HOLDING COMPANY
PROJECT NAME: NATIONAL CAR RENTAL
LOCATION: NEWARK AIRPORT FACILITY

BORING DEPTH 15' BORING DIAMETER 10" DRILLER SUMMIT DRILLING CO. - AL
CASED FROM 0 TO 5 TYPE/DIAM. 4" SCH 40 PVC DRILL RIG/METHOD MOBILE B-57, HSA
SCREENED FROM 5 TO 15 TYPE/DIAM. 4" SCH 40 PVC SAMPLING METHOD SPLIT SPOON, CONTINUOUS
SCREEN SLOT SIZE 0.010" FILTER PACK No. 1 DATE(S) DRILLED 11-29-95
SURFACE ELEV. _____ TOP OF CASING ELEV. _____ PERMIT NUMBER _____
OTHER FLUSH MOUNTED MANHOLE LOGGED BY MIKE KNEUCKER

WELL DETAIL	DEPTH	USCS SYMBOLS	BLOWS/6"	SAMPLE INTERVAL	% RECOVERY	PID	DESCRIPTION (Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%)
		SW	NA				ASPHALT PAVEMENT 4" THICK
							LIGHT BROWN TO REDDISH BROWN
							FINE TO VERY FINE SAND
			22,27		100	0	
	5		38,40				
			47,58		70	0	
			50,50				
			18,22	9-95	80	0	
			20,21				
	10						WET @ 11'
			5,6		80	1	
			9,14				SAND WITH SOME SILT, GRAY
		SP	2,1,2		70	7	
		PT					SILT WITH A LITTLE SAND AND
	15						PEAT, HIGH ORGANIC CONTENT
							WELL COMPLETION
	20						
							GRAVEL 3-15'
							BENTONITE 2-3'
							CONCRETE 0-2'
	25						

Summit DRILLING CO., INC.
ENVIRONMENTAL SPECIALISTS

WELL LOG

[illegible]
[illegible] NJ 08880
Telephone: (908) 722-1700
Cell: (908) 342-0618
FAX: (908) 806-1006

L: MW12 DATE DRILLED: 11/29/1995 COORD #1: 26.22.298 PERMIT #1: 26-42900
COORD #2: PERMIT #2:

E: National Car Rental Syste, Newark Int'L Airport, (buildings 25 & 26), Newark, NJ 07114
ER: GM National Holding Co., 7700 France Avenue South, , Minneapolis, MN 55435

COUNTY: Essex
XSTREET:
USE: Monitor

ER CASING: PVC
METER: 4"
GTH: 5'

OUTER CASING:
DIAMETER:
LENGTH:

SCREEN TYPE 1: PVC
SCREEN TYPE 2:
DIAMETER: 4"
LENGTH 1: 10'
LENGTH 2:

DRILLING METHOD: Auger
SAMPLING METHOD: S/S
HOLE DIAMETER: 10"
TOTAL DEPTH: 15'

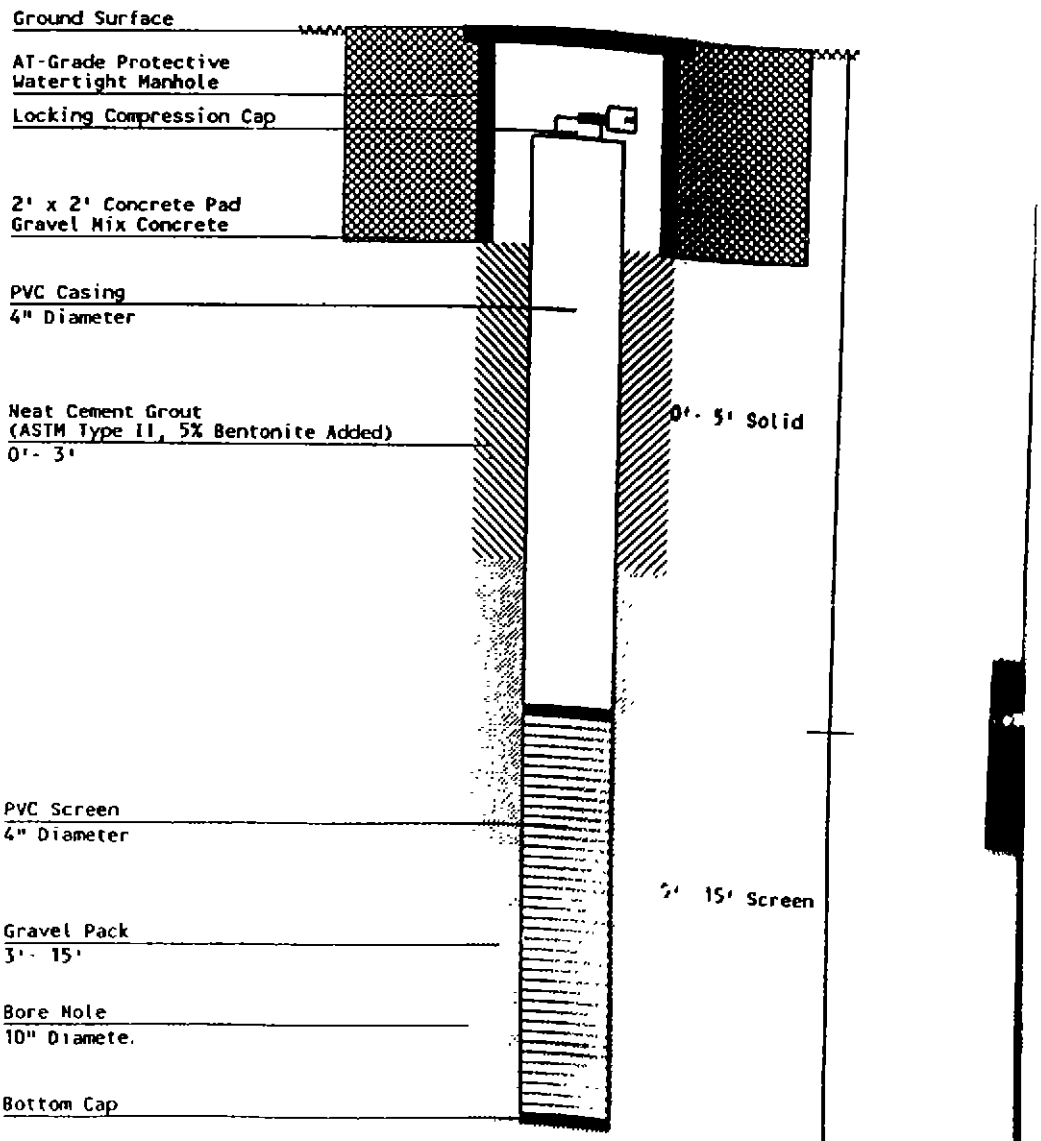
WELL: 15'
VEL PK SZ: Morie #1
LLER: Al Bambace
FACE COMPLETION: M

GAL PER MIN: 1
STAT H2O LVL: 8'
SLOT SIZE: .020
DEVELOPMENT METHOD: Pump
DEVELOPMENT TIME: 1/2 Hour
CASING SEAL: Portland
OPEN HOLE:

DEPTH BELOW SURFACE FROM - TO	BLOWS PER 6" ON SAMPLER
4' - 6'	22-27-38-4[illegible]
6' - 8'	47-58-50-50
8' - 10'	18-22-20-21
10' - 12'	5-6-9-14
12' - 14'	2-1-2-2

ARKS / SOILS IDENTIFICATION

Asphalt & gravel.
Tan fine sand.
[illegible]' Meadow mat.



11/94

MONITORING WELL RECORD

Well Permit No. _____

Atlas Sheet Coordinates _____

OWNER IDENTIFICATION - Owner _____

Address _____

City _____ State _____ Zip Code _____

WELL LOCATION - If not the same as owner please give address. Owner's Well No. MW12

County _____ Municipality _____ Lot No. _____ Block No. _____

Address _____

TYPE OF WELL (as per Well Permit Categories) _____ Date well completed 11/21/95

Regulatory Program Requiring Well _____ Case I.D. # _____

CONSULTING FIRM/FIELD SUPERVISOR (if applicable) New Spring Environ. Cons. Tele. # _____

WELL CONSTRUCTION

Total depth drilled 15 ft.

Well finished to 15 ft.

Borehole diameter:
Top 10 in.
Bottom 10 in.

Well was finished: ☐ above grade ☒ flush mounted

If finished above grade, casing height (stick up) above land surface _____ ft.

Was steel protective casing installed? ☐ Yes ☒ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.) [From land surface]	Diameter (inches)	Type and Material
Inner Casing	0	5	4	Sch 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	5	15	4	Sch 40 PVC .02"
Tail Piece				
Gravel Pack	3	15		Mesh #1 Portland
Annular Seal/Grout	0	3		
Method of Grouting	Pumped			

Static water level after drilling 8 ft.

Water level was measured using tape

Well was developed for 1/2 hours at 1 gpm

Method of development pump

Was permanent pumping equipment installed? ☐ Yes ☒ No

Pump capacity _____ gpm

Pump type: _____

Drilling Method Auger

Drilling Fluid _____ Type of Rig CME-55

Name of Driller AJ Brothers

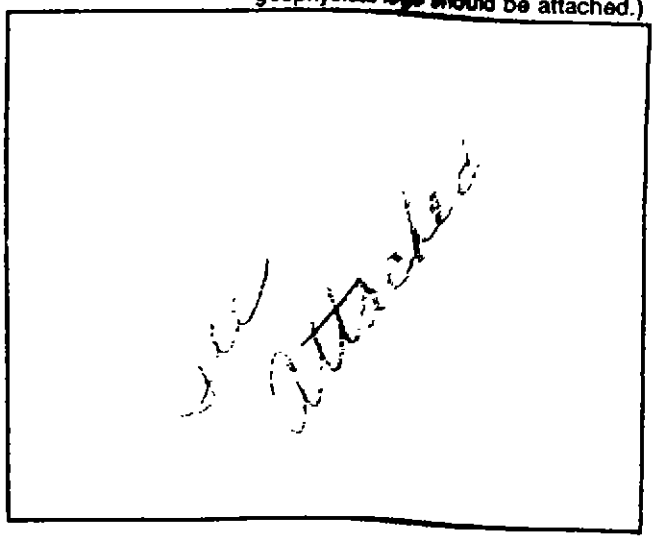
Health and Safety Plan submitted? ☒ Yes ☐ No

Level of Protection used on site (circle one) None D C B A

N.J. License No. 0013751

Name of Drilling Company _____

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)



I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature _____ Date 11/21/95

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

DWR-138 M
11/94

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER ALLOCATION

MONITORING WELL RECORD

Well Permit No. _____ - _____
Atlas Sheet Coordinates _____ : _____ : _____ : _____

OWNER IDENTIFICATION - Owner _____
Address _____
City _____ State _____ Zip Code _____

WELL LOCATION - If not the same as owner please give address. Owner's Well No. MW2
County _____ Municipality _____ Lot No. _____ Block No. _____
Address _____

TYPE OF WELL (as per Well Permit Categories) _____ Date well completed 11/12/95
Regulatory Program Requiring Well _____ Case I.D. # _____
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) _____ Tele. # _____

WELL CONSTRUCTION

Total depth drilled 35 ft.
Well finished to 35 ft.
Borehole diameter:
Top 8 in.
Bottom 8 in.
Well was finished: ☐ above grade ☒ flush mounted
If finished above grade, casing height (stick up) above land surface _____ ft.
Was steel protective casing installed? ☐ Yes ☒ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	0	30	2	Sch40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	30	35	2	Sch 40 PVC .010
Tail Piece				
Gravel Pack	25	35		Morie #1
Annular Seal/Grout	0	28		Portland
Method of Grouting	Tremie			

Static water level after drilling At Surface ft.
Water level was measured using _____
Well was developed for 1 hour at _____ gpm
Method of development _____
Was permanent pumping equipment installed? ☐ Yes ☒ No
Pump capacity _____ gpm
Pump type: _____
Drilling Method Auger
Drilling Fluid _____ Type of Rig B-57
Name of Driller A. Barbarise
Health and Safety Plan submitted? ☒ Yes ☐ No
Level of Protection used on site (circle one) None (D) C B A
N.J. License No. 00325
Name of Drilling Company _____

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

See Attached

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature _____ Date _____

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

Summit
DRILLING CO., INC.
ENVIRONMENTAL SPECIALISTS
889 Union Avenue
Bridgewater, NJ 08807
Telephone (908) 526-0401
Toll Free (800) 526-0491
FAX (908) 526-8073

WELL LOG

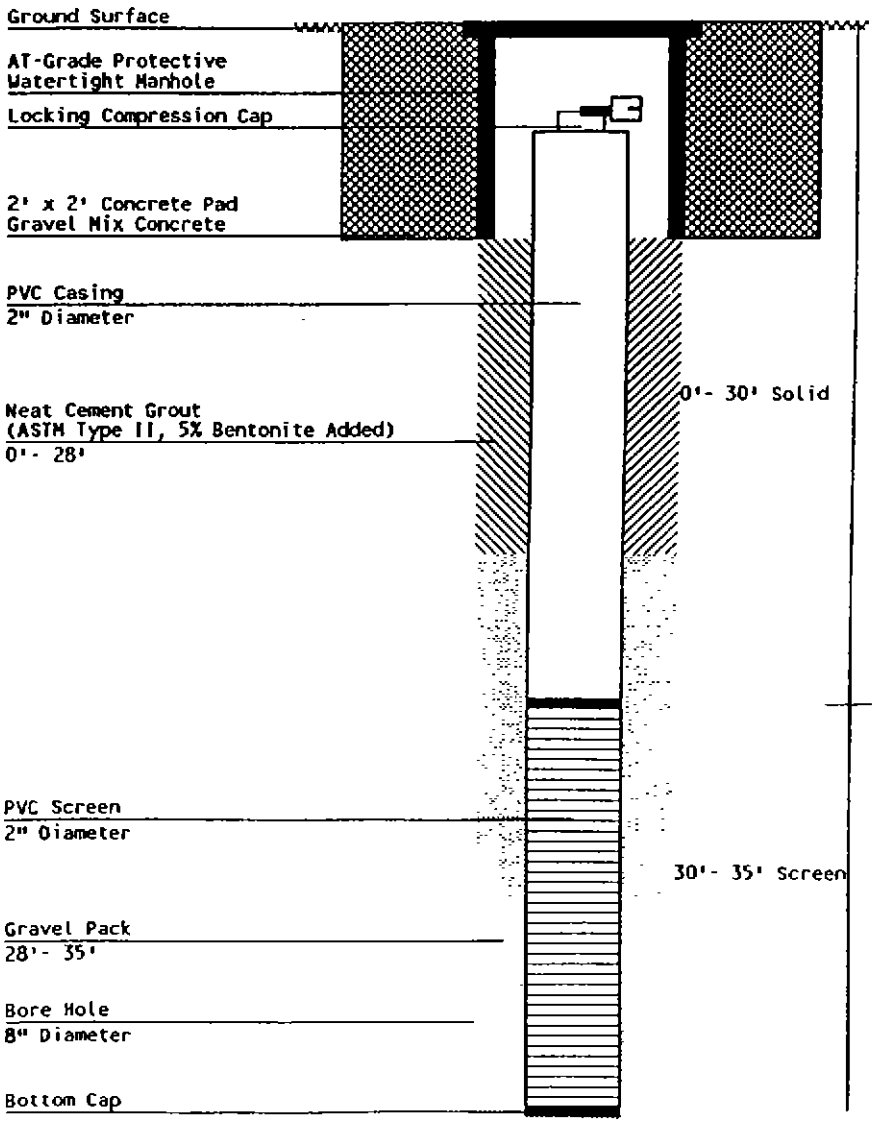
LL: P2 DATE DRILLED: 11/29/1995 COORD #1: 26.22.298 PERMIT #1: 26-42895
COORD #2: PERMIT #2: COUNTY: Essex
TE: National Car Rental Syste, Newark Int'L Airport, (buildings 25 & 26), Newark, NJ 07114 XSTREET:
WNER: GM National Holding Co., 7700 France Avenue South, , Minneapolis, MN 55435 USE: Monitor

NER CASING: PVC OUTER CASING: SCREEN TYPE 1: PVC DRILLING METHOD: Auger
AMETER: 2" DIAMETER: SCREEN TYPE 2: SAMPLING METHOD: S/S
ENGTH: 30' LENGTH: DIAMETER: 2" HOLE DIAMETER: 8"
LENGTH 1: 5' TOTAL DEPTH: 35'
T WELL: 35' GAL PER MIN: LENGTH 2:
AVEL PK SZ: Morie #1 STAT H2O LVL: Not taken SLOT SIZE: .010
ILLER: Al Bambace DEVELOPMENT METHOD: Not dev. CASING SEAL: Portland
URFACE COMPLETION: M DEVELOPMENT TIME: OPEN HOLE:

DEPTH BELOW SURFACE FROM - TO	BLOWS PER 6" ON SAMPLER
4' - 6'	2-3-5-7
6' - 8'	7-12-19-30
8' - 10'	22-28-42-55
10' - 12'	14-25-40-28
12' - 14'	5-2-3-5
14' - 16'	3-4-8-11
16' - 18'	3-5-8-6
18' - 20'	9-12-11-17
20' - 22'	3-5-6-9
22' - 24'	6-9-12-15
24' - 26'	15-8-1-2
26' - 28'	3-5-8-10
28' - 30'	7-8-8-12
30' - 32'	10-10-7-9
32' - 34'	10-8-6-6

EMARKS / SOILS IDENTIFICATION

' - 1' Asphalt & gravel.
' - 14' Tan fine sand.
4' - 15' Meadow mat.
5' - 35' Red-brown fine sand.



SECOR

SECOR International, Incorporated

WELL : P-2 (CONT.)

CLIENT: GM - NATIONAL HOLDING CO
PROJECT NAME: NATIONAL CAR RENTAL SYSTEM
LOCATION: NEWARK AIRPORT FACILITY

BORING DEPTH 35' BORING DIAMETER 8"
CASED FROM 0 TO 30 TYPE/DIAM. 2" PVC
SCREENED FROM 30 TO 35 TYPE/DIAM. 2" PVC
SCREEN SLOT SIZE 0.010 FILTER PACK No. 1
SURFACE ELEV. - TOP OF CASING ELEV. -
OTHER TEMPORARY FLUSH MOUNT

DRILLER SUMMIT DRILLING CO, ALBANY
DRILL RIG/METHOD MOBILE B-57, HSA
SAMPLING METHOD SPLIT SPOON
DATE(S) DRILLED 11-28-95
PERMIT NUMBER
LOGGED BY MIKE RIEMER

WELL DETAIL	DEPTH	USCS SYMBOLS	Blows/6"	SAMPLE INTERVAL	% RECOVERY	PID	DESCRIPTION (Trace < 10% Little 10% to 20% Some 20% to 35% And 35% to 50%)
No. 1 Morie Sand	35	ML	9,11,14,17		0	1	RED-BROWN SILT
			7,7,9,10		100	1	RED BROWN SILT AND CLAY
							END OF BORING

WELL COMPLETION.
0-2 CONCRETE
2-28 PORTLAND/BENTONITE GROUT
28-35 No. 1 MORIE SAND.

SECOR

SECOR International, Incorporated

WELL : P-2

CLIENT: GM National Holding Co.
PROJECT NAME: National Car Rental System
LOCATION: Newark Airport Facility

BORING DEPTH 35 BORING DIAMETER 8 DRILLER Summit Drilling Co, AL & La
CASED FROM 0 TO 30 TYPE/DIAM. 2" Sch 40 PVC DRILL RIG/METHOD Mobile B-57, HSA
SCREENED FROM 30 TO 35 TYPE/DIAM. 2" PVC SAMPLING METHOD Continuous Split Spoon
SCREEN SLOT SIZE 0.010" FILTER PACK No. 1 DATE(S) DRILLED 11-28-95
SURFACE ELEV. — TOP OF CASING ELEV. — PERMIT NUMBER
OTHER Temporary Flush Mount LOGGED BY Mike Kneucker

WELL DETAIL	DEPTH	USCS SYMBOLS	BLOWS/6"	SAMPLE INTERVAL	% RECOVERY	PID	DESCRIPTION (Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%)
							Unpaved Area - Crushed Stone & Gravel
	0	SW			50	2	V.F to Fine Red Brown Sand
							↓
						5	Same w/ Slight Hydrocarbon odor
			10,9,7,12		70		
	5						
			10,10,10,12		70	5	Same - Moist @ 7'
							Fine to med Red-Brown Sand
			10,10,10,10		70	10	Slight to moderate Hydrocarbon odor
							Soils discolored @ 8-8.5'
	10		10,10,12,10		50	149	
							Fine to V.F. Sand, Little Shell
			5,4,2,4		10	24	Slight Hydrocarbon odor
							↓
			3,4,6,9		60	250	Peat 15-16' Below Grade
	15	PT					
		SP					Red-Brown Fine to V.F Sand w/
			4,7,9,15		70	40	Some Silt
							Red-Brown V.F Sand and Silt
		SW	1,4,5,13		50	7	↓
	20						Red - Brown V.F Sand
			1,8,9,20		100	1	↓
		SP	7,11,13,7		70	1	Red-Brown V.F Sand w/ Little Silt
	25						
			8,13,15,18		70	1	V.F. Sand and Silt
		ML	5,9,14,14		70	1	Red-Brown Silt w/ Some V.F Sand

Concrete
Portland/Bentonite Grout
Sand

SECOR

SECOR International, Incorporated

WELL : P-3 (PAGE 2)

CLIENT: _____

PROJECT NAME: _____

LOCATION: _____

BORING DEPTH _____ BORING DIAMETER _____

CASED FROM _____ TO _____ TYPE/DIAM. _____

SCREENED FROM _____ TO _____ TYPE/DIAM. _____

SCREEN SLOT SIZE _____ FILTER PACK _____

SURFACE ELEV. _____ TOP OF CASING ELEV. _____

OTHER _____

DRILLER _____

DRILL RIG/METHOD _____

SAMPLING METHOD _____

DATE(S) DRILLED _____

PERMIT NUMBER _____

LOGGED BY _____

WELL DETAIL	DEPTH	USCS SYMBOLS	Blows/6"	SAMPLE INTERVAL	% RECOVERY	PID	DESCRIPTION (Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%)
No.1 Morie Sand		ML	10,10,7,9		100%	5	RED-BROWN SILT AND V.F. SAND
		↓	10,8,6,6		100%	3	RED-BROWN SILT SOME V.F. SAND
							↓
	35						END OF BORING
	40						
	45						WELL COMPLETION
							GRAVEL 28-35'
							PORTLAND BENTONITE GROUT 2-28
	50						CONCRETE 0'-2'
	55						
	60						

SECOR

SECOR International, Incorporated

WELL : P-3

CLIENT: GM NATIONAL HOLDING CO.
PROJECT NAME: NATIONAL CAR RENTAL
LOCATION: NEWARK AIRPORT FACILITY

BORING DEPTH 35' BORING DIAMETER 8"
CASED FROM 0 TO 30 TYPE/DIAM. 2" PVC
SCREENED FROM 30 TO 35' TYPE/DIAM. 2" PVC
SCREEN SLOT SIZE 0.010 FILTER PACK No. 1
SURFACE ELEV. — TOP OF CASING ELEV. —
OTHER TEMPORARY FLUSH MOUNT MANHOLE

DRILLER SUMMIT DRILLING - AL & LOU
DRILL RIG/METHOD MOBILE B-57, HSA
SAMPLING METHOD SPLIT SPOON CONTINUOUS
DATE(S) DRILLED 11-28-95 → 11-29-95
PERMIT NUMBER
LOGGED BY MIKE KNEUCKER

WELL DETAIL	DEPTH	USCS SYMBOLS	SAMPLE INTERVAL	SAMPLE BLOWS	% RECOVERY	PID	DESCRIPTION (Trace < 10%, Little 10% to 20%, Some 20% to 35%, And 35% to 50%)
Concrete	0						ASPHALT PAVEMENT ~4" THICK.
		SW					LT BROWN FINE SAND.
	5			2,3,5,7	50%	100	SAME W/ SLIGHT GASOLINE ODOR
				7,12,19,30	50%	8067	
			8.5-9.0				SAME W/ STRONGER GASOLINE ODOR
	10			23,38	70%	33,750	SAMPLED @ 8.5'-9.0', WL @ 9.0 FT.
				42,55			SOME FINE SAND, LESSER
				14,25	80%	700	GASOLINE ODOR.
		GM		40,28			GLASS, ASH, STONE, ASSORTED FILL
				5,2,3,5	10%	20	MATERIAL, SOME ORGANIC MAT @ 14'
	15	PT		3,4,8,11	100%	149	BLACK SILTY CLAY W/ PEAT ~1.5'
							THICK.
		SW		3,5,6,8	60%	1000	RED-BROWN V.F. SAND.
	20			9,12,11,17	60%	149	
				3,5,6,9	60%	15	
				6,9,14,15	100%	3	
	25			1,5,8,12	100%	3	
		SP		3,5,8,10	100%	3	SAME W/ INCREASING SILT CONTENT
				7,8,8,11	100%	1	RED-BROWN V.F SAND LITTLE TO SOME SILT
Portland/Bentonite Grout							
Sand							

11/94

BUREAU OF WATER ALLOCATION

MONITORING WELL RECORD

Well Permit No. _____

Atlas Sheet Coordinates _____

OWNER IDENTIFICATION - Owner _____

Address _____

City _____ State _____ Zip Code _____

WELL LOCATION - If not the same as owner please give address. Owner's Well No. P3

County _____ Municipality _____ Lot No. _____ Block No. _____

Address _____

TYPE OF WELL (as per Well Permit Categories) MONITORING Date well completed 11/1/95

Regulatory Program Requiring Well _____ Case I.D. # _____

CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Nine Springs Environment Consultant Tele. # _____

WELL CONSTRUCTION

Total depth drilled 35 ft.

Well finished to 35 ft.

Borehole diameter:
Top 8 in.
Bottom 8 in.

Well was finished: ☐ above grade ☑ flush mounted

If finished above grade, casing height (stick up) above land surface _____ ft.

Was steel protective casing installed? ☐ Yes ☑ No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	0	30	2	Sch. 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	30	35	2	Sch. 40 PVC .010
Tail Piece				
Gravel Pack	28	35		Morie #1
Annular Seal/Grout	0	24		Portland
Method of Grouting	Tremie			

Static water level after drilling not taken ft.

Water level was measured using _____

Well was developed for not dev hours at _____ gpm

Method of development _____

Was permanent pumping equipment installed? ☐ Yes ☑ No

Pump capacity _____ gpm

Pump type: _____

Drilling Method Auger

Drilling Fluid _____ Type of Rig B-57

Name of Driller Al Bamba

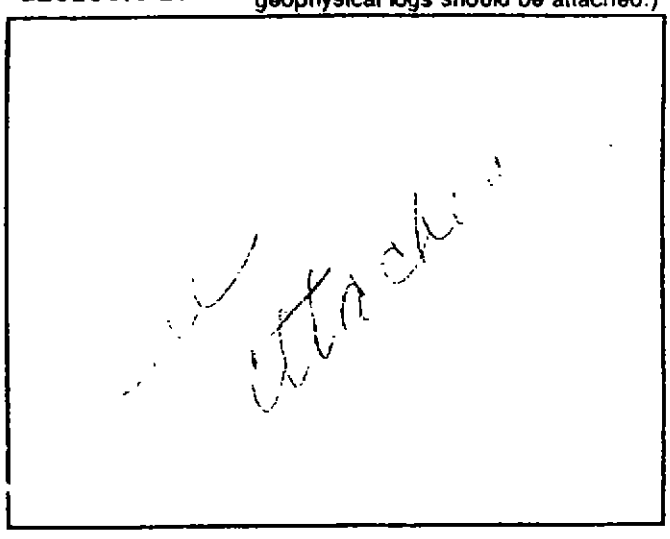
Health and Safety Plan submitted? ☑ Yes ☐ No

Level of Protection used on site (circle one) None (D) C B A

N.J. License No. 10137 51

Name of Drilling Company _____

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)



I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature _____ Date 11/7

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

Summit DRILLING CO., INC.
ENVIRONMENTAL SPECIALISTS
150 Union Avenue
Bridgewater, NJ 08807
Telephone (908) 722-4266
Toll Free (800) 242-8648
FAX (908) 722-0819

WELL LOG

P3 DATE DRILLED: 11/29/1995 COORD #1: 26.22.298 PERMIT #1: 26-42896
COORD #2: PERMIT #2:
COUNTY: Essex
XSTREET:
USE: Monitor

: National Car Rental Syste, Newark Int'L Airport, (buildings 25 & 26), Newark, NJ 07114
R: GM National Holding Co., 7700 France Avenue South, , Minneapolis, MN 55435

R CASING: PVC
ETER: 2"
TH: 30'

OUTER CASING:
DIAMETER:
LENGTH:

SCREEN TYPE 1: PVC
SCREEN TYPE 2:
DIAMETER: 2"
LENGTH 1: 5'
LENGTH 2:
SLOT SIZE: .010

DRILLING METHOD: Auger
SAMPLING METHOD: S/S
HOLE DIAMETER: 8"
TOTAL DEPTH: 35'

WELL: 35'
EL PK SZ: Morie #1
LER: Al Bambace
ACE COMPLETION: M

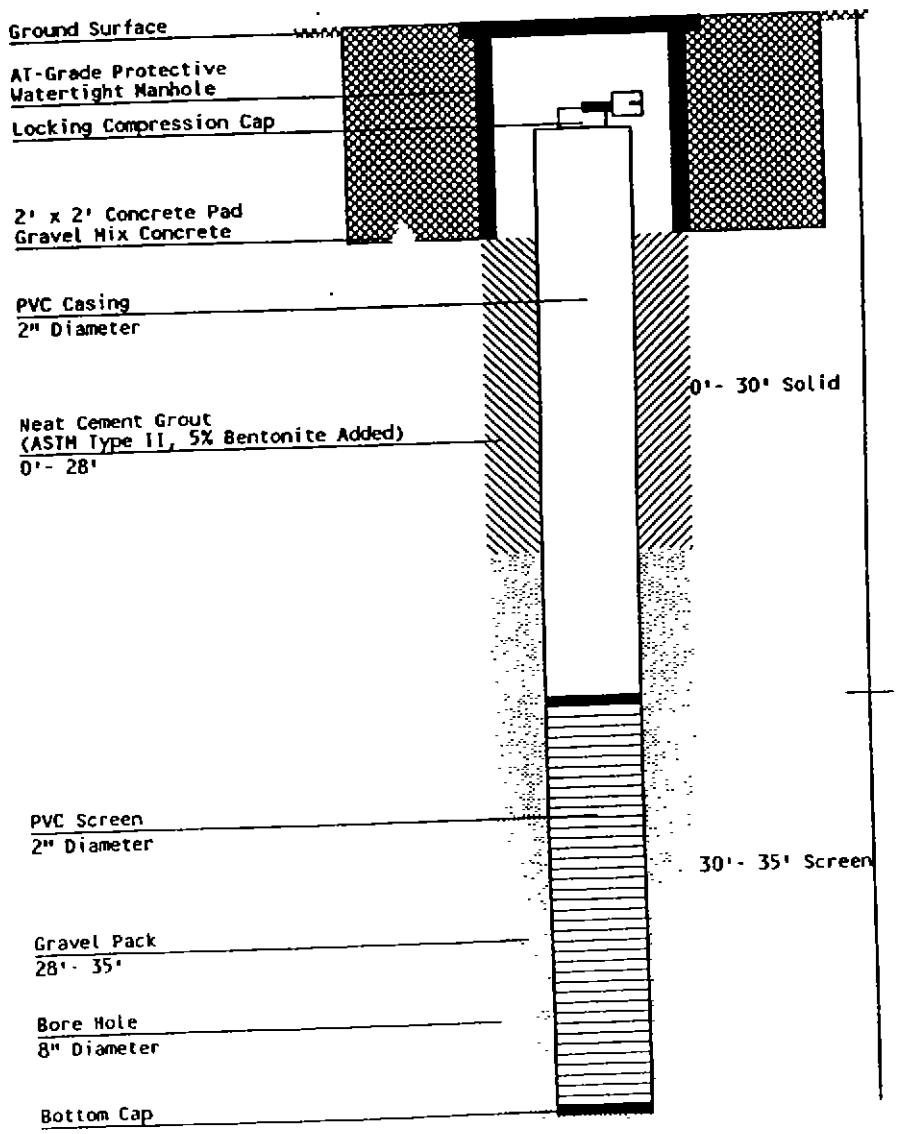
GAL PER MIN:
STAT H2O LVL: Not taken
DEVELOPMENT METHOD: Not dev.
DEVELOPMENT TIME:

CASING SEAL: Portland
OPEN HOLE:

DEPTH BELOW SURFACE FROM - TO	BLOWS PER 6" ON SAMPLER
4' - 6'	5-7-17-16
6' - 8'	12-13-14-11
8' - 10'	16-24-27-40
10' - 12'	13-18-17-20
12' - 14'	5-4-2-4
14' - 16'	3-4-6-9
16' - 18'	4-7-9-15
- 20'	1-4-9-13
- 22'	1-8-9-20
22' - 24'	7-11-13-17
24' - 26'	8-13-15-18
26' - 28'	5-9-14-14
28' - 30'	8-11-14-17
30' - 32'	10-11-14-18
32' - 34'	7-7-9-10

MARKS / SOILS IDENTIFICATION

- 1' Asphalt & gravel.
- 14' Tan fine sand.
' - 15' Meadow mat.
' - 35' Red-brown fine sand.



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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: TERM A & B	NAME OF CONTRACTOR: TESHWELL CRAIG	BORING NO.: MW 25	SURFACE ELEV.
LOCATION: EWR (REPLACEMENT WELL)		CONTRACT NO.: 40-92-005	DATE: 10/30/92

SPOON: 3 O.D. 2 3/8" I.D. | CASING SIZE: 4" ODEX | HOLE TYPE: 4" Monitor
HAMMER: 140 # FALL 30 | HAMMER: 8 # 10.0 FALL
DRILLER: J. CRAIG
INSPECTOR:

GROUND WATER LEVEL

Date	Time	Depth	Remarks
10/30/92	AM	7.5'	SE 4 OBSERVED WHILE SAMPLING T.P. MW 14.0
10/30/92	AM	—	WITHDRAWN INSTALLED

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				6" ASPHALT PAVT. 0.5
1		12 5 6 11	24"	1	BRN, F-M SD. - TR SLT - TR GRAVEL (FILL)
		9 10 13 10	24"	2	" SAME"
	5	8 7 8 10	24"	3	" SAME"
1		5 5 12 13	24	4	" SAME"
4		10 11 11 13	24"	5	" SAME"
4	10	4 5 6 6	24"	6	" SAME"
1		3 6 6 5	20"	7	" SAME" 14.5'
	15				BOTTOM OF BORE

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, [illegible]

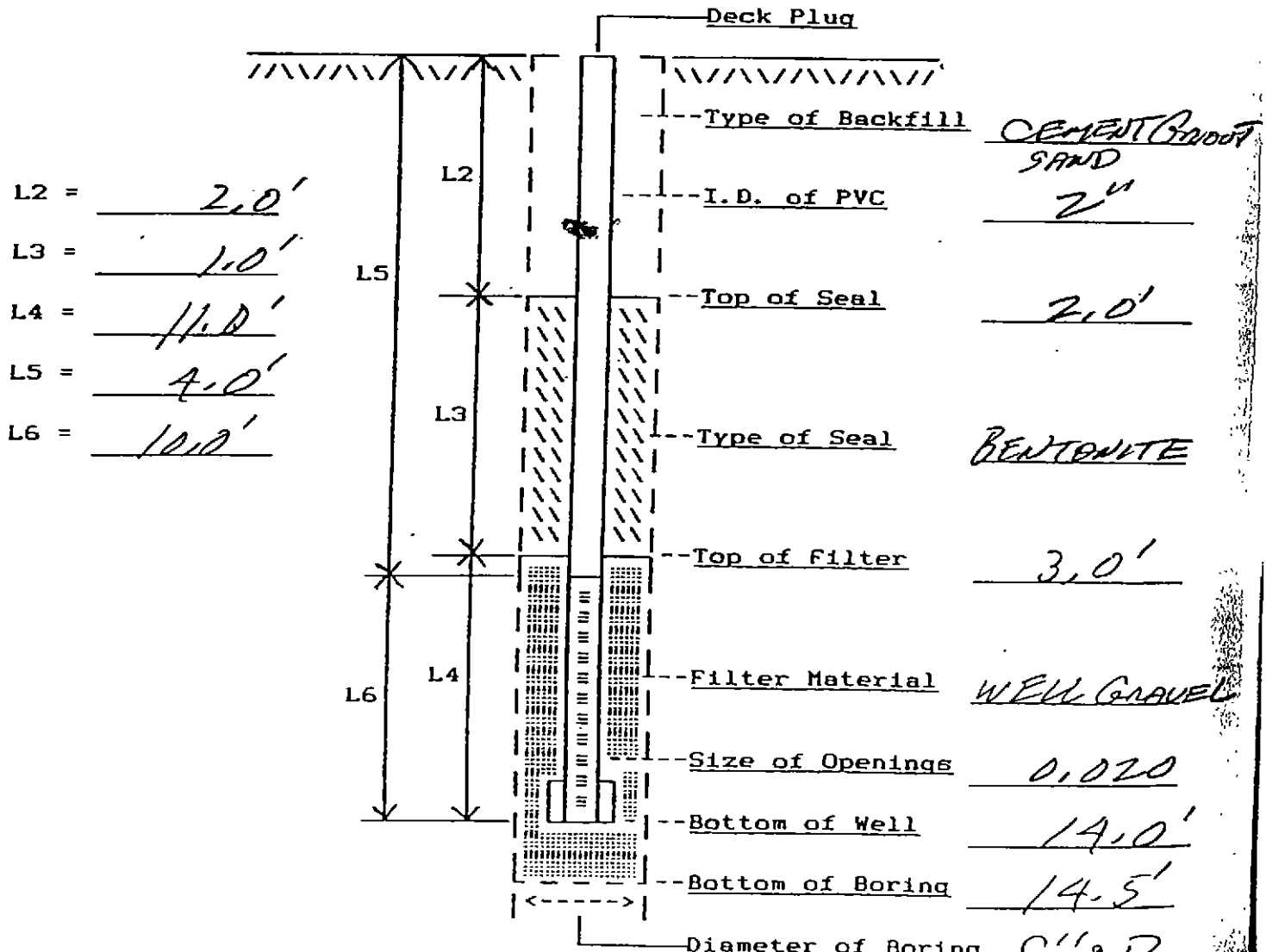
The Port Authority of New York and New Jersey
Engineering Department - Materials and Research Division

Well Installation Report

Project:	TERM A&B	Contractor	WESTWELL-CEA
Location	EWR	Contract No.	116-92-02
Driller	J. Grace	Inspector	
Well No.	MW 25	Type of Well	4" Flow Tube
		Date	12/30/92

Well Development

Date	Water Level Before	Water Level After
Note: Water level readings from top of PVC	Taken ____ min. After Developmen	



Remarks

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Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 of 1

PROJECT: TERM. IMPR.	NAME OF CONTRACTOR: WESTWELL CONST.	BORING NO.: MW 30	SURFACE EL.: 11.7
LOCATION: EWR (AS LAID OUT IN FIELD)		CONTRACT NO.: 410-92-006	DATE: 10/30/92

SPOON: 3" O.D. 2 1/8" I.D. | CASING SIZE: AUGER | HOLE TYPE: 8" "A" MOUNTED

HAMMER: 140# FALL 30" | HAMMER: 8" O.D. # FALL

DRILLER: T. CRAIG

INSPECTOR: L. LARSEN

GROUND WATER LEVEL

Date	Time	Depth	Remarks
10/30/92	P.M.	6.6'	T.H. 9 OBSERVED UPON COMPLETION
10/30/92	P.M.	—	T.H. 9.0 INITIALLY INSTALLED

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D[1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0	2-4	11"		GRASS OVER BROWN F-M SD. TR GRAVEL (FILL) MOIST
		5-7	24"	1	
		7-10			"SAME"
		10-12	24"	2	" "
4	5	12-12	23"		"SAME"
		13-15		3	" "
		6-9	24"		"SAME" OIL ODOR
		9-9		4	
		7-7	24"		"SAME" OIL ODOR
		7-8		5	
	10	1-0	24"		GREY & BROWN ORG. SLT -
		0-1		6	TR VEG. TR FINE SD. WET
					BOTTOM OF BORING
	15				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing etc.

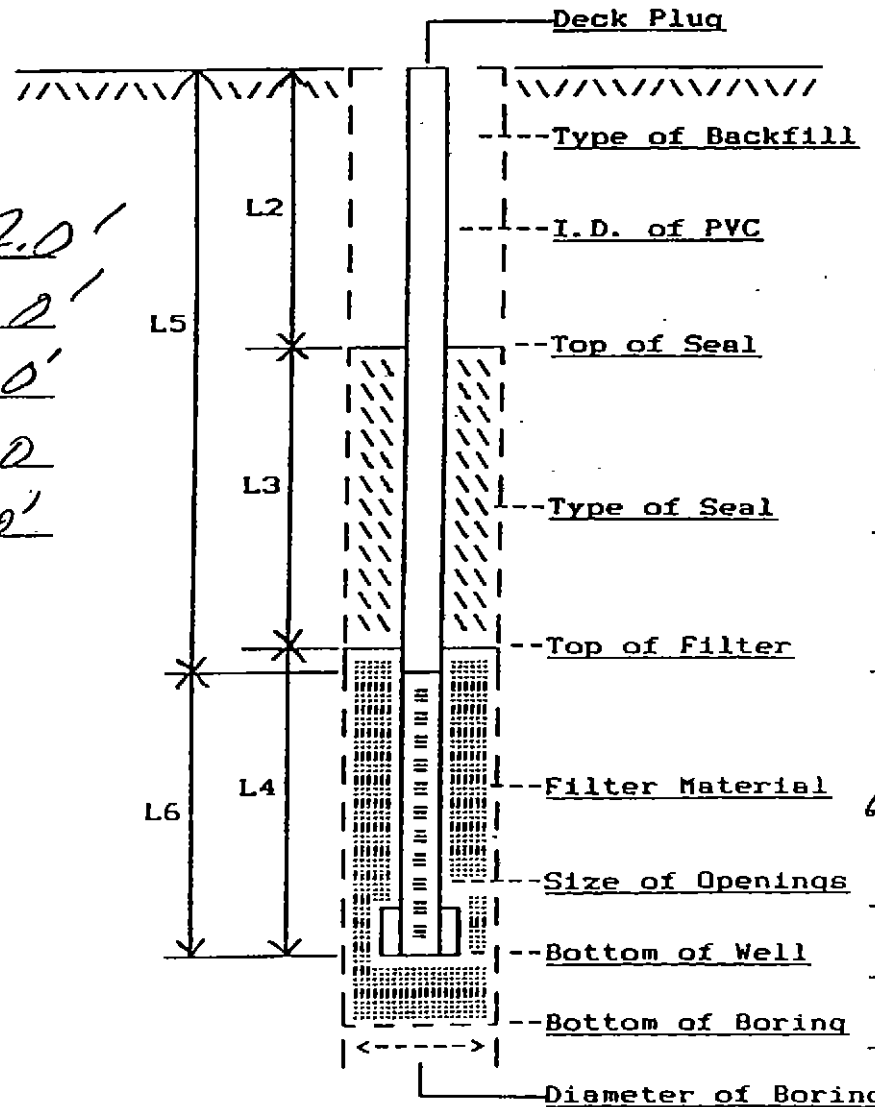
The Port Authority of New York and New Jersey
Engineering Department - Materials and Research Division

Well Installation Report

Project:	TERM. A + B.	Contractor	TESTWELL CRAIG
Location	EWR	Contract No.	4/0-92-056
Driller	J. CRAIG	Inspector	
Well No.	MW 3D	Type of Well	4" MONITOR
		Date	9/30/92

Well Development

Date	Water Level Before	Water Level After
Note: Water level readings from top of PVC	Taken _____ min. After Development	



L2 = 2.0'
L3 = 1.0'
L4 = 6.0'
L5 = 4.0
L6 = 5.0'

Type of Backfill	CEMENT GROUT SAND
I.D. of PVC	2"
Top of Seal	2.0'
Type of Seal	BENTONITE
Top of Filter	3.0'
Filter Material	WELL GRAVEL
Size of Openings	0.020
Bottom of Well	9.0'
Bottom of Boring	12.0'
Diameter of Boring	8" O.D.

Remarks: Hole Backfilled with Well Gravel from 12.0' to 9.0'.

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Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: Ferry Hall B	NAME OF CONTRACTOR: Testwell Craig	BORING NO.: MW 59	SURFACE ELEV.: 4
LOCATION: EWR GATE 67 SE AS DIRECTED IN FIELD		CONTRACT NO.: 40-92-006	DATE: 10/30/92

SPOON	CASING SIZE	HOLE TYPE
2 "O.D. 1 3/8 "I.D.	4" Flush	'A' Mounted

HAMMER: 140 # FALL 30" — HAMMER: 8" O.D. # Patt.

DRILLER: J. Cerio

INSPECTOR: T. Brennan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
10/30/92	A.M.	10.5	SAT OBSERVED WHILE SAMPLING TOP. MW 17.0
10/30/92	A.M.	—	INITIALLY INSTALLED

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				0.0
					6" ASPHALT 0.5
		AUGER	24"	1	SILT - SD. - GRAVEL (FILL) 2.5'
		AUGER	24"	2	BRN TO RED SLT - TR SD - TR. GRAVEL (FILL)
	5	8 12 14 6	24"	3	" SAME "
		12 16 26 32	24"	4	" SAME " — SOME GRAVEL
		12 14 16 18	24"	5	" SAME " — SOME SILT 10.5'
	10	6 6 4 5	10"	6	RED BRN SLT - FR. CSE - FINE SAND & GRAVEL (FILL) 12.5'
		6 8 6 6	20"	7	RED BRN SILT SAND & GRAVEL (FILL)
	15	4 4 5 5	24"	8	" SAME "
		3 3 3 3	24"	9	TOP 18" " SAME " 18.0' BOT 6" GREY ORG. SILT & VEG. 18.5'
	20				BOTTOM OF BORING

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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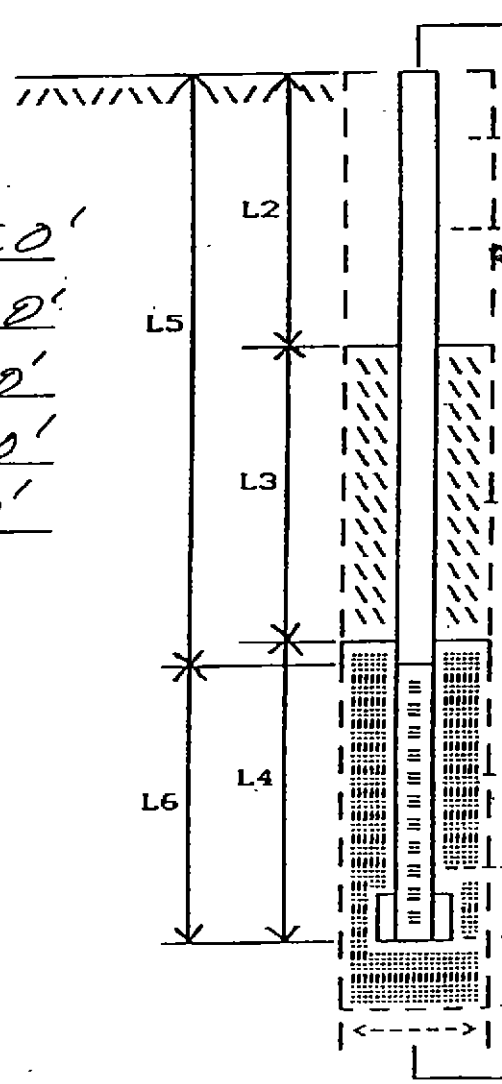
Engineering Department - Materials and Research Division

Well Installation Report

Project: TERM. HUB		Contractor: BOWELL CRAIG	
Location: EWR		Contract No.: 410-92-006	
Driller: J. CRAIG	Inspector: L. Ramos		
Well No.: MW 59	Type of Well: 2" A" MONITOR	Date: 12/30/92	

Well Development

Date	Water Level Before	Water Level After
Note: Water level readings from top of PVC	Taken _____ min. After Development	



L2 = 5.0'
L3 = 1.0'
L4 = 11.0'
L5 = 7.0'
L6 = 10.0'

Type of Backfill: CEMENT GROUT SAND
I.D. of PVC: 2"
Top of Seal: 5.0'
Type of Seal: BENTONITE
Top of Filter: 6.0'
Filter Material: WELL GRAVEL
Size of Openings: 0.020"
Bottom of Well: 17.0'
Bottom of Boring: 18.5'
Diameter of Boring: 8" O.D.

Remarks: Hole back filled with well gravel from 18.5 to 17.0'

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BORING REPORT

SHEET 1 OF 4

PROJECT: TERMINAL A+B	NAME OF CONTRACTOR: TESTWELL-CRAIG	BORING NO.: MW 6D	SURFACE ELEV.:
LOCATION: EWR (AS LAID OUT IN FIELD)		CONTRACT NO.: 410-92-006	DATE: 10/29/92

SPOON: 3 "O.D. 2 3/8 "I.D. | CASING SIZE: AUGERS | HOLE TYPE: 'A' Monitor

HAMMER: 140 # FALL 30 | HAMMER: 5" O.D # FALL

DRILLER: T. CRAIG

INSPECTOR: L. Connor

GROUND WATER LEVEL

Date	Time	Depth	Remarks
10/29/92	A.M	8.5'	S# 5 OBSERVED WHILE SAMPLING T.P. 15.5'
10/29/92	A.M	—	INITIALLY INSTALLED

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				ASPHALT 6" 0.0
		AUGER	24"	1	0.5 SD - GRAVEL - SILT (FILL) 2.5
		AUGER	24"	2	BROWN F-M SD, - TR. SLT, TR. GRAVEL (NOTE: SLIGHT FUEL ODOR) (FILL)
	5	8 9 8 9	24"	3	" SAME " SLIGHT OIL ODOR "
		8 9 12 16	24"	4	" SAME " " " " "
	10	8 9 9 2	24	5	" SAME " STRONG OIL ODOR
		4 5	24	6	" SAME " " " "
		7 6	28"	7	" SAME " " " "
	15	3 1 1	24"	8	TOP 18" SAME SLIGHT ODOR 16.5 BOT 6" GREY ORG. SILTY CLAY 17.0
					BOTTOM OF BORING
	20				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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Engineering Department - Materials and Research Division

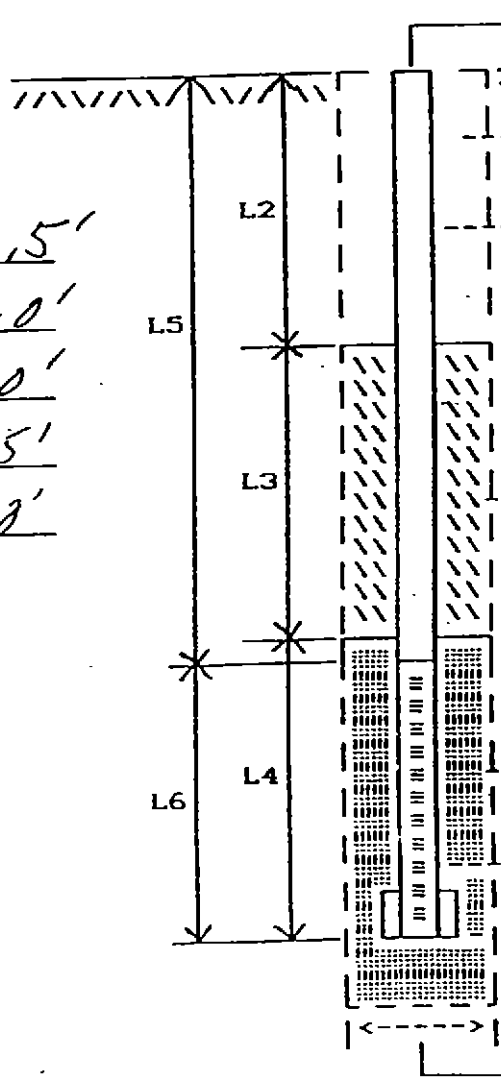
Well Installation Report

Project: TERM. A&B			Contractor TESTWELL
Location EW 12			Contract No. 410-9[illegible]
Driller J. CRAIG		Inspector [illegible]	
Well No. MW 60		Type of Well "A" MONITOR	Date 10/[illegible]

Well Development

Date	Water Level Before	Water Level After
Note: Water level readings from top of PVC		Taken _____ min. After Devel[illegible]

L2 = 3.5'
L3 = 1.0'
L4 = 11.0'
L5 = 5.5'
L6 = 18.5'



CEMENT GR[illegible]
SAND
2"
3.5'
BENTONI[illegible]
4.5'
WELL GR[illegible]
0.020"
15.5'
16.5'

Remarks

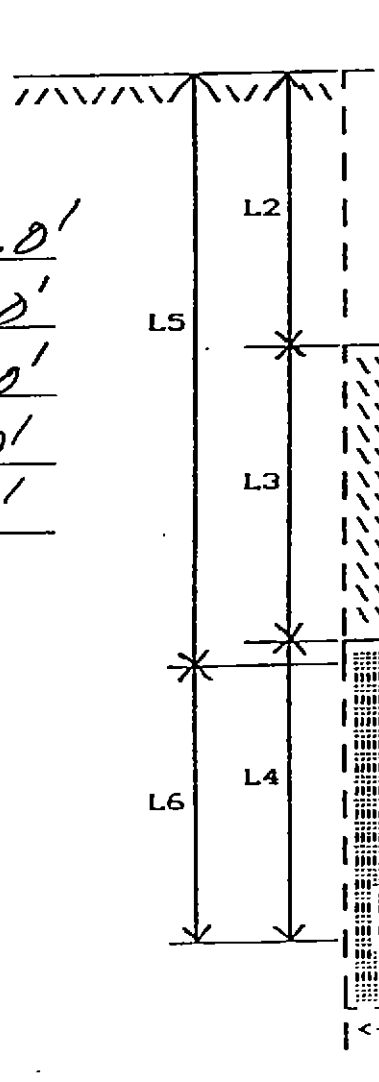
The Port Authority of New York and New Jersey
Engineering Department - Materials and Research Division

Well Installation Report

Project: TERM. A & B		Contractor TESTWELL-CRAIG
Location EWR		Contract No. 410-92-005
Driller J. CRAIG	Inspector L. Bonura	
Well No. MW 61	Type of Well "B Monitor"	Date 10/29/92

Well Development

	Water Level Before	Water Level After
Water level readings from top of PVC	Taken _____ min. After Development	



L2 = 3.0'
L3 = 1.0'
L4 = 9.0'
L5 = 5.0'
L6 = 8.0'

Type of Backfill	CEMENT GROUT SAND
I.D. of PVC	2"
Top of Seal	3.0'
Type of Seal	BENTONITE
Top of Filter	4.0
Filter Material	WELL GRAVEL
Size of Openings	0.020
Bottom of Well	13.0'
Bottom of Boring	14.5'
Diameter of Boring	9"OD

Remarks: Hole backfilled with well gravel from 14.5 to 13.0'.

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Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: TERM. A + B	NAME OF CONTRACTOR: TESTWELL CRAIG	BORING NO.: MW61	SURFACE ELEV.:
LOCATION: EWR (AS LAID OUT IN FIELD)		CONTRACT NO.: 410-92-205	DATE: 10/29/92

SPOON: 3 "O.D. 2 3/8 "I.D. | CASING SIZE: AUGERS | HOLE TYPE: A'Mounted

HAMMER: 140 # FALL 30 " | HAMMER: 8" O.D. # FALL "

DRILLER: J. CRAIG

INSPECTOR: L. Cannon

GROUND WATER LEVEL

Date	Time	Depth	Remarks
10/29/92	AM	8.5'	SET 5 OBSERVED WHILE DRILLING
10/30/92	AM	—	T/P 13.0 INITIALLY INSTALLED

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D	SAMP.² NO.	²SAMPLE DESCRIPTION AND REMARKS (LINE LOCATES CHANGE OF PROFILE)
	0				6" ASPHALT 0.5'
11		AUGER	24"	1	SILT - SAND GRAVEL (FILL)
					2.5'
		AUGER	24"	2	BROWN F. + SD. TR. SILT TR. GRAVEL
	5	9 10 14 14	24"	3	"SAME" FUEL OIL ODOR
		14 13 14 14	24"	4	"SAME"
		12 10 10 8	24"	5	"SAME"
	10	2 3 5 5	24"	6	"SAME"
		2 3 2 3	24"	7	TOP 1" SAME
	15				BOT 1' DK. GREY OR. SILT 14.5
					BOTTOM OF BORING

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

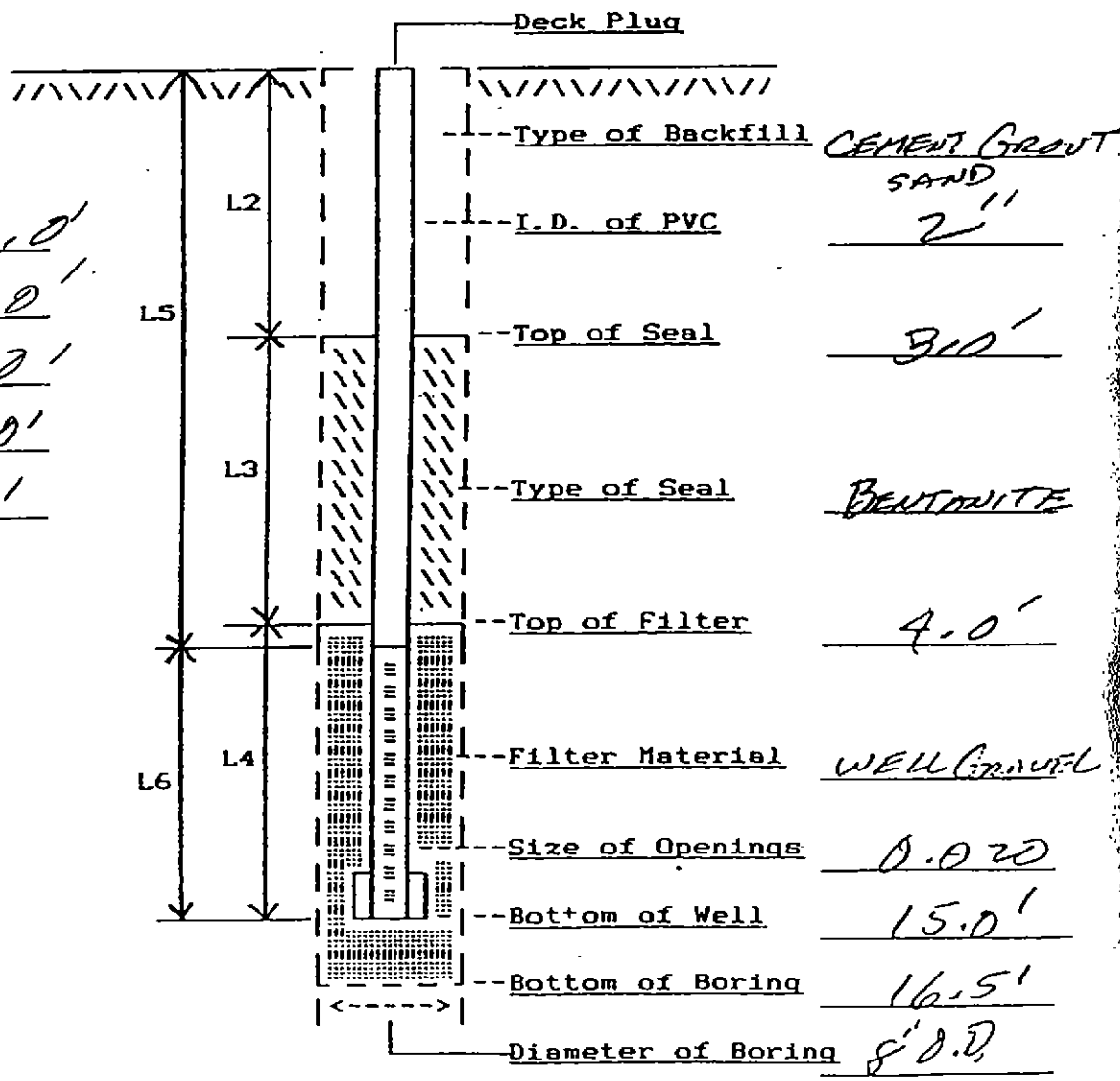
The Port Authority of New York and New Jersey
Engineering Department - Materials and Research Division

Well Installation Report

Project: TERM A+B			Contractor TESTWELL-CRA
Location EWR			Contract No. 410-92-086
Driller J CRAIG		Inspector L Bennett	
Well No. MW 62	Type of Well 4" H Houston		Date 10/29/92

Well Development

Date	Water Level Before	Water Level After
Note: Water level readings from top of PVC	Taken _____ min. After Development	



L2 = 3.0'
L3 = 4.0'
L4 = 11.0'
L5 = 5.0'
L6 = 10.0'

Remarks Hole backfilled from 16.5' to 15.0' with well gravel.

THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

TERM. A + B	NAME OF CONTRACTOR: TESTWELL-CRAIG	BORING NO.: MW 62	SHEET 1 OF 4
AUR (AS LAID OUT IN FIELD)		CONTRACT NO.: 440-92-006	SURFACE ELEV.: DATE 12/29/92

O.D. 3" I.D. 2 1/8" | CASING SIZE: AUGERS | HOLE TYPE: 'A' MONITOR | HAMMER WT. 140 LBS. O.D. | FALL 30"

T. CRAIG

L. Connor

GROUND WATER LEVEL

Date	Time	Depth	Remarks
12/29/92	PM	7.5	SEE 4 OBSERVED WHILE SAMPLING.
12/29/92		—	TIP INITIALLY DISTURBED

DEPTH	SPOON BLOWS/6"	RE-COV'D	SAMP. NO.	SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
0				6" ASPHALT 0.5'
	AUGER	24"	1	SD - GRAVEL - SILT (FILL) 2.5'
	AUGER	24"	2	BROWN F-M SD, TR-SOME SILT - TR. GRAVEL (FILL)
5	6 6 6 4	24"	3	" SAME" SLIGHT OIL ODOR
	4 6 10 10	24"	4	" SAME" " " "
10	4 5 12 12	24"	5	" SAME" " " "
	5 5 6 6	24"	6	" SAME" " " "
	4 6 8 9	24"	7	" SAME" " " "
15	2 1 1 1	24"	8	TOP 6" " SAME" 15.0' BOT 18" GREY ORG. SILT - TR. SD - TR. PEAT 16.5'
				BOTTOM OF BORING
20				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

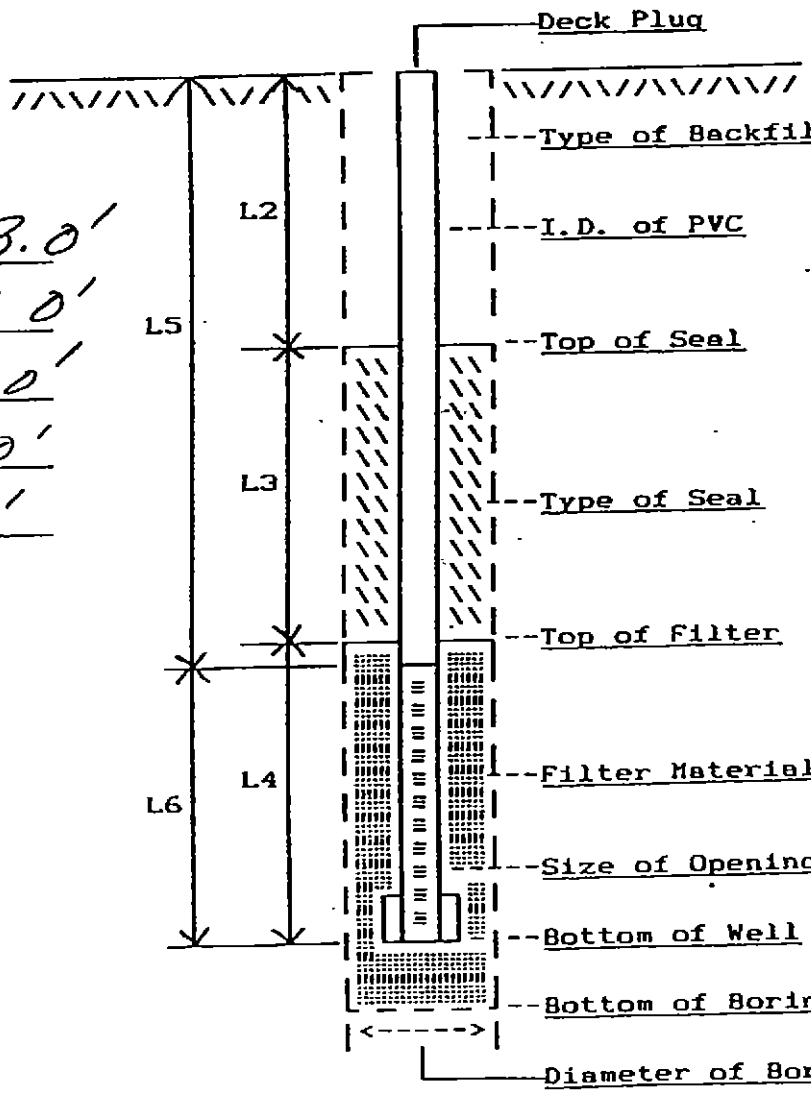
The Port Authority of New York and New Jersey
Engineering Department - Materials and Research Division

Well Installation Report

Project: TERMINAL B.	Contractor TESTWELL-CRAIG
Location EWR	Contract No 40-92-006
Driller T. CRAIG.	Inspector [illegible]
Well No. MW 64	Type of Well "H" MONITOR Date 11/23/92

Well Development

Date	Water Level Before	Water Level After
Note: Water level readings from top of PVC	Taken _____ min. After Development	



L2 = 3.0'
L3 = 1.0'
L4 = 10.0'
L5 = 5.0'
L6 = 9.0'

Type of Backfill: CEMENT GROUT SAND
I.D. of PVC: 2"
Top of Seal: 3.0'
Type of Seal: BENTONITE
Top of Filter: 4.0'
Filter Material: WELL GRAVEL
Size of Openings: 0.020
Bottom of Well: 14.0'
Bottom of Boring: 16.5'
Diameter of Boring: 8" O.D.

Remarks: Hole back filled from 16.5' to 14.0' with well gravel.

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Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: TERMINAL A&B	NAME OF CONTRACTOR: TESTWELL-CRAIG	BORING NO.: MW 69	SURFACE ELEV.
LOCATION: EWR (AS LAID OUT IN FIELD)		CONTRACT NO.: A10-92-006	DATE: 10/29/92

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGERS	4" Monitor
HAMMER: 140 # FALL 30	HAMMER: SOIL O.D # FALL	
DRILLER: J. CRAIG		
INSPECTOR: L. Gannon		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
10/29/92	P.M.	8.5'	S.F. 5 OBSERVED WHILE SAMPLING
10/30/92	P.M.	—	TMP. MW 14 INITIALLY INSTALLED

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP.[2] NO.	*SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				6" ASPHALT 0.5
		AUGERS	24"	1	SI - GRAVEL - SILT (FILL) 2.5
		AUGERS	24"	2	BROWN F-M SD. - TR. SILT - TR. GRAVEL (FILL)
	5	7 9 10	24"	3	" SAME " SLIGHT OIL ODOR
		7 10 8 9	24"	4	" SAME " " " "
	10	4 5 5 3	24"	5	" SAME " " " "
		4 4 4 4	24"	6	" SAME " NO ODOR
		4 2 2 1	24"	7	" " 14.5
	15	1 1 1 1	24"	8	DK. GREY ORG. SILT - TR. FINE SAND 16.5
					BOTTOM OF BORING
	20				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

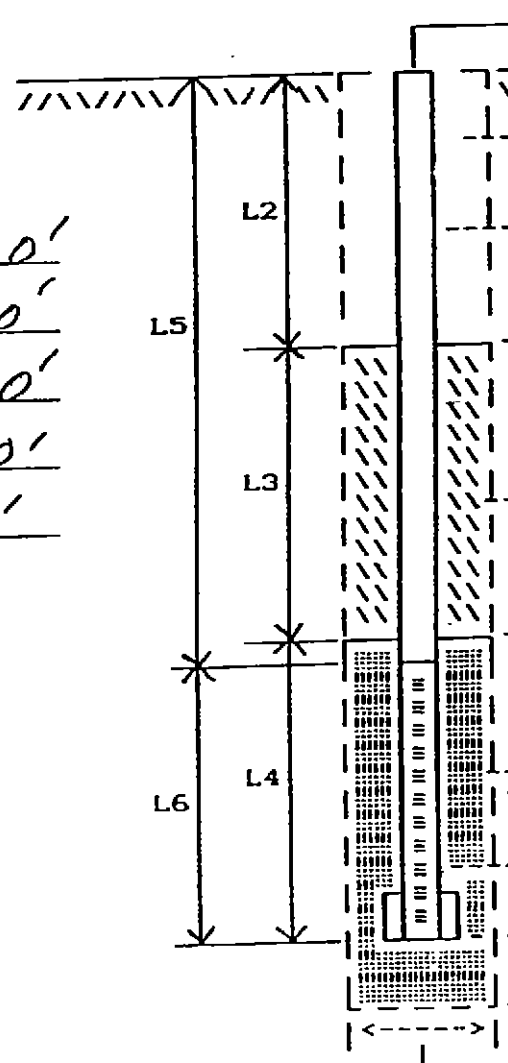
The Port Authority of New York and New Jersey
Engineering Department - Materials and Research Division

Well Installation Report

Project: TERM. A+B	Contractor Kenney-Cea
Location EWR BREWSTER RD	Contract No. 410-92-00
Driller J. CRAIG	Inspector
Well No. MW 65	Type of Well MONITOR / Date 10/28/92

Well Development

Date	Water Level Before / Water Level After
Note: Water level readings from top of PVC	Taken _____ min. After Development



L2 = 4.0'
L3 = 1.0'
L4 = 6.0'
L5 = 6.0'
L6 = 5.0'

Type of Backfill: CEMENT GROUT / SAND
I.D. of PVC: 2"
Top of Seal: 4.0'
Type of Seal: BENTONITE
Top of Filter: 5.0'
Filter Material: WELL GRAVEL
Size of Openings: 0.020
Bottom of Well: 11.0'
Bottom of Boring: 12.0'
Diameter of Boring: 8" OD

Remarks

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: INVEST. OF FUEL LINES	NAME OF CONTRACTOR: TESTWELL CRAIG	BORING NO.: MW 6S	SURFACE ELEV.:
LOCATION: EWTR A & B TERMINAL		CONTRACT NO.: A10-92-006a	DATE: 10/26/92

SPOON	CASING SIZE	HOLE TYPE
2" O.D. 1 3/8" I.D.	4" ODEX	8" 'A' Mount

HAMMER: 140 # FALL 30" — HAMMER: 5" O.D. # FALL

DRILLER: J. CRAIG

INSPECTOR: L. Barrone

GROUND WATER LEVEL

Date	Time	Depth	Remarks
10/26/92	PM	8.0'	SET 5 OBSERVED WHILE SAMPLING
10/28/92	PM	—	TIP. MW 11.0' INITIALLY DISTALLED

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- COV'D [1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0	2-3	22"	1	CROSS OVER BELT F-M SD - TR SILT TR GRAVEL (FILL) 0.0
		4-4			
		3-2	24"	2	BROWN F-M SD - TR SILT - TR GRAVEL (FILL)
		1-1			
	5	1-0	24"	3	" SAME "
		1-0			
		7-9	24	4	" SAME "
		13-13			
		4-4	24"	5	" SAME "
	10	5-6			
		1-1	24"	6	TOP 1' " SAME " 11.0
		1-1			BOT 1' GREY BRN ORG SILT - TR FINE SAND
					BOTTOM OF BORING
	15				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: EWR TERMINAL A & B	NAME OF CONTRACTOR: CRAIG	BORING NO.: MW-66	SURFACE ELEV.:
LOCATION: INSIDE POSTAL SERVICE PARKING LOT 10'± FROM GATE 37		CONTRACT NO.: 426-96-003	DATE: 3/18/96 - 3/19/96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGERS	4" MONITOR

HAMMER	HAMMER
140 # FALL 30"	# FALL

DRILLER: B. KIMLEY

INSPECTOR: C. PEREZ

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/19/96	AM	6.0	SAMPLE # 4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
	0				ASPHALT	0.0' 0.4'
		HAND	20"	1	FILL - brown m-f SAND, trace Silt, trace Gravel	
		AUGER.				
			24"	2	FILL - SAME	
	5					
			24"	3	FILL - SAME	6.0'
		17-22				
		23-19	19"	4	FILL - grey-brown C-f SAND, trace Silt, trace Gravel	
		5-6			FILL - SAME	
		7-8	20"	5	~~grey organic CLAY~~	9.8' 10.0'
	10				BOTTOM OF BORING	
					NOTE: ALL SAMPLE WERE SCREENED FOR VOC's USING PID. SAMPLE #4 WAS SAVED IN ONE 4 OZ JAR AND ONE 16 OZ JAR. THE REMAIN SAMPLE WERE DISCARDED.	
	15					

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

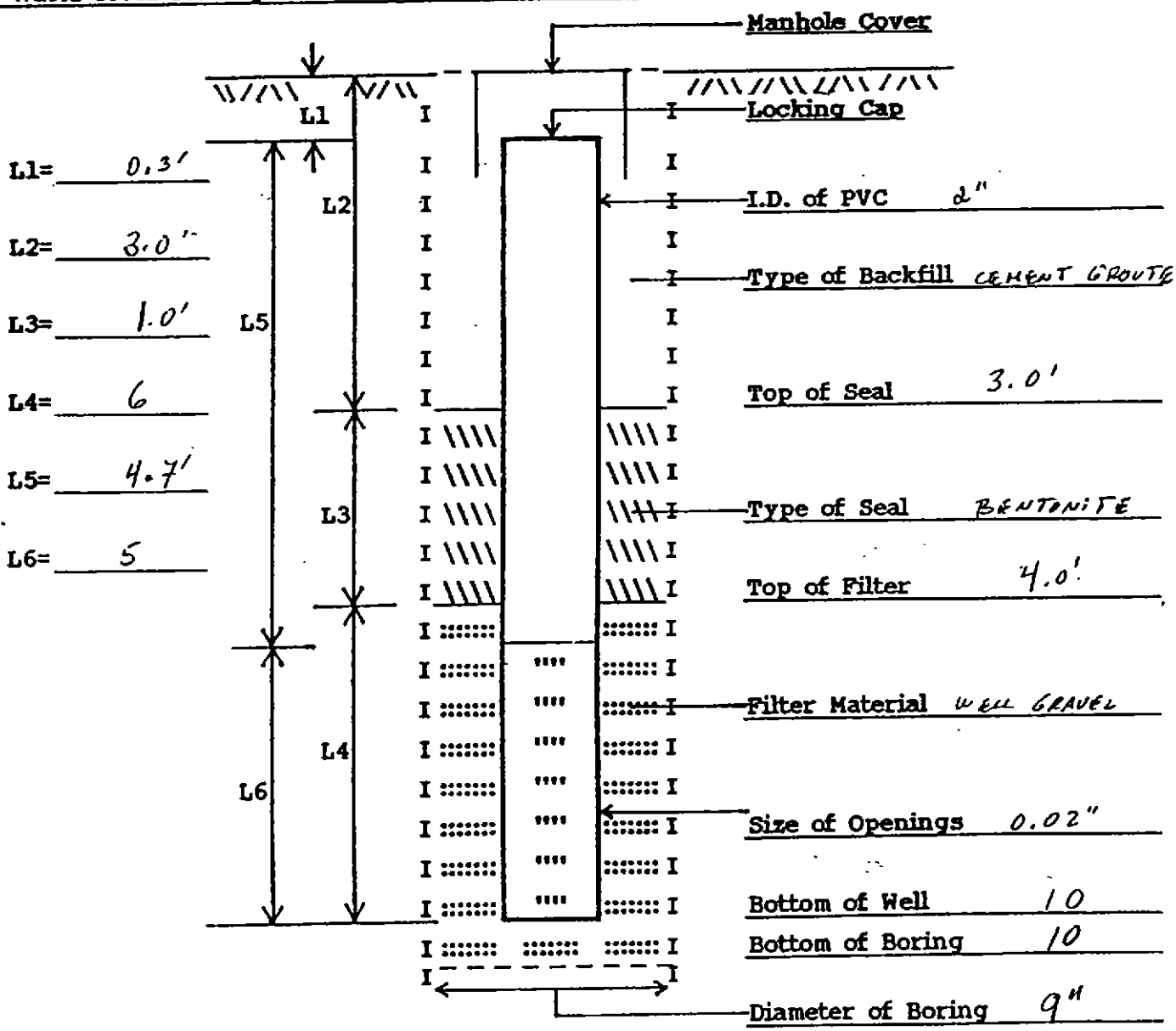
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR TERMINAL A & B	Contract No.: 426.96.003
Location: INSIDE POSTAL SERVICE PARKING LOT 10' FROM GATE 37	Contractor: GRAIG
Driller: B. KIMLEY	Inspector: C. PEREZ.
Well No.: MW-66	Type of Well: "A" MONITOR
	Date: 3/19/96

Well Development

Date: 3/19/96	Water Level Before: 6.6'	Water Level After: 6.6'
Note: Water level readings from top of PVC	Taken 35 min. After Development	



Remarks:

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: CWR - Term A & B	NAME OF CONTRACTOR: Craig	BORING NO.: MW-67	SURFACE ELEV.
LOCATION: As laid out in field (PKG. 4 of 'D' @ Const. GATE)		CONTRACT NO.: 426-96-003	DATE: 3/23/96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.		Ammerton

HAMMER (SAFETY)	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: B. Kimley

INSPECTOR: T. R

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/23/96	1:35p	8.0'	In sample # 4 (Typ. 4 pm)

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				Asphalt 0.1'
		Hand Auger			Sand & Gravel 1.0'
			12"	1	Fill - RdBr m-f Sand, tr Silt, tr Gravel.
					Same
			24"	2	
	5				Same
		↓	24"	3	
		22-24			Same
		34-40	15"	4	
		7-8			Same
		9-10	14"	5	
	10	3-4			Same
		4-4	18"	6	
		2-2			Same 13.0'
		3-4	16"	7	Al-y silty Clay 14.0'
	15				Bottom of Boring
					Note: Sample # 4 was saved for testing. Samples' # 1-3 & 5-7 were screened w/ HNU & then discarded

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

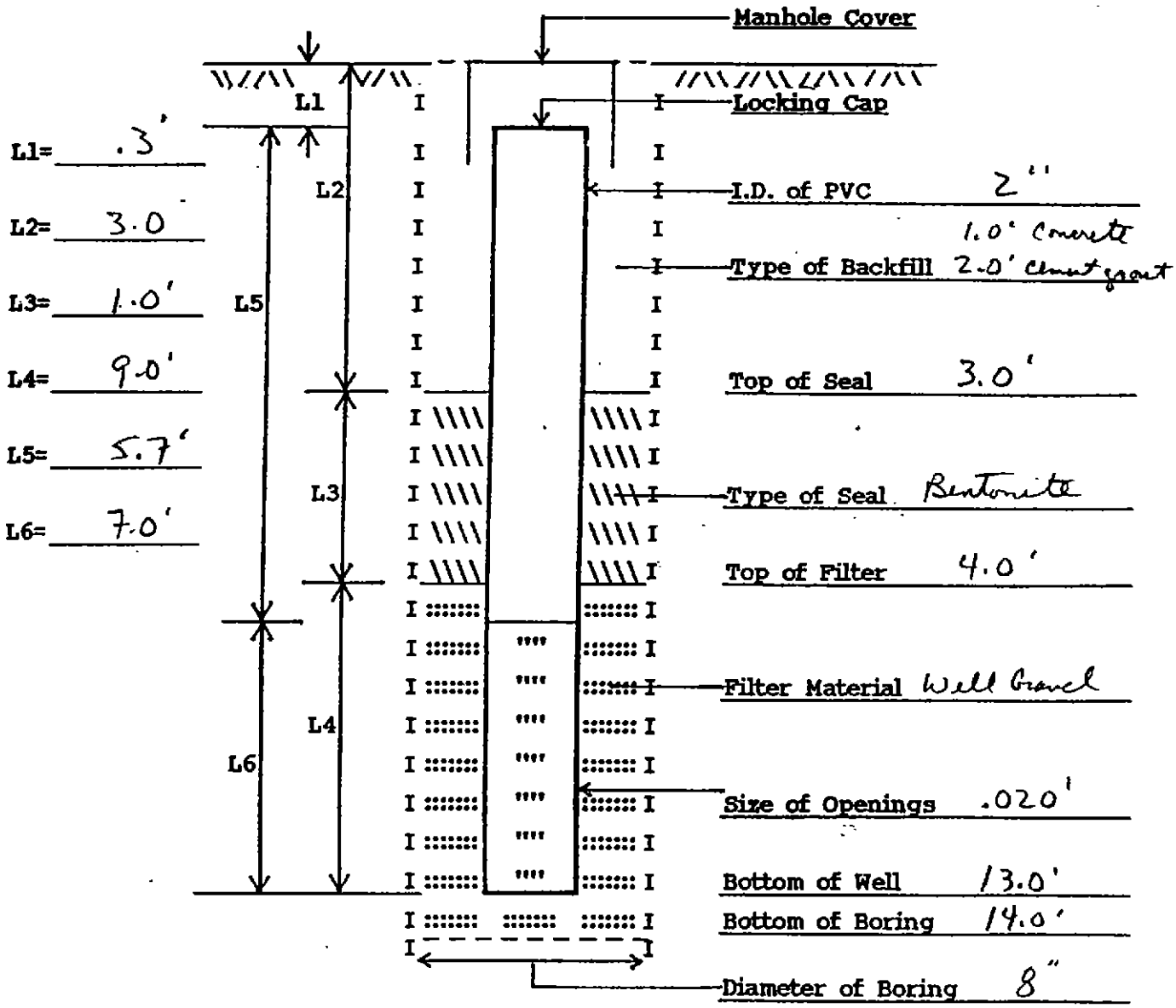
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR Term A & B	Contract No.: 426-96-003
Location: As laid out in field	Contractor: Craig
Driller: B. Kimley — Inspector: T. Ryan	
Well No.: 67 — Type of Well: Ammann	Date: 3/23/96

Well Development

Date: 3/23/96	Water Level Before: 8.0'	Water Level After: 8.0'
Note: Water level readings from top of PVC	Taken 20 min. After Development	



Remarks: Backfilled w/ bentonite from 14' to 13' with bentonite

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: EWR - Term A & B	NAME OF CONTRACTOR: Cray	BORING NO.: MW-68	SURFACE ELEV.
LOCATION: As laid out in field (Parking lot 'D')		CONTRACT NO.: 426-96-003	DATE: 3/23/96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Augers-6"	Mounted

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: B. Kimley
INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/23/96	11:30A	8.0'	In sample #4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D	SAMP. NO.	SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Undisturbed	0	Hand auger			Asphalt 0'-0.5'
					Sand & Gravel 0.5'-1.2'
			12"	1	Fill - Red Br M-F Sand, t Silt, t Gravel
				2	Same
			24"		
	5			3	Same.
			24"		
Augers		17-29		4	Same
		30-35	22"		
		28-37		5	Red silty Clay, some cinders, little Glass, t Brick 4.2'-5.0'
	10	35-14	18"		
		16-22		6	Same
		24-19	12"		
		4-4		7	Same w/ org silty clay in top spoon 9.0'-10.0'
		3-4	16"		
	15				Bottom of Boring 14.0'
	20				Note: Sample #4 was saved for testing. Samples #1, 2, 3, 5, 6 & 7 were screened w/ Hand & then discarded
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

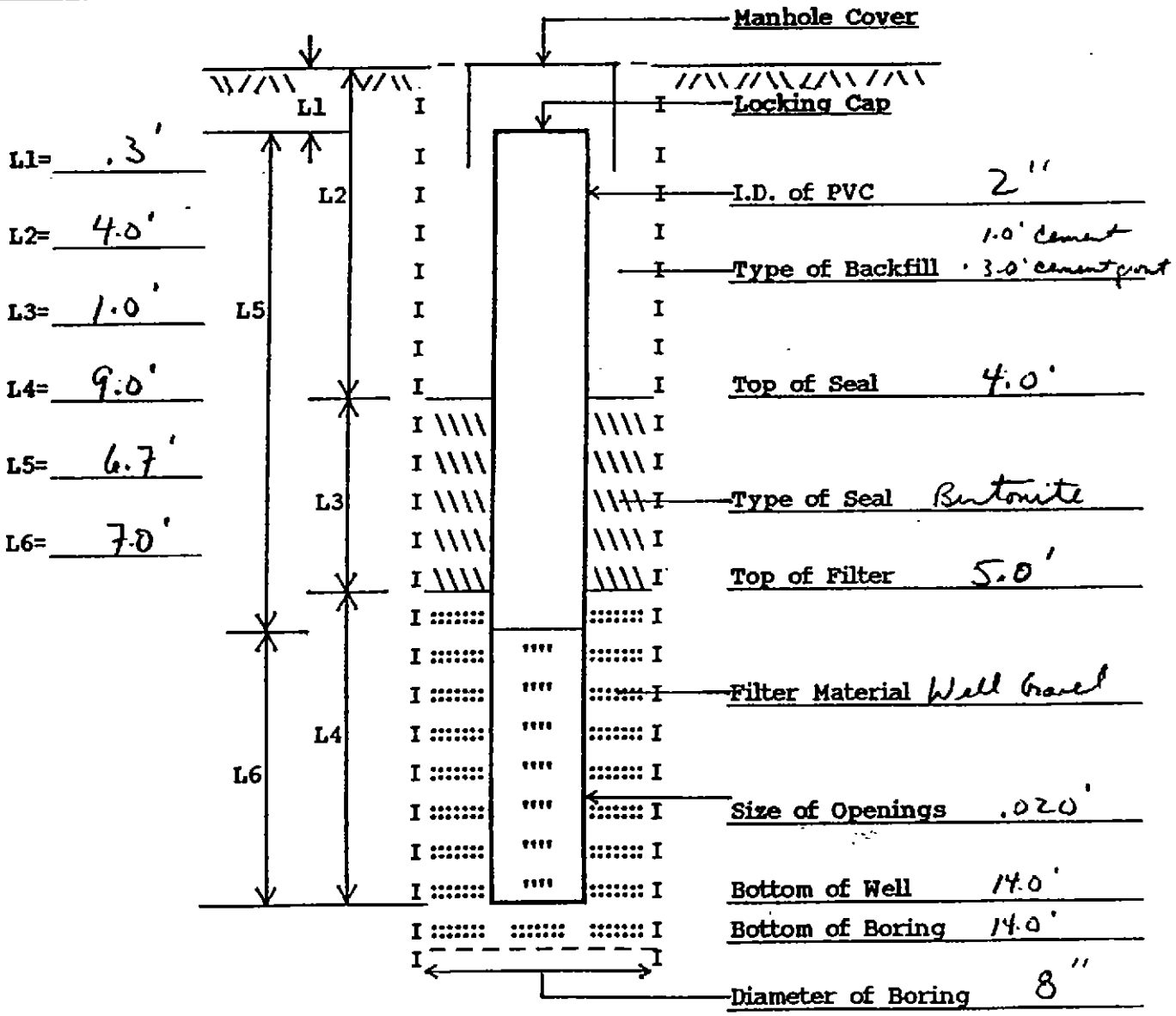
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR-Term A & B	Contract No.: 426-96-003
Location: As Laid out in field (Parking Lot 'D')	Contractor: Craig
Driller: B. Kimley	Inspector: T. Ryan
Well No.: MW-68	Type of Well: Monitor
	Date: 3/23/96

Well Development

Date: 3/23/96	Water Level Before: 8.0'	Water Level After: 8.3'
Note: Water level readings from top of PVC	Taken 30 min. After Development	



Remarks:

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: EWTR TERMINALS A & B	NAME OF CONTRACTOR: CRAIG	BORING NO.: MW-69	SURFACE ELEV.
LOCATION: TERMINAL "A" WEST BUS STOP ; 55' EAST OF CURB		CONTRACT NO.: 426.96.003	DATE: 3-25-96
SPOON: 3 "O.D. 2 3/8 "I.D.	CASING SIZE: AUGERS	HOLE TYPE: "A" MOD. TOR	
HAMMER (SAFETY): 140 # FALL 30 "	HAMMER: # FALL "		
DRILLER: B. KIMLEY			
INSPECTOR: M. OUDEH			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/25/96	AM	8.3'	Found in Sample #5

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
Hollow	0	HAND	24"	1	FILL DK. BR. C-F SAND, TR GRAVEL, TR SILT	0.7'
STEM		AUGER			FILL BR C-F SAND, TR GRAVEL, TR SILT	
AUGERS			24"	2	SAME	
	5		24"	3	SAME	
		10-22-34-47	20"	4	SAME	
		14-24-26-34	21"	5	SAME	
	10	10-17-11-5	18"	6 A	SAME	10.7'
				6 B	BR FINE SAND, TR GRAVEL, TR SILT	
		7-7-7-9	22"	7 A	SAME	13.1'
				7 B	DK GREY ORGANIC SILTY CLAY	14.0'
	15				NOTE: ALL SAMPLES WERE SCREENED FOR VOC'S	
					SAMPLE NO.5 WAS SAVED IN 1 ONE pt. JAR	
					AND 1 VOA JAR, THE REMAINING	
					SAMPLES WERE DISCARDED.	
	20				BOTTOM OF BORING	
	25					

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

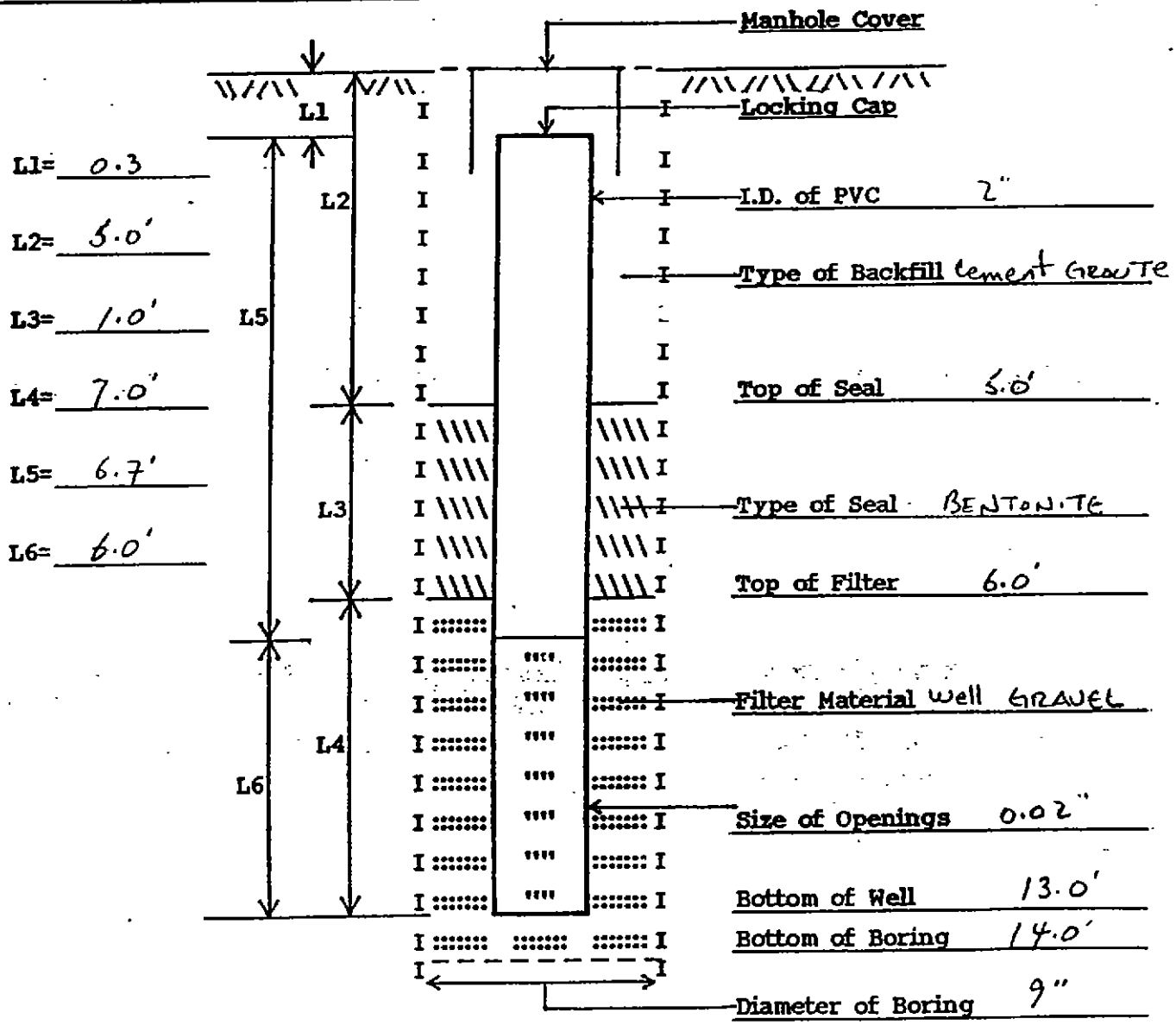
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR TERMINALS A & B			Contract No.: 426-96-003
Location: TERMINAL "A" WEST BUS STOP; 55' EAST OF CURB			Contractor: CRAIG
Driller: B. KIMLEY		Inspector: M. OUDEH	
Well No.: MW-69	Type of Well: "A" MONITOR		Date: 3-25-96

Well Development

Date: 3-25-96	Water Level Before: 7.9'	Water Level After: 7.9'
Note: Water level readings from top of PVC	Taken 35	min. After Development



Remarks: Backfilled 14' to 13' with BENTONITE

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
EWR TERMINALS A & B	CRAIG	MW-70	
LOCATION		**CONTRACT NO.**	**DATE**
AS LAID OUT BY P.A. SURVEY		426-96-003	3-8-96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Augers	"A" Monitor

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: B. KIMLEY

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3-8-96	12 35	8.5'	Found in S #5

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Hollow	0				CONCRETE 0.5'
					CRUSHED STONE 0.9'
STEM		Hand	25"	1	FILL BR M-F SAND, TR GRAVEL, TR SILT
AUGERS		Auger			
		SAME	24"	2	SAME
	5				
		SAME	12"	3	SAME
		11-11-12-16	24"	4	FILL BR M-F SAND, Little Gravel, TR SILT
		16-32-44-48	20"	5	FILL BR C-F SAND, Some GRAVEL, TR SILT
	10				
		10-13-14-13	18"	6	FILL Grey-BR C-F SAND, Little Gravel, TR SILT
		2-3-4-5	20"	7A	SAME 13.1'
				B	GRAY-BR ORGANIC SILTY CLAY 14.0'
	15				
					BOTTOM of Boring
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

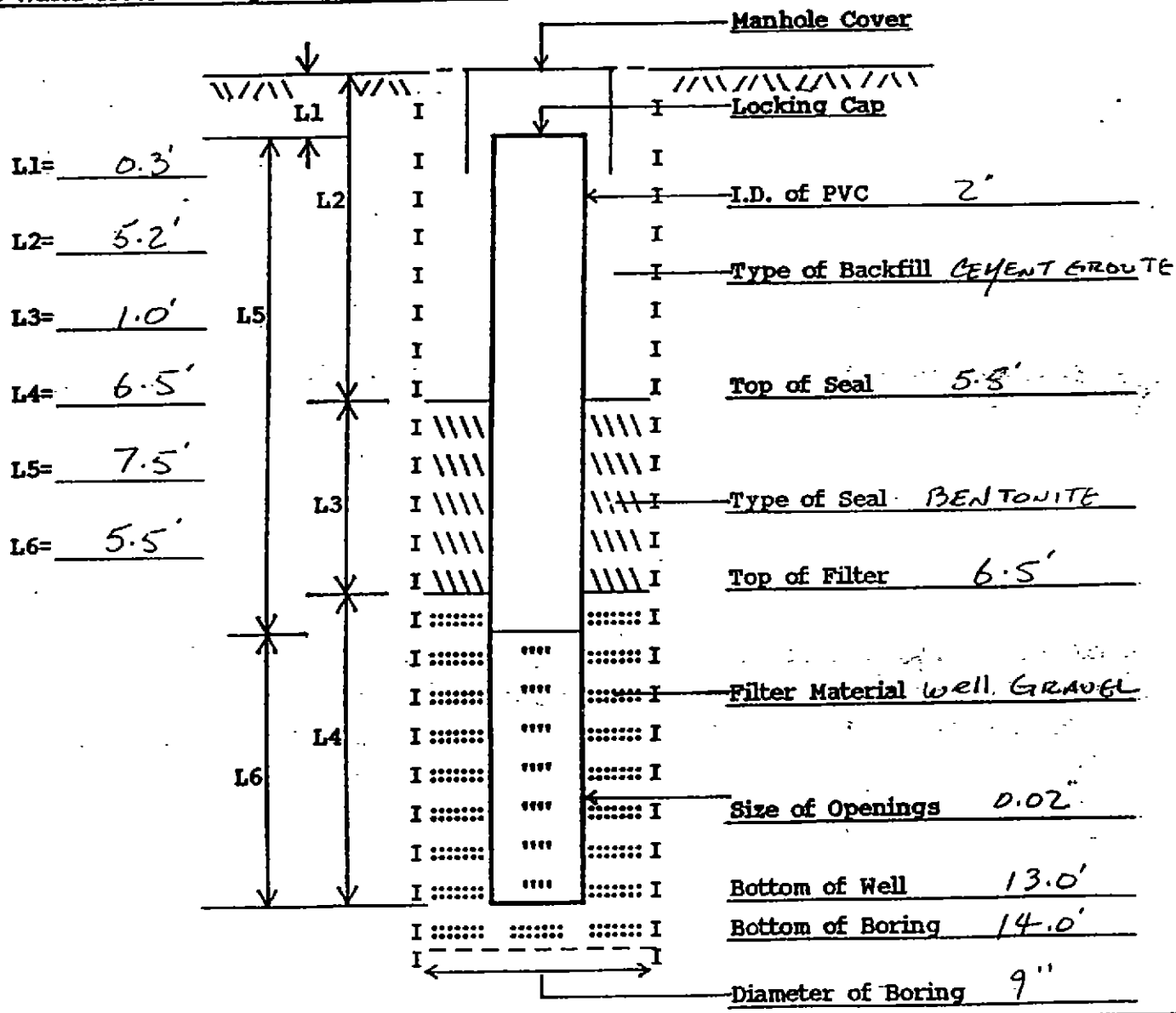
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR TERMINALS A & B			**Contract No.:** 426-96-003
Location: AS LAID OUT BY P.A. SURVEY			**Contractor:** CRAIG
Driller: B. KIMLEY		**Inspector:** M. OUDEH	
Well No.: MW-70	**Type of Well:** "A" MONITOR		**Date:** 3-8-96

Well Development

Date: 3-12-96	**Water Level Before:** 7.9'	**Water Level After:** 7.9'
Note: Water level readings from top of PVC	**Taken** 60 **min. After Development**	



Remarks: BACKFILLED 14' to 13' WITH BENTONITE.

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: EWR TERMINALS A & B	NAME OF CONTRACTOR: CRAIG	BORING NO.: HW-71	SURFACE ELEV.:
LOCATION: AS LAID OUT BY P.A. SURVEY		CONTRACT NO.: 426-96-003	DATE: 3-13-96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGERS	4" MONITOR
HAMMER (SAFETY) 140 # FALL 30 "	HAMMER # FALL "	
DRILLER: B. KIMLEY		
INSPECTOR: M. OUDELL		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/13/96	AM	8.8'	FOUND IN S #4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Hollow Stem Augers	0				ASPHALT 0.5'
					CRUSHED STONE, FLYASH 2.3'
		HAND AUGER	19"	1	FILL BR M-F SAND, TR GRAVEL, TR SILT
	5		24"	2	SAME
		18-24-44-58	20"	3	SAME
		22-29-34-45	18"	4	FILL BR C-F SAND, LITTLE GRAVEL, TR SILT (FUEL ODOR)
	10	8-17-24-24	21"	5	SAME
		11-15-12-10	20"	6	FILL BR-GREY C-F SAND, LITTLE GRAVEL, TR SILT
		9-9-7-8	22"	7A	SAME 14.4'
	15			7B	GREY ORGANIC SILTY CLAY, SOME PEAT 16.0'
					NOTE: ALL SAMPLES WERE MEASURED FOR VOC'S USING PID. SAMPLE NO. 4 WAS SAVED IN A 4 oz JAR, THE REMAINING SAMPLES WERE DISCARDED.
	20				BOTTOM OF BORING
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

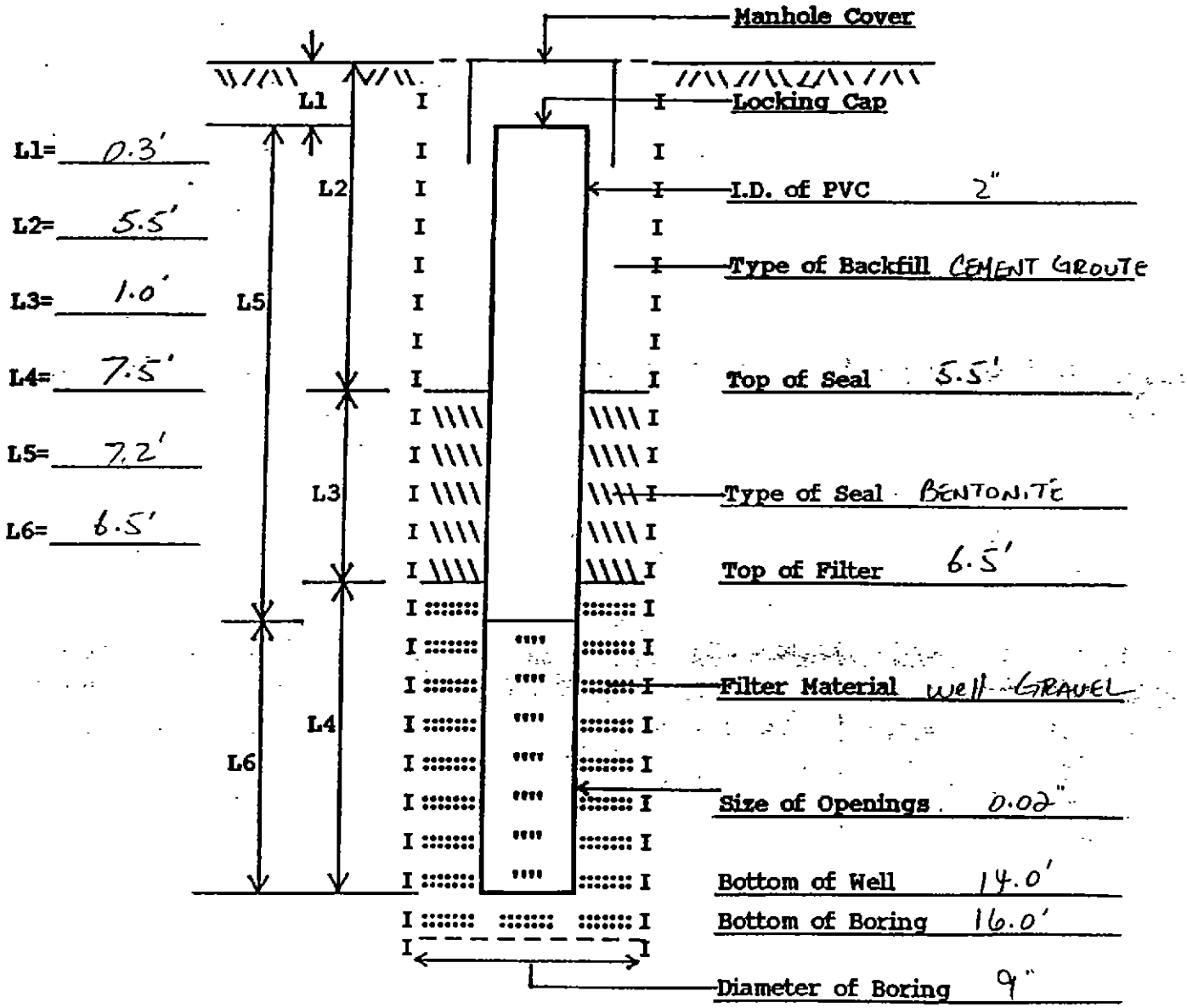
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR TERMINALS A & B			**Contract No.:** 426-96-003
Location: AS LAID OUT BY P.A. SURVEY			**Contractor:** CRAIG
Driller: B. KIMLEY		**Inspector:** M. OUDEH	
Well No.: MW-71	**Type of Well:** "A" MONITOR		**Date:** 3-13-96

Well Development (DID NOT DEVELOPE FUEL IN well)

Date: 3-13-96	**Water Level Before:** 8.6'	**Water Level After:**
Note: Water level readings from top of PVC	**Taken**	**min. After Development**



Remarks: BACKFILLED 16' to 14' WITH BENTONITE

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
EWR TERMINALS A & B	CRAIG	MW-72	
LOCATION		**CONTRACT NO.**	**DATE**
± 70' SOUTH FROM ORIGINAL LOCATION		426-96-003	3-13-96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGERS	4" MONITOR
HAMMER (SAFETY)	HAMMER	
140 # FALL 30 "	# FALL "	
DRILLER: B. KIMLEY		
INSPECTOR: M. OUDEH		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/13/96	AM	8.5'	FOUND IN S #4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				ASPHALT 0.5'
Hollow					CRUSHED STONE 1.8'
Stem					
Augers		HAND	35"	1	FILL BR M-F SAND, TR GRAVEL, TR SILT
		AUGER			
	5		24"	2	SAME
		18 37 39 51	18"	3	FILL BR M-F SAND, TR GRAVEL, TR SILT (1 PIECE OF 2"x2" FOUND IN SPOON SAMPLE)
		8 11 33 56	20"	4	FILL BR C-F SAND, LITTLE GRAVEL, TR. SILT
	10				
		25 35 45 55	20"	5	SAME
		25 18 22 24	18"	6	SAME (SLIGHT FUEL ODOR)
		5 6 6 9	22"	7A	SAME 14.5'
	15			7B	BR ORGANIC SILTY CLAY, SOME PEAT 16.0'
					NOTE: ALL SAMPLES WERE SCREENED FOR VOC'S. SAMPLES NO. 4 & NO. 6 WERE EACH SAVED IN 4 oz JARS, THE REMAINING SAMPLES WERE DISCARDED.
	20				BOTTOM OF BORING
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

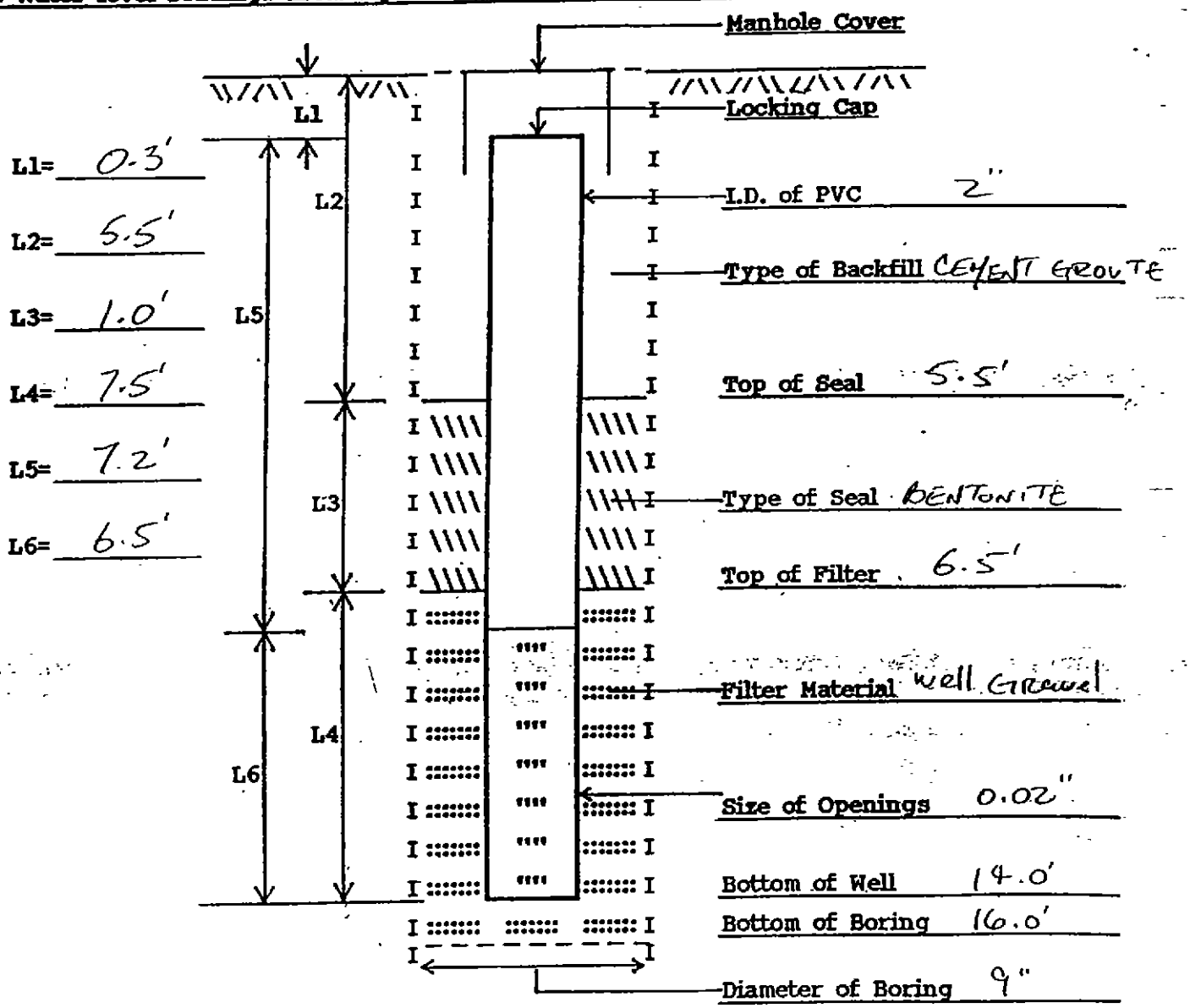
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR TERMINALS A&B		**Contract No.:** 426-96-003	
Location: ±70' SOUTH FROM ORIGINAL LOCATION		**Contractor:** CRAIG	
Driller: B. KIMLEY		**Inspector:** M. OUDEH	
Well No.: HW-72	**Type of Well:** "A" MONITOR	**Date:** 3-13-96	

Well Development

Date: 3-13-96	**Water Level Before:** 8.7'	**Water Level After:** 8.7'
Note: Water level readings from top of PVC	**Taken** 65 **min. After Development**	



Remarks: BACKFILLED 16' to 14' with BENTONITE.

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
EWR TERMINALS A & B	CRAIG	MW-73	
LOCATION		**CONTRACT NO.**	**DATE**
HAZDSTAND AMELIA – ±85' EAST OF THE LETTER "M" OF "AMELIA"		426-96-003	3-9-96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGER	A "MONITOR
HAMMER (SAFETY) 140 # FALL 30 "	**HAMMER** # FALL "	
DRILLER B. KIMLEY		
INSPECTOR M. OUDEH		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3-9-96	AM	6.4'	FOUND IN S#3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Hollow STEM AUGERS	0				CONCRETE 1.5'
		HAND AUGER	24"	1	FILL BR F-F SAND, TR GRAVEL, TR SILT
	5	HAND AUGER	30"	2	SAME
		6-12-18-24	21"	3	SAME
		19-32-30-57	20"	4	FILL BR C-F SAND, LITTLE GRAVEL, TR SILT (FUEL ODOR)
	10	12-15-12-11	20"	5	SAME
		5-5-4-3	22"	6 A	SAME 13.3'
				B	GREY-BR ORGANIC SILTY CLAY, TR PEAT 14.0'
	15				NOTE: EACH SOIL SAMPLE WAS SCREENED FOR VOCs. SAMPLES NO. 4 & 5 WERE EACH SAVED IN 4 OZ JARS. REMAINING SAMPLES WERE DISCARDED.
	20				BOTTOM OF BORING
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

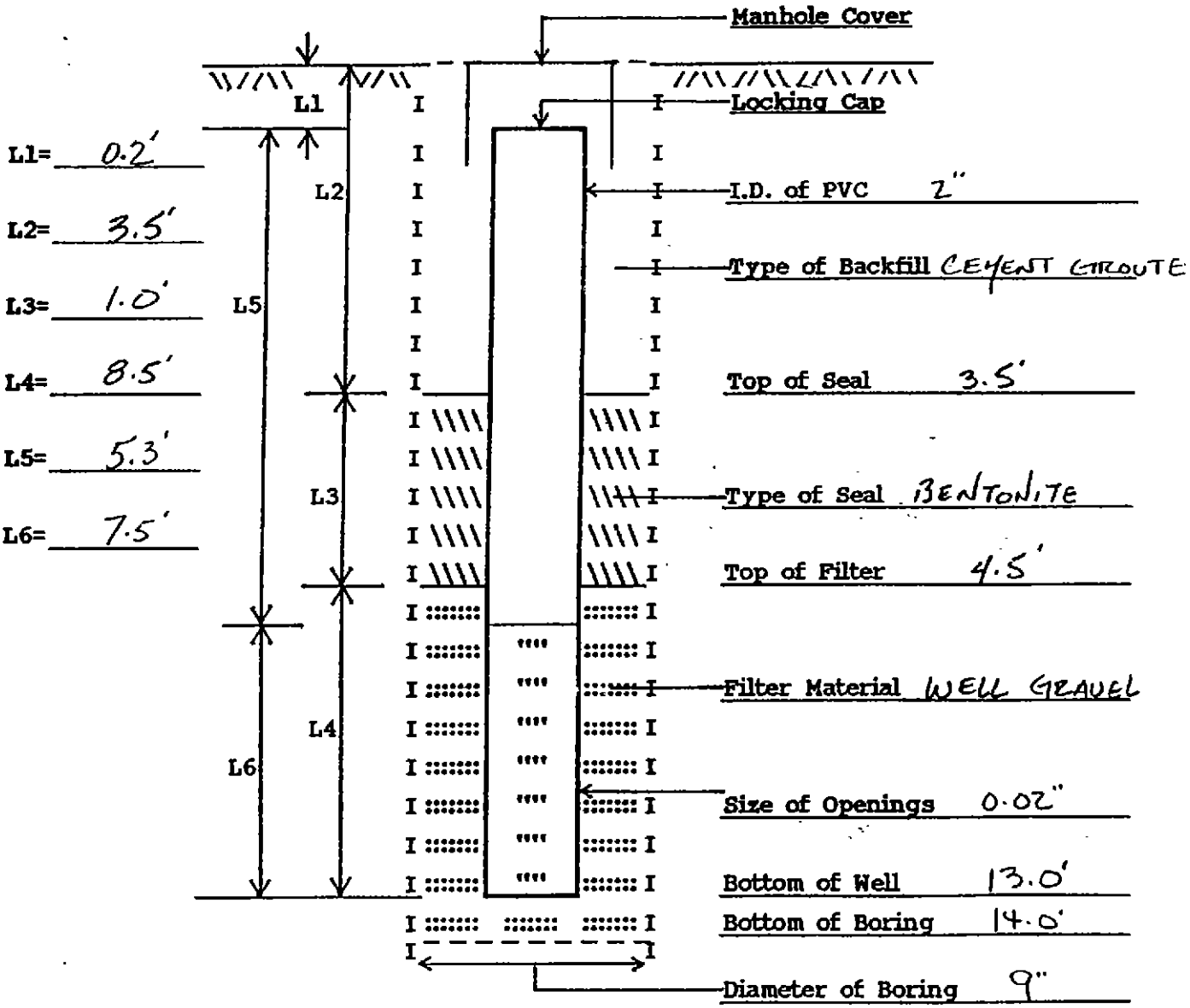
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR TERMINALS A & B	Contract No.: 426-96-003
Location: HARDSTAND AMELIA; ±85' E of THE LETTER "M" of AMELIA	Contractor: CRAIG
Driller: B. KIMLEY	Inspector: M. OUDEH
Well No.: MW-73	Type of Well: "A" MONITOR
	Date: 3-9-96

Well Development

Date: 3-12-96	Water Level Before: 6.8'	Water Level After: 6.8'
Note: Water level readings from top of PVC	Taken 70 min. After Development	



Remarks: BACKFILLED 14' to 13' WITH BENTONITE

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
EWR TERMINALS A & B	CRAIG	MW-74	
LOCATION		**CONTRACT NO.**	**DATE**
AS LAID OUT BY P.A. SURVEY		426-96-003	3-12-96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGERS	"A" MONITOR
HAMMER (SAFETY) 140 # FALL 30 "	**HAMMER** # FALL "	
DRILLER B. KIMLEY		
INSPECTOR M. OUDEH		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/12/96	AM	7.9'	FOUND IN S #3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	*SAMPLE DESCRIPTION AND REMARKS ____ LINE LOCATES CHANGE OF PROFILE
	0				ASPHALT 0.5'
Hollow					CRUSHED STONE, FLYASH, CEMENT 2.6'
STEM		HAND		1	FILL BR M-F SAND, TR SILT, TR GRAVEL
AUGERS	5	AUGER	17"		
			24"	2	SAME
		32-28-34-44	20"	3	SAME
		40-34-29-36	15"	4	FILL BR-GREY C-F SAND, LITTLE GRAVEL, LITTLE SILT
	10	9-8-7-7	16"	5	MISC. FILL GREY-BR C-F SAND, GLASS, WOOD, LITTLE SILT 11.3'
					GREY ORGANIC CLAYEY SILT 12.0'
					NOTE: ALL SAMPLES WERE SCREEN FOR VOC's USING PID. SAMPLE NO. 3 WAS SAVED IN A 4 OZ JAR AND THE REMAINING SAMPLES WERE DISCARDED.
	15				BOTTOM OF BORING
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

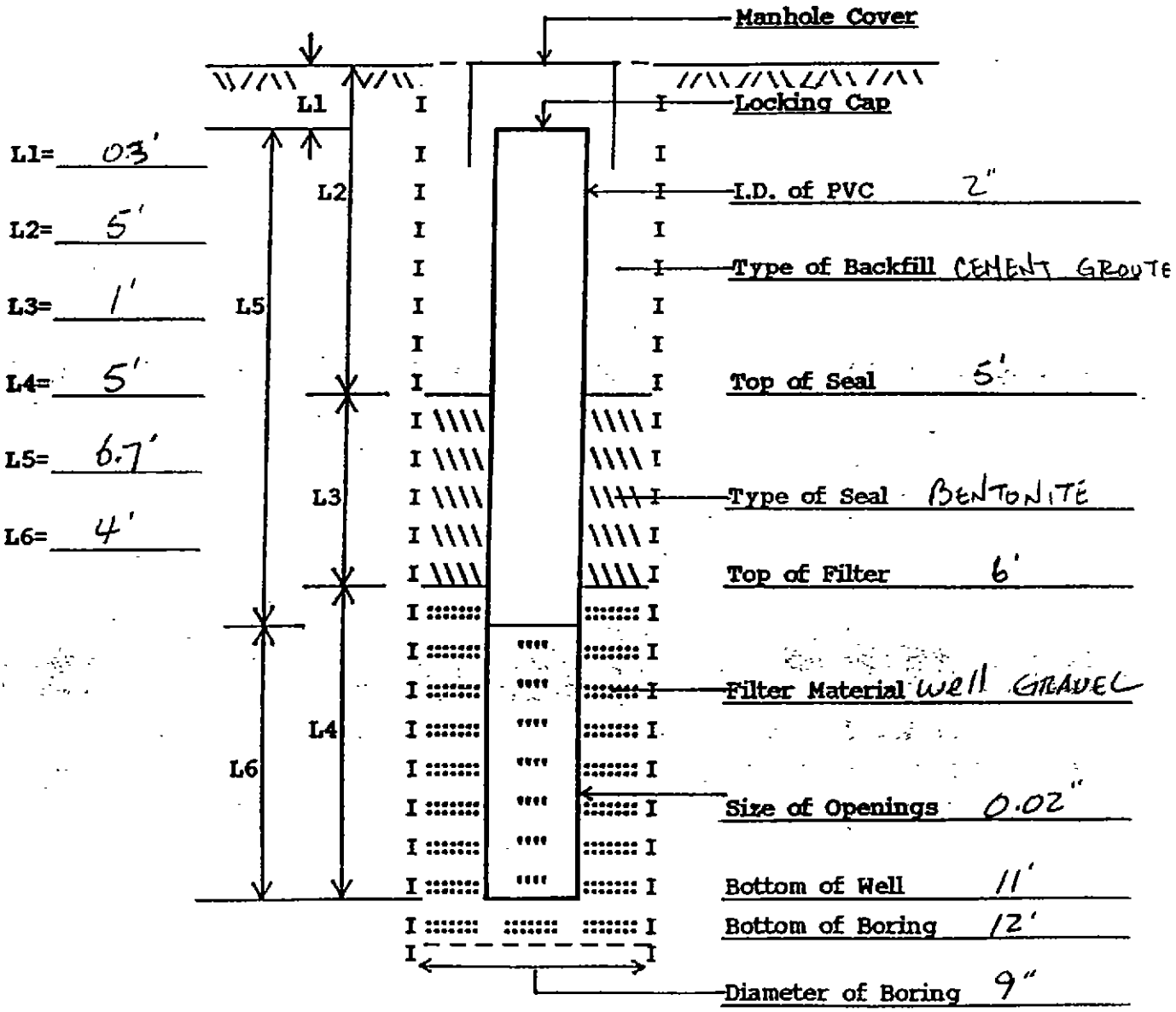
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR TERMINALS A & B			**Contract No.:** 426-96-003
Location: AS LAID OUT BY P.A. SURVEY			**Contractor:** CRAIG
Driller: B. KIMLEY	**Inspector:** M. OUDEH		
Well No.: MW-74	**Type of Well:** "A" MONITOR		**Date:** 3-12-96

Well Development

Date: 3-12-96	**Water Level Before:** 7.1'	**Water Level After:** 7.1
Note: Water level readings from top of PVC	**Taken** 75 **min. After Development**	



Remarks: BACKFILLED 12' to 11' WITH BENTONITE

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET | OF 4

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
EWR TERMINALS A & B	CRAIG	MW-75	
LOCATION: LINDY HARDSTAND (NORTH SIDE) 145' EAST FROM THE LETTER "L" OF "LINDY" & 50' SOUTH FROM NORTH EDGE OF LINDY HARDSTAND (GATE #35)		CONTRACT NO. 426-96-003	DATE 3-11-96

SPOON	CASING SIZE	HOLE TYPE
3" O.D. 2 3/8" I.D.	AUGERS	"A" MONITOR

HAMMER (SAFETY)	HAMMER
140 # FALL 30"	# FALL "

DRILLER: B. KIMLEY

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/11/96	11:24 AM	8.6'	FOUND IN S#5

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Hollow	0				CONCRETE 1.5'
STEM					
AUGERS		HAND	18"	1	FILL BR H.F SAND, TR GRAVEL, TR SILT
		AUGER	24"	2	SAME
	5		12"	3	SAME
		25-27-34-46	20"	4	SAME
		24-17-15-16	24"	5	SAME
	10	15-12-11-12	20"	6	SAME
		28-22-15-12	20"	7	SAME
	15	3-4-5-6	18"	8A	SAME 15.3'
				B	GREY-BR ORGANIC SILTY CLAY, TR PEAT 16.0'
	20				NOTE: ALL SAMPLES WERE SCREENED FOR VOC'S USING A PID. SAMPLE NO. 4 WAS SAVED IN A 4 OZ JAR AND THE REMAINING SAMPLES WERE DISCARDED.
					BOTTOM OF BORING
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

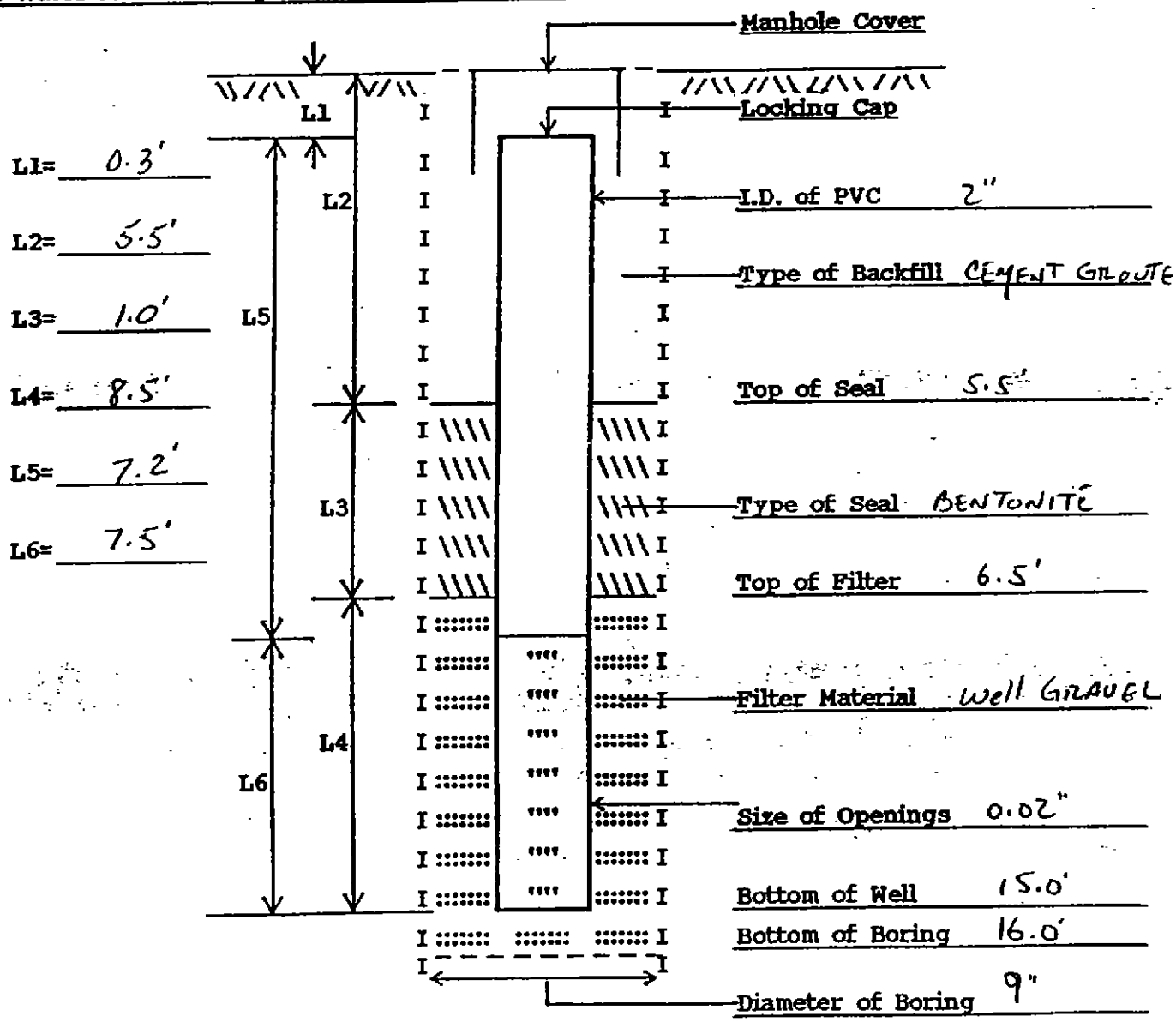
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR TERMINALS A & B	Contract No.: 426-96-003
Location: 145' E. FROM "L" OF LINDY & 50' South From NORTH EDGE	Contractor: CRAIG
Driller: B. KIMLEY	Inspector: M. OUDEH
Well No.: MW-75	Type of Well: "A" MONITOR
	Date: 3-11-96

Well Development

Date: 3-12-96	Water Level Before: 8.3'	Water Level After: 8.3'
Note: Water level readings from top of PVC	Taken 35	min. After Development



Remarks: BACKFILLED 16' to 15' with Bentonite

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 1

PROJECT: EWR TERMINALS A & B	NAME OF CONTRACTOR: CRAIG	BORING NO.: B-76	SURFACE ELEV.:
LOCATION: ±50' NORTH FROM ORIGINAL LOCATION		CONTRACT NO.: 426-96-003	DATE: 3-25-96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGERS	4" MONITOR
HAMMER: SAFETY 140 # FALL 30 "	HAMMER # FALL "	
DRILLER: B. KIMLEY		
INSPECTOR: M. OUDEH		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/26/96	PM	6.4'	Sample #4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. NO. [2]	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Hollow	0	HAND	24"	1 A	FILL DK GREY C-F SAND, TR GRAVEL, TR SILT — 1.7'
Stem		AUGER		1 B	FILL BR C-F SAND, TR GRAVEL, TR SILT
Auger			24"	2	SAME
			24"	3	SAME — 4.8'
	5				
		24. 100/3"	9"	4	FILL GREY C-F SAND, TR GRAVEL, TR SILT
					SAME — 6.8'
					NOTE: ALL SAMPLES WERE DISCARDED.
	10				
					BOTTOM OF BORING
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: EWR TERMINALS A & B	NAME OF CONTRACTOR: CRAIG	BORING NO.: MW-76	SURFACE ELEV.
LOCATION: ±1.5' N.E. FROM B-76		CONTRACT NO.: 426-96-003	DATE: 3.25-96

SPOON: 3 "O.D. 2 3/8 "I.D.	CASING SIZE: Augers	HOLE TYPE: 4" Monitor
HAMMER: SAFETY 140 # FALL 30 "	HAMMER # FALL "	
DRILLER: B. KINLEY		
INSPECTOR: M. OUDEH		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/25/96	Pm	6.4'	Sample 4B

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	*SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Hollow Stem Auger	0	HAND AUGER	24"	1A	Fill DK Grey c-f SAND, TR GRAVEL, TR Silt
				1B	Fill BR c-f SAND, TR GRAVEL TR SILT 1.7
			24"	2	SAME
			24"	3A	SAME 4.9'
	5			3B	Fill Grey c-f SAND, TR GRAVEL, TR SILT
		8-9 9-100/3"	45"	4A	SAME 6.5'
				4B	Misc. Fill Grey c-f SAND, Brick, Tile, Little silt, Tr. wood
		52-N 11-24	18"	5	Misc. Fill DK Grey c-f Sand, PAPER, wood, PLASTIC Little Silt, Little GRAVEL
	10	16-24 22-30	18"	6	SAME
		9-8 6-5	19"	7A	SAME 13.5'
				7B	Bor. ORGANIC PEAT 14.0'
	15				NOTE: All SAMPLES WERE SCREENED FOR VOC's SAMPLE NO. 4B WAS SAVED IN 1 one pt. JAR & 1 4 oz JAR. THE REMAINING SAMPLES WERE DISCARDED.
	20				Bottom of Boring
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

THE PORT AUTHORITY OF N.Y. & N.J.

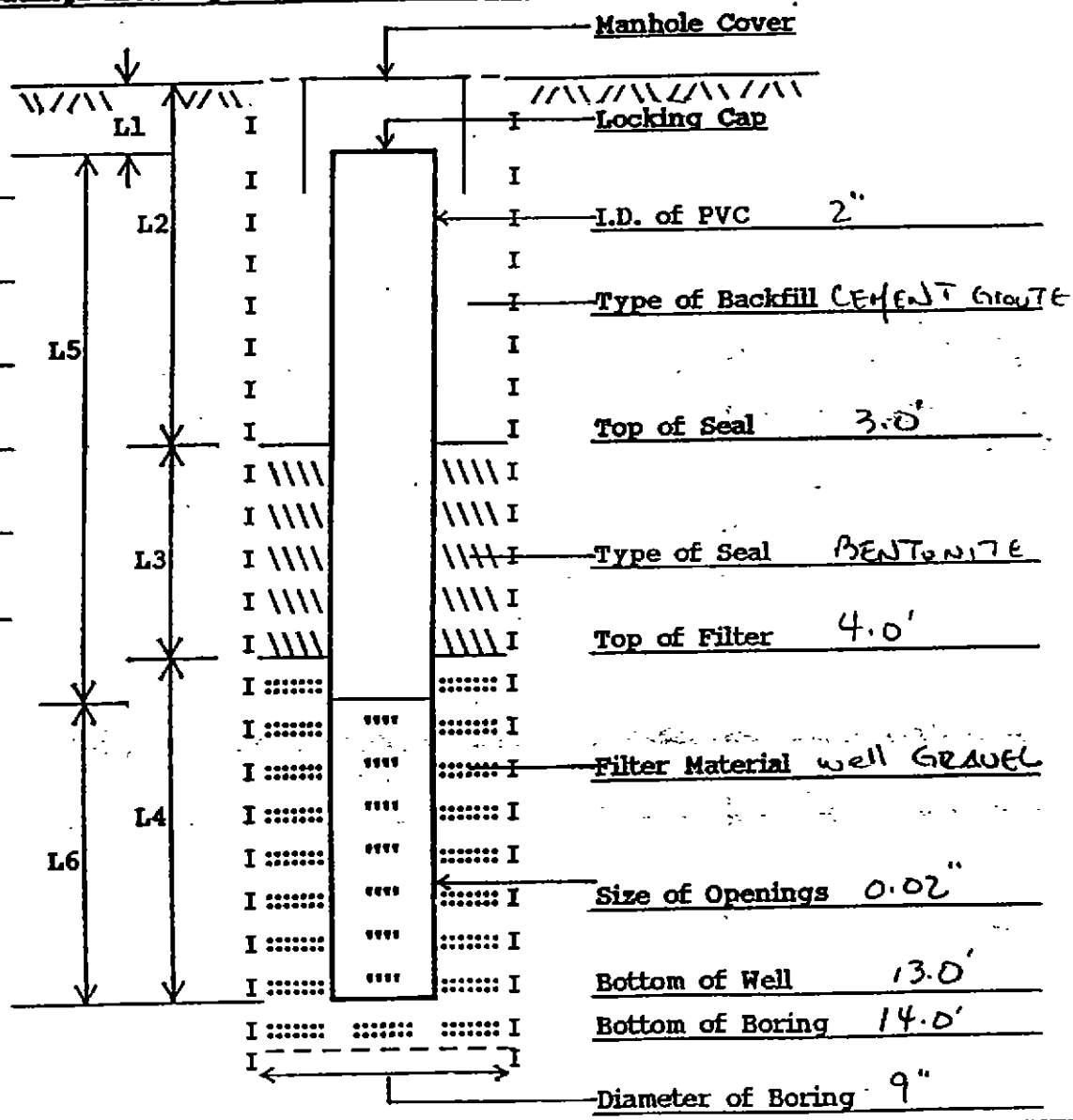
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR TERMINALS A & B	Contract No.: 426-96-003
Location: ± 1.5' N.E. FROM B-76	Contractor: CRAIG
Driller: B. KIMLEY	Inspector: M. DUDEH
Well No.: MW-76	Type of Well: "A" MONITOR
	Date: 3-25-96

Well Development

Date: 3-25-96	Water Level Before: 6.2'	Water Level After: 6.2'
Note: Water level readings from top of PVC	Taken 30	min. After Development

L1= 0.3'
L2= 3.0'
L3= 1.0'
L4= 9.0'
L5= 4.7'
L6= 8.0'



Remarks: Backfilled 14' to 13' with BENTONITE.

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
EWR TERMINALS A & B	CRAIG	MW-77	
LOCATION		**CONTRACT NO.**	**DATE**
± 220' N.E. FROM MW-76.		426-96-003	3-26-96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGERS	4" MONITOR

HAMMER (SAFETY)	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: B. KIMLEY

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/26/96	AM	7.1'	SAMPLE # 4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Hollow	0	HAND	24"	1 A	FILL DK. BR. C-F SAND, TR GRAVEL, TR SILT 0.7'
STEM		AUGER		1 B	FILL BR. C-F SAND, TR GRAVEL, TR SILT
AUGERS			24"	2	SAME
	5		24"	3	SAME
		20. 27 31. 44	20"	4	SAME
		23. 14. 11. 11	18"	5 A	SAME 8.8'
	10			5 B	MISC. FILL DK. GRAY C-F SAND, GLASS, BRICK, WOOD, LITTLE SILT
		6. 5 11. 16	18"	6	SAME
		63. 25 27. 33	17"	7	SAME
	15	27. 21. 11. 8	18"	8	SAME 16.0'
					NOTE: ALL SAMPLES WERE SCREENED FOR VOC'S
					SAMPLE NO. 4 WAS SAVED AND THE
	20				REMAINING SAMPLES WERE DISCARDED.
					BOTTOM OF BORING
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

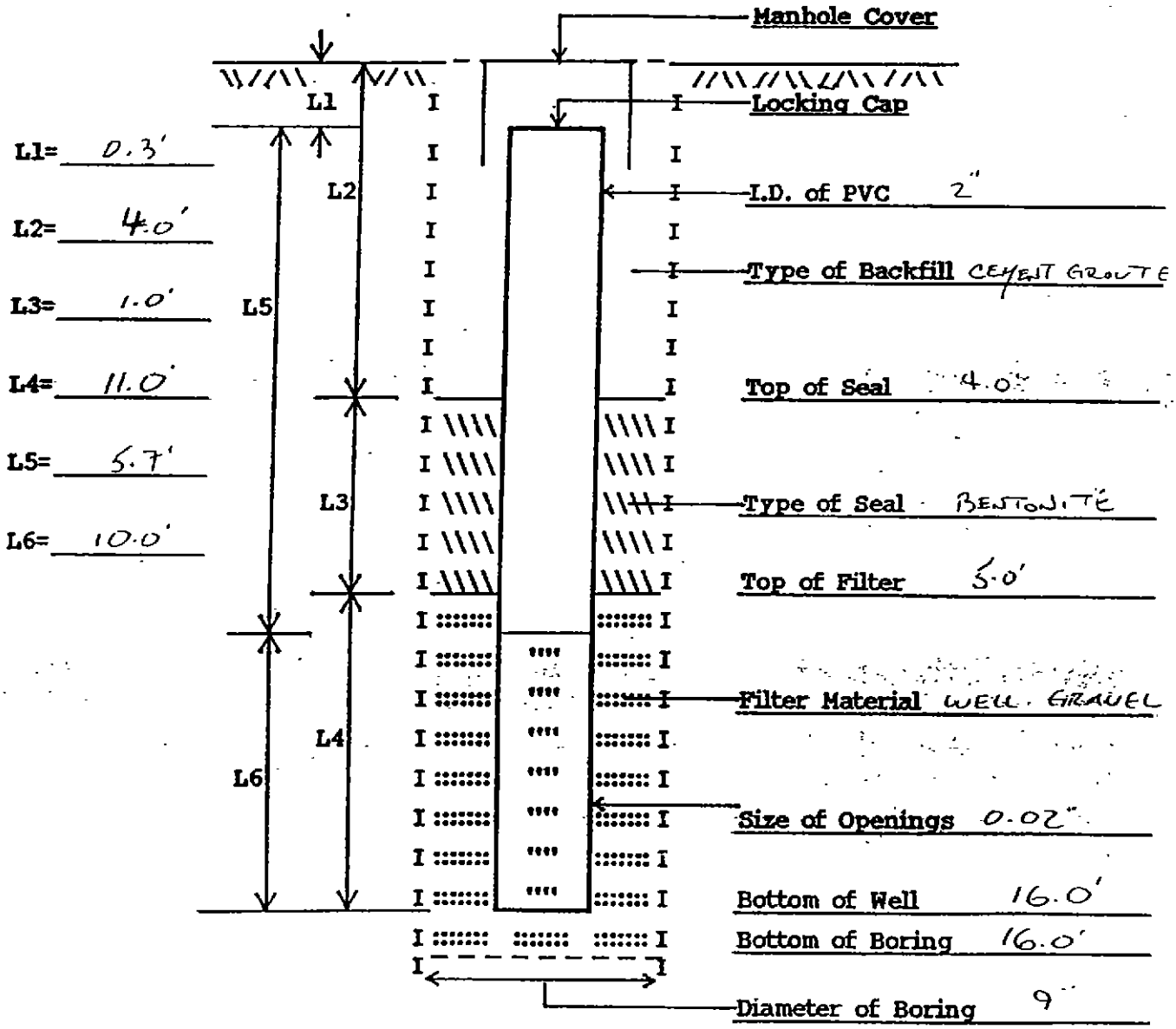
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR TERMINALS A & B			**Contract No.:** 426-96-003
Location: ± 220' N.E. from MW-76A			**Contractor:** CRAIG
Driller: B. KIMLEY		**Inspector:** M. OUDEH	
Well No.: MW-77	**Type of Well:** "A" MONITOR		**Date:** 3-26-96

Well Development

Date: 3-26-96	**Water Level Before:** 8.0'	**Water Level After:** 7.8'
Note: Water level readings from top of PVC	**Taken** 60 **min. After Development**	



Remarks:

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
EWR TERMINALS A & B	CRAIG	MW-78	
LOCATION		**CONTRACT NO.**	**DATE**
TERMINAL "A" BUS STOP; ±65' S.W. FROM RDWY. BET. TERM. "B" & BUS STOP.		426-96-003	3-27-96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGER	A'MONITOR

HAMMER (SAFETY)	HAMMER
140 # FALL 30"	# FALL

DRILLER: B. KINSEY

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/27	AM	14.4'	Sample #8

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D	SAMP. NO.	SAMPLE DESCRIPTION AND REMARKS (LINE LOCATES CHANGE OF PROFILE)
Hollow Stem Augers	0	HAND Auger		1	FILL DK BR C-F SAND, TR GRAVEL, TR SILT
				2	SAME
	5			3 A	SAME 4.8'
				3 B	FILL BR. C-F SAND, TR GRAVEL, TR SILT
		4-6 11-17	20"	4	SAME
		20-24 28-37	18"	5 A	SAME 8.8'
				5 B	WOOD 9.1
	10			5 C	FILL BR. C-F SAND, TR GRAVEL, TR SILT
		10-10 11-15	18"	6 A	SAME 13'
				6 B	FILL GREY C-F SAND, TR GRAVEL, TR SILT
		24-28 19-16	16"	7	SAME
	15	11-12 12-12	18"	8	SAME
		7-9 9-10	17"	9 A	SAME
				9 B	MISC. FILL GREY C-F SAND, GLASS, WOOD, TILE, LITTLE SILT, TR. GRAVEL
		12-16 19-26	14"	10	SAME
	20	4-5 5-5	20"	11 A	SAME 20.4'
				11 B	GREY-BR ORGANIC PEAT AND SILTY CLAY 22.0'
	25				NOTE: ALL SAMPLES WERE SCREENED FOR VOC'S. SAMPLE NO. 8 WAS SAVED, THE REMAINING SAMPLES WERE DISCARDED. BOTTOM OF BORING

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

THE PORT AUTHORITY OF N.Y. & N.J.

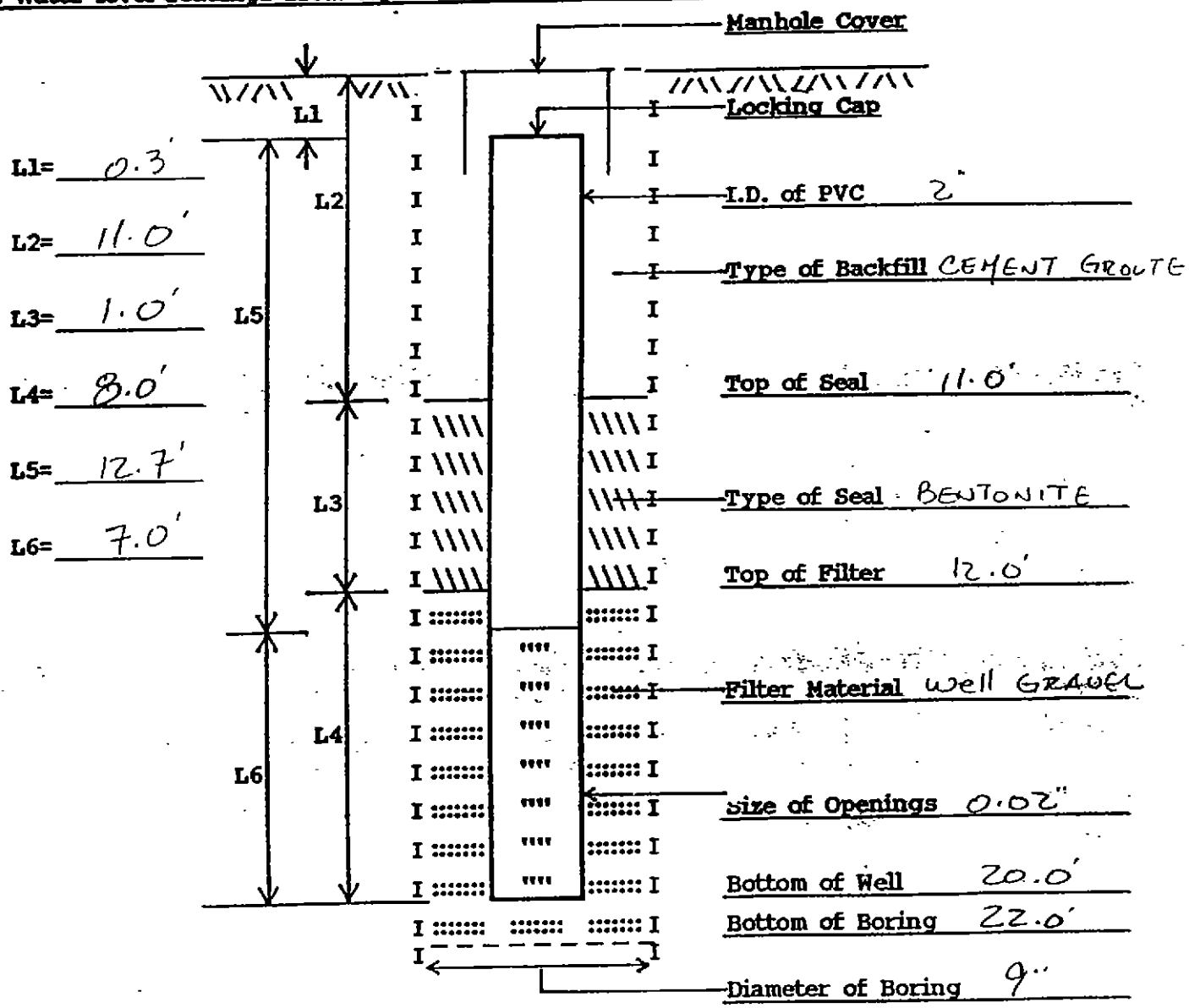
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Sheet 3 of 4

Project: EWR TERMINALS A & B	**Contract No.:** 426-96-003
Location: TERM A Bus Stop; ±65' S.W. from Entry Pt. Term B & Bus STOP	**Contractor:** CRAIG
Driller: B. KIMLEY	**Inspector:** M. OUDEH
Well No.: MW 78	**Type of Well:** A MONITOR **Date:** 3-27-96

Well Development

Date: 3-27-96	**Water Level Before:** 15.1	**Water Level After:** 15.1
Note: Water level readings from top of PVC	**Taken** 45 **min. After Development**	



Remarks: BACKFILLED 22' to 20' WITH BENTONITE.

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: EWR TERMINAL A & B	NAME OF CONTRACTOR: CRAIG	BORING NO.: MW-79	SURFACE ELEV.
LOCATION: AS LAY OUT BY P.A. SURVEY.		CONTRACT NO.: 426-96-003	DATE: 3/18/96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGERS	"A" MONITOR

HAMMER (SAFETY)	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: B. KIMLEY

INSPECTOR: C. PEREZ

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/18/96	AM	6.0	SAMPLE # 4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
	0			—	ASPHALT	0.0' 0.5'
				—	CRUSHED STONE	1.5'
		HAND AUGER	18"	1	Fill- brown c-f SAND, trace Silt, trace Gravel	
			24"	2	Fill- SAME	
	5		12"	3	Fill- SAME	
		11-18			Fill- SAME	5.5
		28-11	24"	4	Fill- grey c-f SAND, trace silt, some Gravel	
		8-11		5		
		18-24	22"		Fill- SAME, trace Gravel	
	10	2-5		6		
		11-9	20"		Fill- SAME	
		3-4		7	Fill- SAME	13.0
		4-5	24"		grey organic CLAY, trace brown Peat fibers	14.0'
	15				BOTTOM OF BORING	

NOTES: ALL SAMPLES WERE SCREENED FOR VOC'S USING PID. SAMPLE # 7 WAS SAVED IN ONE 4OZ JAR & ONE 16OZ JAR. THE REMAIN SAMPLES WERE DISCARDED.

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

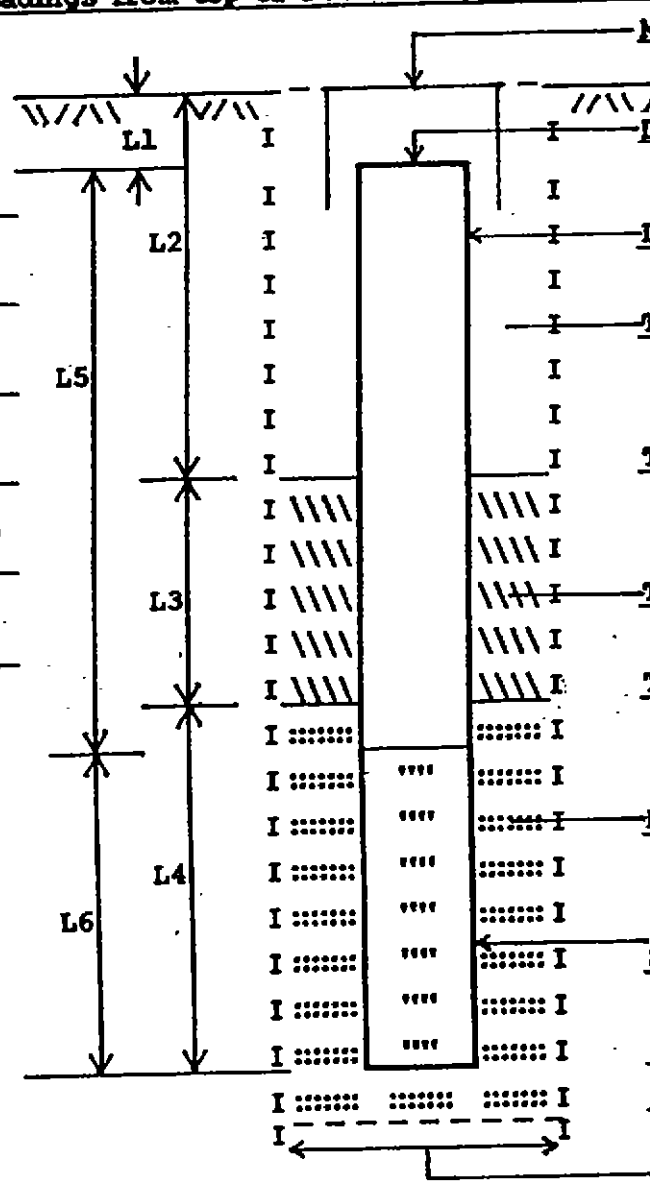
Sheet 3 of 4

Project: EWR TERM. A & B	Contract No.: 426-96-003
Location: AS LAY OUT by P.A. SURVEY	Contractor: CRAIG
Driller: B. KIMLEY	Inspector: C. PEREZ
Well No.: MW-79	Type of Well: "A" MONITOR Date: 3/18/96

Well Development

Date: 3/18/96	Water Level Before: 7.3	Water Level After: 7.3
Note: Water level readings from top of PVC	Taken 30 min. After Development	

L1= 0.3'
L2= 4.0'
L3= 1.0'
L4= 7.0'
L5= 5.7'
L6= 6.0'



Manhole Cover
Locking Cap
I.D. of PVC 2"
Type of Backfill CEMENT GROUTE
Top of Seal 4.0'
Type of Seal BENTONITE
Top of Filter 5.0'
Filter Material WELL GRAVEL
Size of Openings 0.02"
Bottom of Well 12.0'
Bottom of Boring 14.0'
Diameter of Boring 9"

Remarks: BACKFILLED 14' TO 12' WITH BENTONITE

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: EWR TERMINALS A & B	NAME OF CONTRACTOR: CRAIG	BORING NO.: MW-80	SURFACE ELEV.
LOCATION: ±17' WEST FROM ORIGINAL LOCATION (GRASS AREA)		CONTRACT NO.: 426-96-003	DATE: 3-14-96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGER	"A" Monitor
HAMMER (SAFETY) 140 # FALL 30 "	HAMMER # FALL "	

DRILLER: B. KIMLEY

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/14/96	PM	8.1'	FOUND IN S#5

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Hollow	0	Hand	24"	1	FILL BR M-F SAND, TR GRAVEL, TR. SILT
STEM		AUGER			
AUGERS			24"	2	SAME
	5		24"	3	FILL BR M-F SAND, LITTLE CRUSHED STONE, TR SILT, TR. GRAVEL
		38-32 28-33	18"	4	SAME
		52-15 15-16	21"	5	FILL GREY-BR C-F SAND, LITTLE GRAVEL, TR SILT
	10	17-12 11-10	20"	6A	SAME
				6S	BR ORGANIC CLAY SILT, TR PEAT 11.6' 12.0'
					NOTE: ALL SAMPLES WERE SCREENED FOR VOC'S SAMPLE NO. 5 WAS SAVED IN 1 FOUR OZ JAR AND 1 one pt. JAR, THE REMAINING SAMPLES WERE DISCARDED.
	15				
	20				BOTTOM OF BORING
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

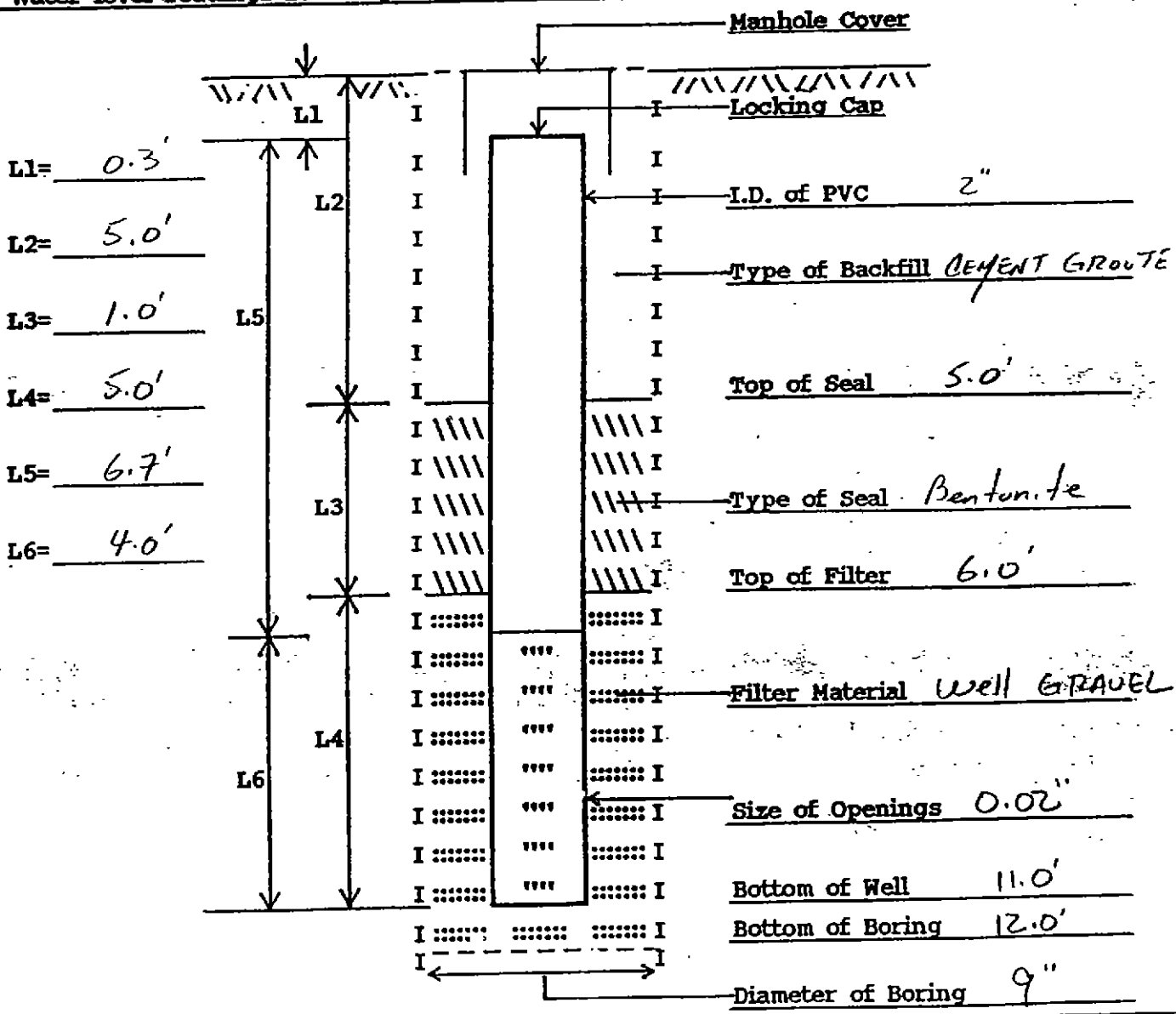
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR TERMINALS A & B		Contract No.: 426-96-003	
Location: ±17' WEST FROM ORIGINAL LOCATION		Contractor: CRAIG	
Driller: B. KIMLEY		Inspector: M. OUDEH	
Well No.: MW-80	Type of Well: 4" MONITOR	Date: 3-14-96	

Well Development

Date: 3-14-96	Water Level Before: 7.2'	Water Level After: 7.2'
Note: Water level readings from top of PVC	Taken 35	min. After Development



Remarks: BACKFILLED 12' to 11' with Bentonite

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
EWR TERMINALS A & B	CRAIG	MW-81	
LOCATION		**CONTRACT NO.**	**DATE**
±105' WEST FROM ℄ OF T/W "A" (GRASS AREA); ±140' SOUTH FROM NORTH GRASS EDGE.		426-96-003	3-14-96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGERS	"A" MONITOR
HAMMER (SAFETY)	**HAMMER**	
140 # FALL 30 "	# FALL "	

DRILLER: B. KIMLEY

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/13/96	AM	6.2'	FOUND IN S #4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Hollow	0	HAND	24"	1	FILL BR M-F SAND, TR GRAVEL, TR SILT
STEM		AUGER			
AUGERS			24"	2	SAME
	5		24"	3	SAME
		40-9-13-13	20"	4	SAME
		8-3-3-3	20"	A	SAME 8.4'
	10			SB	GREY ORGANIC SILTY CLAY, LITTLE PEAT 10.0'
					NOTE: ALL SAMPLES WERE SCREENED FOR VOC'S. SAMPLE NO. 4 WAS SAVED IN 1 40z JAR & 1 one pt. JAR, THE REMAINING SAMPLES WERE DISCARDED.
	15				
					BOTTOM OF BORING
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

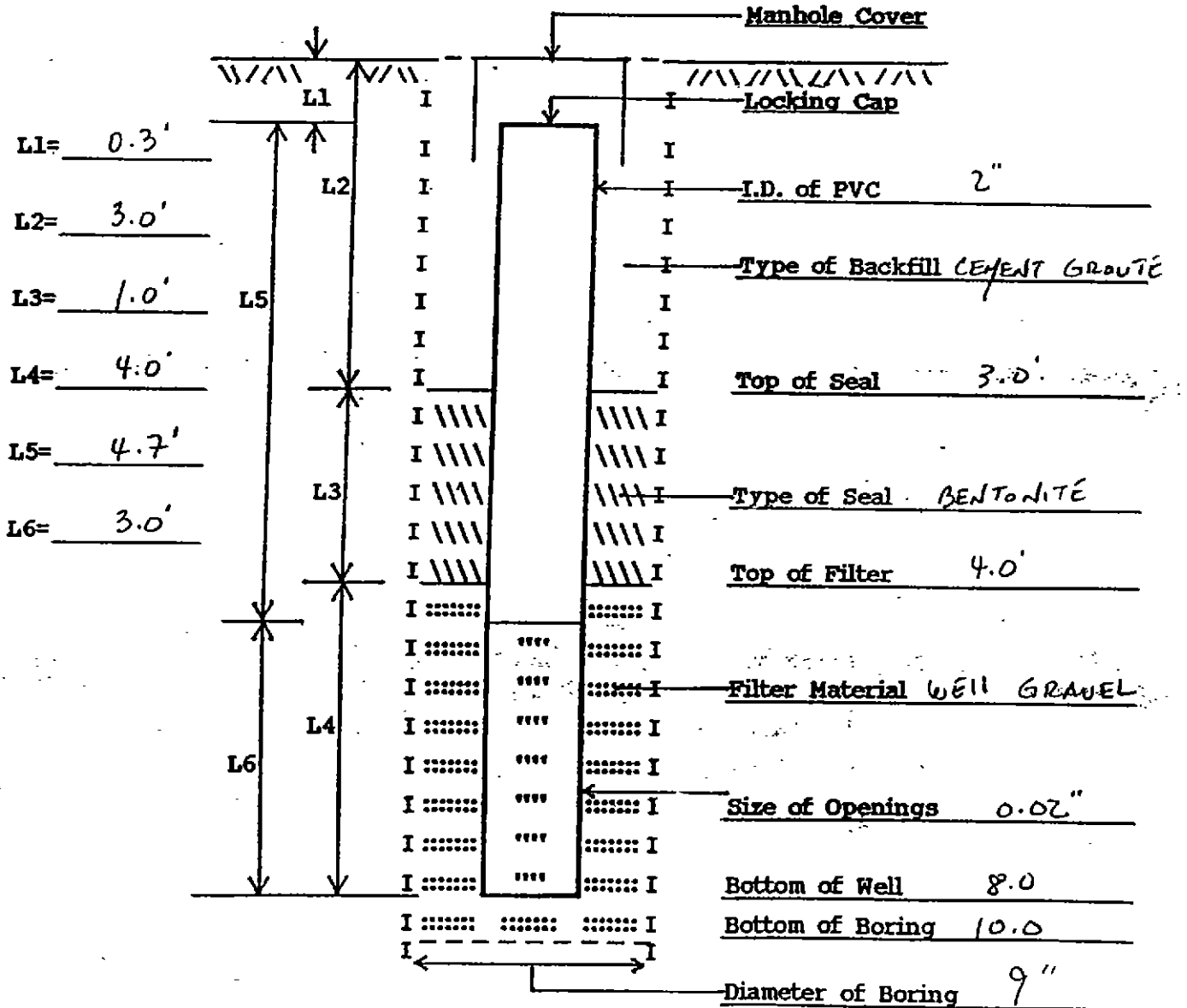
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR TERMINALS A & B	Contract No.: 426-96-003
Location: ±105' WEST FROM ℄ OF T/N "A" (GRASS AREA) ±140' SOUTH FROM NORTH GRASS EDGE	Contractor: CRAIG
Driller: B. KIMLEY	Inspector: M. OUDEH
Well No.: MW-81	Type of Well: "A" MONITOR Date: 3-14-96

Well Development

Date: 3-14-96	Water Level Before: 6.6'	Water Level After: 6.7'
Note: Water level readings from top of PVC	Taken 60 min. After Development	



Remarks: BACKFILLED 10' to 8' WITH BENTONITE.

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 1

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
EWR TERMINALS A & B	CRAIG	BH-82	
LOCATION		**CONTRACT NO.**	**DATE**
± 58' SOUTH FROM HP-1		426-96-003	3-28-96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGERS	"A" MONITOR

HAMMER SAFETY	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: T. WARD

INSPECTOR: M. OUDEH

GROUND WATER LEVEL			
Date	Time	Depth	Remarks

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS _____ LINE LOCATES CHANGE OF PROFILE
	0				ASPHALT
					2.0'
	5				
					BOTTOM of BORING
					(ASPHALT FOUND AT 2.0'
	10				RELOCATED BORING)
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 1

PROJECT: EWR TERMINALS A & B	NAME OF CONTRACTOR: CRAIG	BORING NO.: BH-82A	SURFACE ELEV.
LOCATION: ± 30' WEST FROM BH-82		CONTRACT NO.: 426-96-003	DATE: 3-28-96

SPOON "O.D. "I.D.	CASING SIZE	HOLE TYPE
HAMMER # FALL "	HAMMER # FALL "	

DRILLER: T. WARD

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				ASPHALT
					2.0'
	5				
					BOTTOM OF BORING
					(ASPHALT FOUND AT 2.0'
	10				RELOCATED BORING)
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: EWR TERMINALS A & B	NAME OF CONTRACTOR: CRAIG	BORING NO.: MW-82	SURFACE ELEV.
LOCATION: BETWEEN GATES 84 & 86 ±44' SOUTH FROM CONCRETE PAVEMENT		CONTRACT NO.: 426-96-003	DATE: 4-13-96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	H.S. Augers	4" Monitor
HAMMER SAFETY 140 # FALL 30 "	HAMMER # FALL "	
DRILLER: J. CRAIG		
INSPECTOR: M. OUDEH		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
4/13	AM	7.4'	Found in S-3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP. [2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
H.S. Augers	0				ASPHALT 0.5'
		HAND AUGER			CRUSHED STONE, FLYASH ±.8'
		HAND AUGER	14"	1	FILL BR C-F SAND, TR GRAVEL, TR SILT
	5	HAND AUGER	24"	2	SAME
		13-19 16.15	120"	3	SAME
		10-12 12-12	18"	4	FILL BR-GREY C-F SAND, LITTLE GRAVEL, TR SILT
	10	4-5 5 5	18"	5	FILL BR M-F SAND, LITTLE SILT, TR GRAVEL
		7-6 6.5	15"	6	FILL GREY-BRN F SAND, LITTLE RED-BR CLAYEY SILT TR. GRAVEL
					SAME 19.4
	15	7 6 6 5	24"	7	DK GREY ORGANIC PEAT 16.0'
					NOTE: ALL SAMPLES WERE SCREENED FOR VOC'S. SAMPLE #3 WAS SAVED IN A ONE PT. JAR AND 4 OZ JAR. THE REMAINING SAMPLES WERE DISCARDED
	20				BOTTOM OF BORING
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

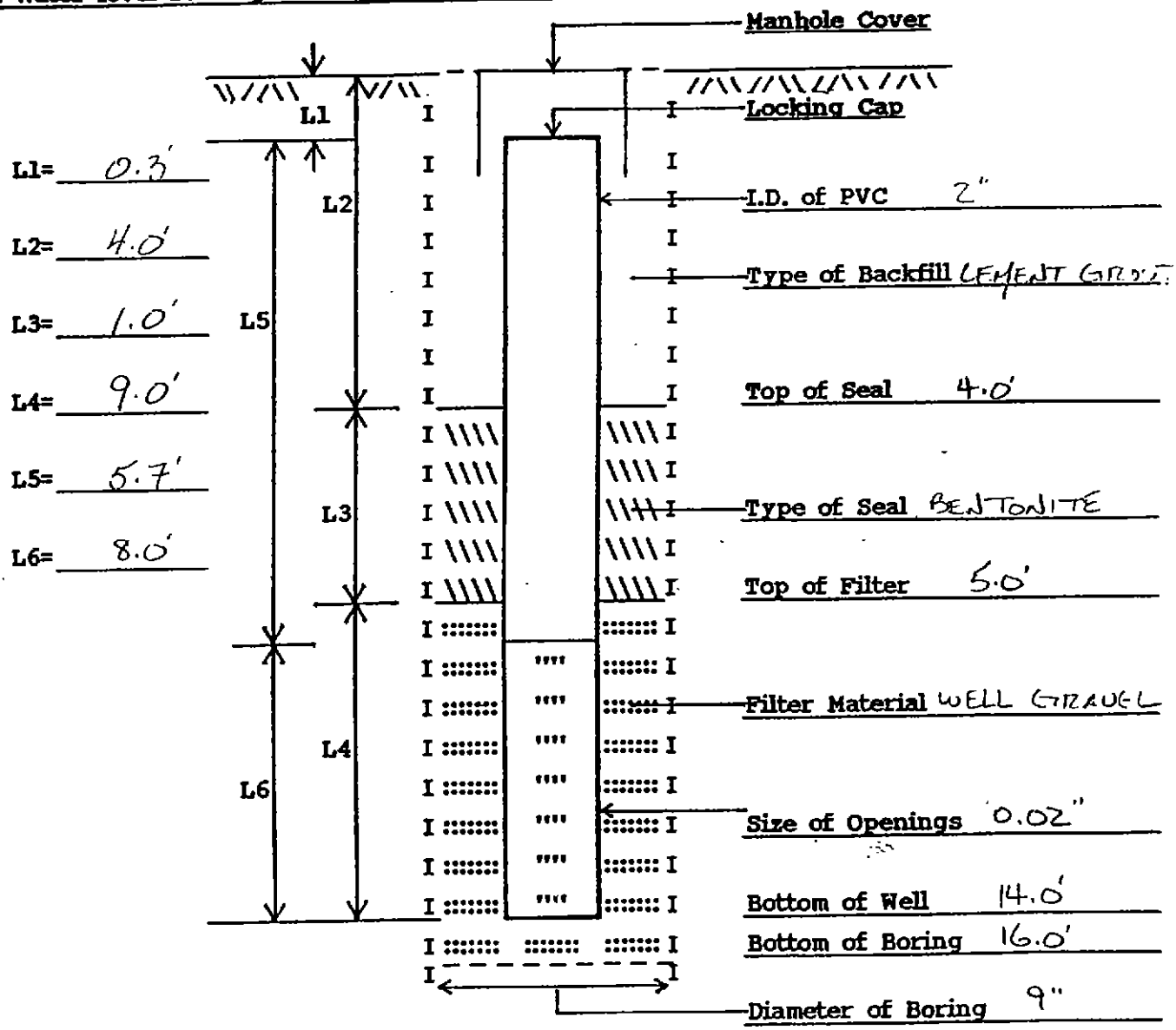
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR TERMINALS A & B	**Contract No.:** 426-96-003
Location: Bet. GATES 84 & 86 ±44' SOUTH from Concrete Pavement	**Contractor:** CRAIG
Driller: J. CRAIG	**Inspector:** M. OUDEH
Well No.: MW-B2	**Type of Well:** "A" MONITOR **Date:** 4-13-96

Well Development

Date: 4-13-96	**Water Level Before:** 7.5'	**Water Level After:** 7.5'
Note: Water level readings from top of PVC	**Taken** 45 **min. After Development**	



Remarks: Backfilled 16' to 14' with BENTONITE

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF —

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
EWR TERMINALS A & B	CRAIG	MW-83	
LOCATION		**CONTRACT NO.**	**DATE**
B3 TERM. BET. GATES 61 & 62, ± 80' SOUTH OF CONCRETE PAVEMENT		426-96-003	3-15-96

SPOON	CASING SIZE	HOLE TYPE
2" O.D. 2 3/8 I.D.	AUGERS	"A" MONITOR
HAMMER (SAFETY) 140 # FALL 30"	HAMMER # FALL	
DRILLER: B. KINLEY		
INSPECTOR: M. OUDEH		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/15/96	1400	6.6'	FOUND IN SILT

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				ASPHALT 0.4'
					CRUSHED STONE 1.5'
Hollow		HAND AUGER	18"	1	FILL GREY-BR C-F SAND, LITTLE GRAVEL, TR SILT
STEM		1	24	2	FILL BR C-F SAND, TR GRAVEL TR SILT
AUGERS	5	1	12"	3	SAME
		12-11 8-11	20"	4	SAME
		7-8 8-13	21"	5	FILL BR-GREY C-F SAND, TR GRAVEL, TR SILT (SLIGHT FUEL ODOR)
	10	8-19 27-22	20"	6	SAME
		28-32 34-34	17"	7	FILL BR-GREY C-F SAND, LITTLE GRAVEL, TR SILT
	15	24-25 30-32	18"	8	FILL BR C-F SAND, LITTLE GRAVEL, TR SILT
		12-7 4-4	22"	9A	SAME 16.7'
				9B	BR-GREY ORGANIC SILTY CLAY, LITTLE PEAT 18.0'
	20				NOTE: ALL SAMPLES WERE SCREENED FOR VOC'S USING PID. SAMPLES NO. 4 & 5 WERE EACH SAVED IN 1 QUART JAR FOR LATER USE. THE REMAINING SAMPLES WERE DISCARDED.
					BOTTOM OF BORING
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

THE PORT AUTHORITY OF N.Y. & N.J.

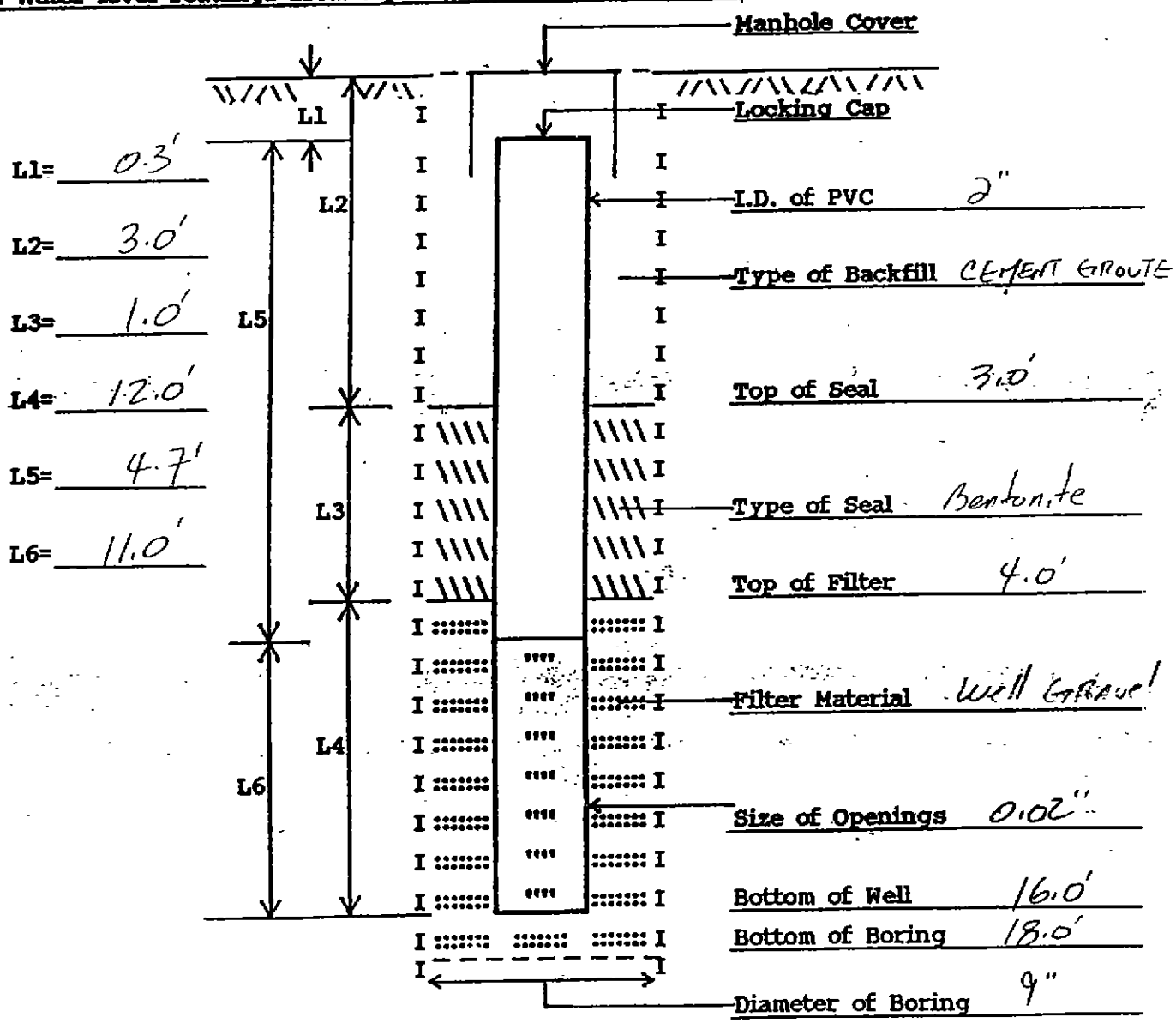
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Sheet 3 of 4

Project: EWR TERM. A & B		**Contract No.:** 426-96-003	
Location: B3 TERM. Bet. Gates 60 & 61; ±80' South of Concrete Pav.		**Contractor:** CRAIG	
Driller: M. OUDEH	**Inspector:** M. OUDEH		
Well No.: MW-83	**Type of Well:** 2" Monitor	**Date:** 3-5-96	

Well Development

Date: 3-15-96	**Water Level Before:** 7.2'	**Water Level After:** 7.3'
Note: Water level readings from top of PVC	**Taken** 40 **min. After Development**	



Remarks: Backfilled 18' to 16' with Bentonite

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF ✓

PROJECT: EWR TERMINALS A & B	NAME OF CONTRACTOR: CRAIG	BORING NO.: MW-B4	SURFACE ELEV.:
LOCATION: ±115' SOUTH OF NORTH EDGE OF TERM. 'B' BUS STOP		CONTRACT NO.: 426-96-003	DATE: 3-26-96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGERS	"A" MONITOR

HAMMER (SAFETY)	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: B. KIMLEY

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3/26/96	AM	12.4'	Sample # 7B

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Hollow	0	HAND	24"	1 A	FILL DK. BR C-F SAND, TR GRAVEL, TR SILT 0.7'
Stem		AUGER		1 B	FILL BR C-F SAND. TR GRAVEL, TR SILT
Augers			24"	2	SAME
	5		24"	3	SAME
		5-14. 16 22	15"	4	SAME
		6-12 16 18	18"	5	SAME
	10	10. 12 16 21	18"	6	SAME
		37. 46 58. 28	20"	7 A	SAME 12.3'
				7 B	FILL CRUSHED STONE, SOME RED-BR C-F SAND, LITTLE SILT
	15	30. 50 54 60	10"	8	SAME
		50. 48 56. 21	12"	9 A	SAME
				9 B	RED-BR C-F SAND, SOME GRAVEL, TR SILT 17.6'
		11 18 19 29	16"	10	SAME
	20				20.0'
					NOTE: ALL SAMPLES WERE SCREENED FOR VOCs
					SAMPLE # 7B WAS SAVED IN 1 ONE pt. JAR & 1 4 oz JAR
					THE REMAINING SAMPLES WERE DISCARDED.
					BOTTOM of BORING
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

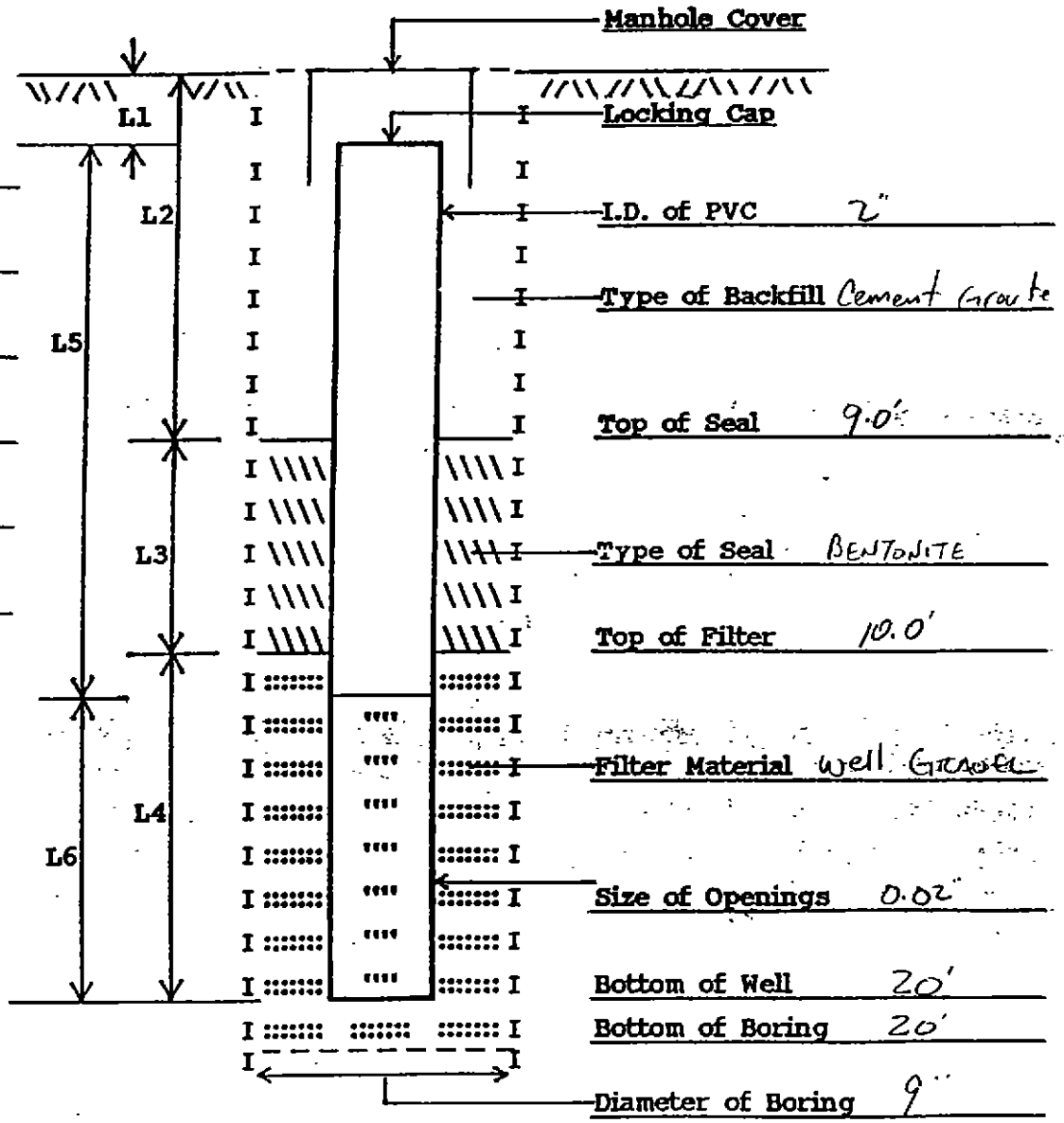
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: EWR TERMINALS A & B			**Contract No.:** 426-96-003
Location: 115' S. of N. Edge of Term. 'B' Bus stop			**Contractor:** CRAIG
Driller: B. KIMLEY		**Inspector:** H. OUDEH	
Well No.: MW-84	**Type of Well:** A MONITOR		**Date:** 3-26-96

Well Development

Date: 3-26-96	**Water Level Before:** 12.7'	**Water Level After:** 12.5'
Note: Water level readings from top of PVC	**Taken** 35 **min. After Development**	



L1= 0.3'
L2= 9.0'
L3= 1.0'
L4= 10.0'
L5= 10.7'
L6= 9.0'

Remarks:

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: EWR TERMINALS A & B	NAME OF CONTRACTOR: CRAIG	BORING NO.: MW-85	SURFACE ELEV.:
LOCATION: AS LAID OUT BY P.A. SURVEY		CONTRACT NO.: 426-96-003	DATE: 3-5-96

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Augers	"A" Hollow Stem

HAMMER (SAFETY)	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: D. OSUCH

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3.5.96	12:30 pm	7.1'	Found in Sample No. 4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D	SAMP.² NO.	³SAMPLE DESCRIPTION AND REMARKS (LINE LOCATES CHANGE OF PROFILE)
Hollow stem Augers	0	HAND AUGER	24"	1	Fill Br M-F SAND, Tr GRAVEL, Tr SILT
			24"	2	SAME
	5		24"	3	SAME
		6-5-4-4	20"	4	SAME
		4-6-10-10	20"	5	SAME
	10	3-3-3-3	18"	6	SAME
		3-4-3-5	19"	7	SAME
	15	4-4-7-8	16"	8A	SAME
				8B	Grey ORGANIC CLAYEY SILT 15.7' 16.0'
	20				BOTTOM of BORING
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

The Port Authority of New York and New Jersey
Engineering Department - Materials and Research Division

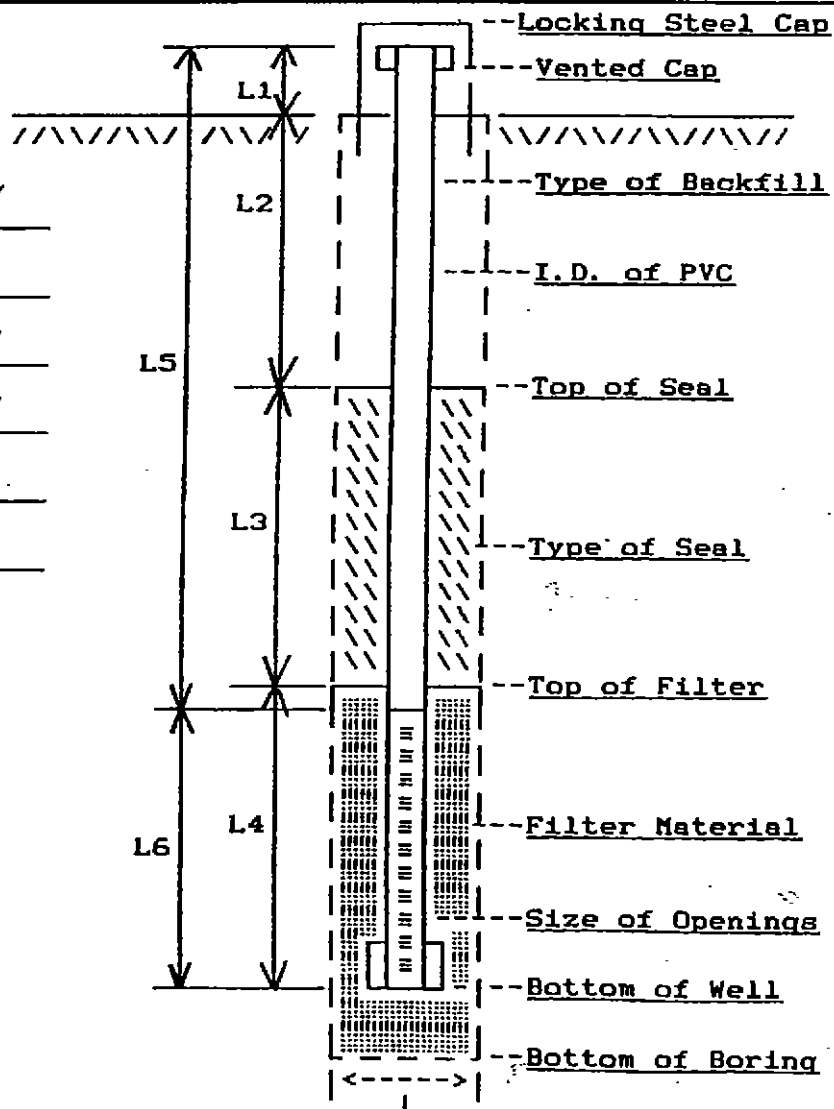
Well Installation Report

Project: EWR TERMINALS A & B			Contractor CRAIG
Location AS LAID OUT BY P.A. SURVEY			Contract No. 426-96-003
Driller D. OSUCH		Inspector M. OUDEH	
Well No. MW-85	Type of Well "A" MONITOR		Date 3-5-96

Well Development

Date 3-12-96	Water Level Before 6.8'	Water Level After 6.8'
Note: Water level readings from top of PVC	Taken 65 min. After Development	

L1 = 2.5'
L2 = 4.0
L3 = 1.0'
L4 = 10.5'
L5 = 8.5'
L6 = 9.5'



--Locking Steel Cap
---Vented Cap
---Type of Backfill: CEMENT GROUTE
---I.D. of PVC: 2"
--Top of Seal: 4.0'
--Type of Seal: Bentonite
--Top of Filter: 5.0'
--Filter Material: well GRAVEL
--Size of Openings: 0.02"
--Bottom of Well: 15.5'
--Bottom of Boring: 16.0'
Diameter of Boring: 8"

Remarks: Hole Backfilled 15.5-16.0 with Bentonite

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: N.J. Marine - UST	NAME OF CONTRACTOR: Craig	BORING NO.: MW-C25-1	SURFACE ELEV.
LOCATION: as last nut in field east of Bldg. 102		CONTRACT NO.: 4260-94-001	DATE: 1/11/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Augers	4" monitor

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: J. Kozarek
INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
1/11/94	2:00P	3.5'	In augers

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. NO. [2]	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
Roller Bit	0					
					ASPHALT	0.3'
					CONCRETE	0.7
						1.0
Augers		11-15	12"	1	Fill - M-F Gr sand to silt, tr gravel, tr wood fabric	
		5-5			Same as above	
		6-9	12"	2	(2 attempts were made to recover sample)	
		18-10			Same as above	
	5	7-7	14"	3		
		1-6			Same as above, slight odor on	
		2-2 3/4	12"	4	Hit cobble at 7.0'	9.0'
		3-6			Brown org silt & F sand, trace	
		5-5	5"	5		
	10				Auger advanced to 11.0' no sample taken	11.0'
					Bottom of Boring	
	15					

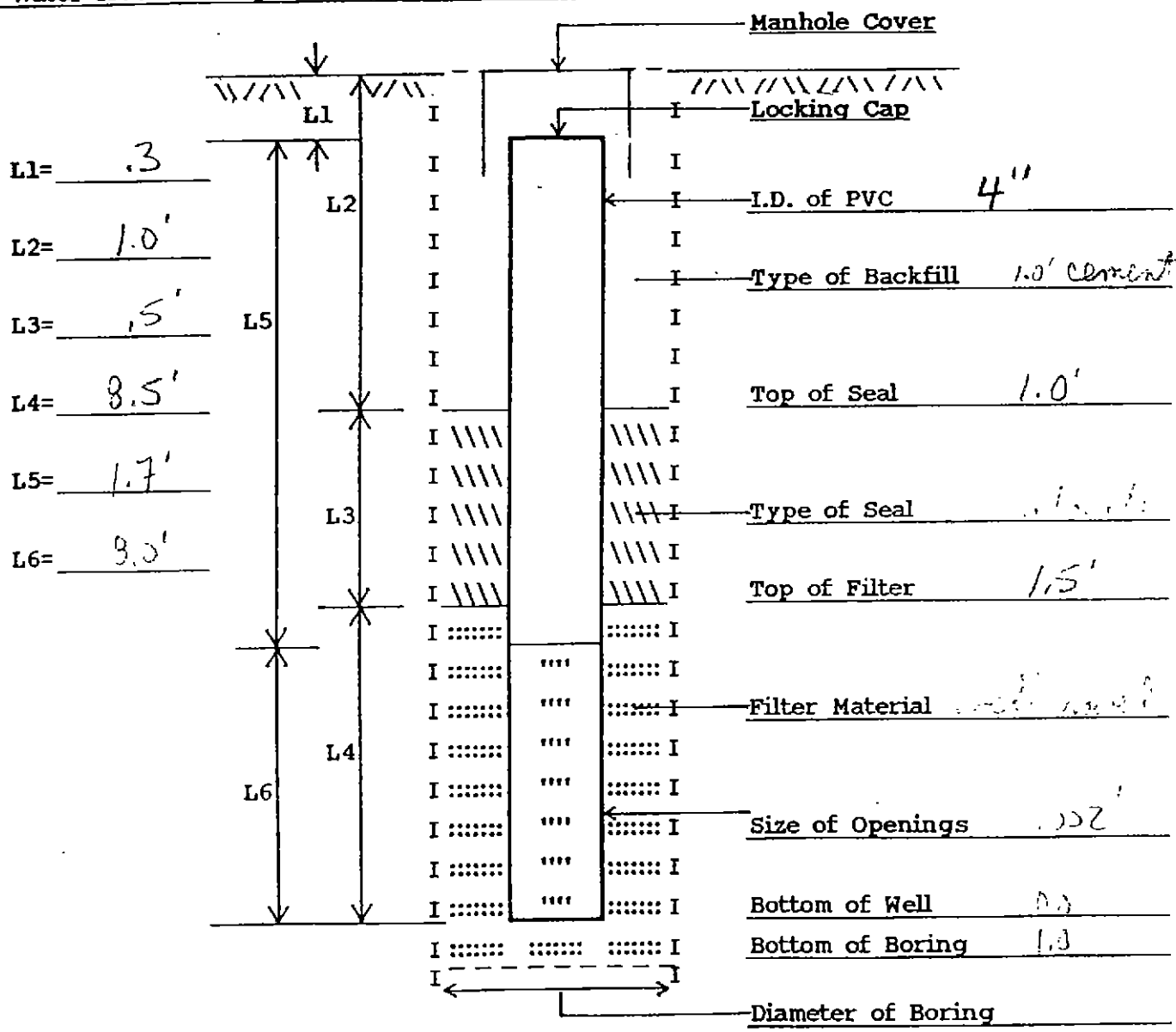
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.S. Piers U.S.		Contract No.: [illegible]
Location: As laid out in field west of Ilelig 102		Contractor: [illegible]
Driller: J. Kozacka	Inspector: [illegible]	
Well No.: 225 1	Type of Well: Auger	Date: 1/12/94

Well Development

Date: 1/14/94	Water Level Before: 2.0'	Water Level After: 4.5'
Note: Water level readings from top of PVC	Taken 30 min. After Development	



Remarks: Backfilled with bentonite from 11.0' to 10.0'
NJ Well Permit [illegible]

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: N.J. Marine - U.S.T	NAME OF CONTRACTOR: Grace	BORING NO.: MW-C25-2	SURFACE ELEV.
LOCATION: [illegible]		CONTRACT NO.: 426-94-001	DATE: 1/12/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 " I.D.	[illegible]	"A" monitor

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: J. Kovarski
INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
1/12/94	1105	2.5	In casing = 2

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
Roller Bit	0				ASPHALT	0.3
					AGGREGATE	0.4
						1.2
		[illegible]	12"	1	F-M-C-F Br Sand & gravel, trace silt (fill)	
		[illegible]				
		[illegible]	24"	2	Same as above (sample #1 taken)	4.0'
		[illegible]			F-M-C-F Sand & Gravel, [illegible]	
	5	[illegible]	24"	3		6.0'
Augers		11-5			[illegible]	
		4-6	16"	4		8.0'
		2-2				
V	10	1-2	12"	5	Brown wet [illegible]	10.0'
	15					
	20					
	25					

NOTES: 1 — Length recovered; 0" — Loss of Sample; T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

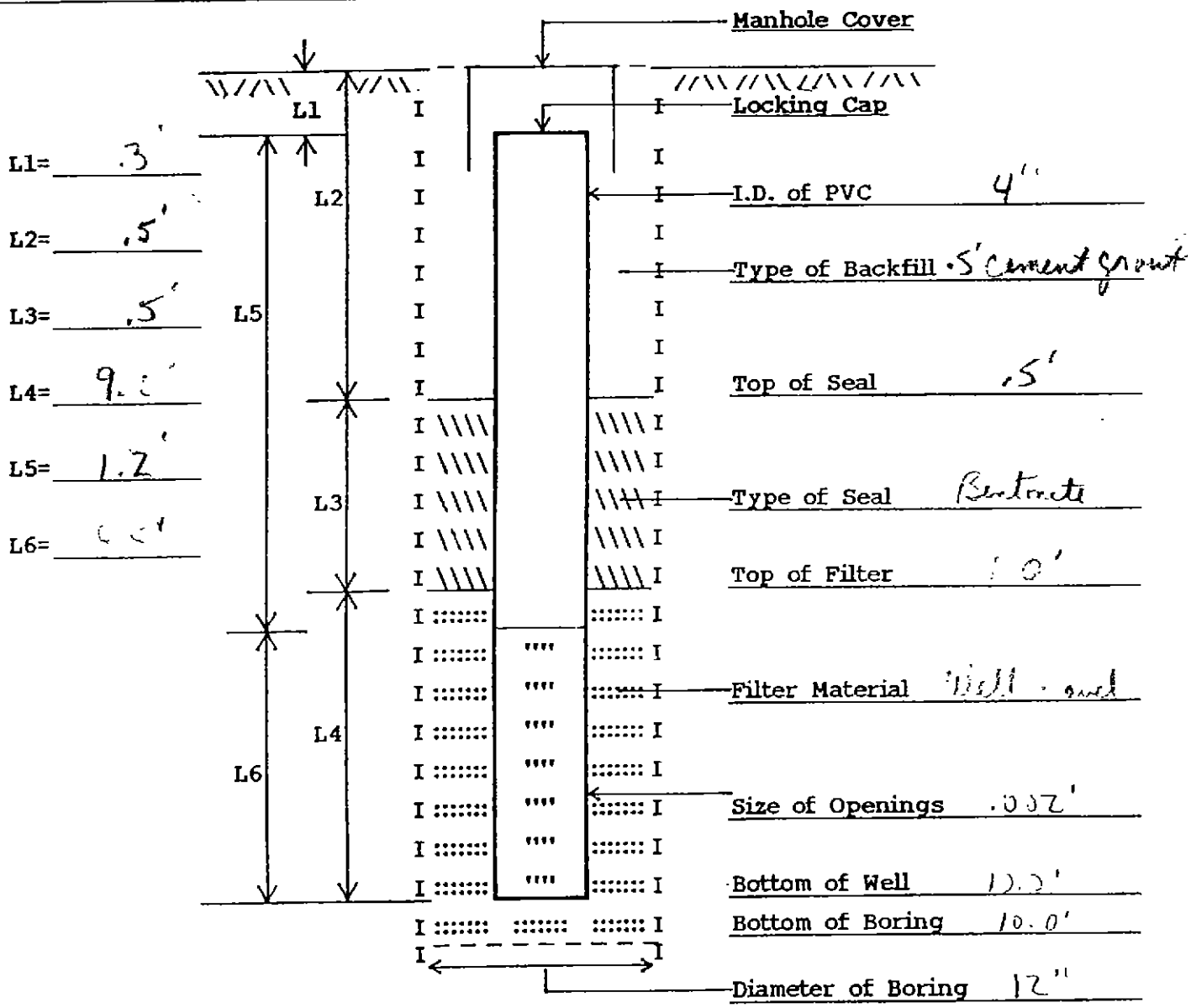
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: [illegible]	Contract No.: 92-84-001
Location: On land out in Lido west of Mile 102	Contractor: Craig
Driller: T. Kowalski	Inspector: T. Ryan
Well No.: [illegible]	Type of Well: Monitor / Date: 1/12/94

Well Development

Date: 1/14/94	Water Level Before: 2.0'	Water Level After: 2.5'
Note: Water level readings from top of PVC	Taken 10 min. After Development	



Remarks: [illegible]

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Construction Division
Materials Engineering Section

BORING REPORT

SHEET OF

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
	Cruz	MW-C25-3	
LOCATION		CONTRACT NO.	DATE
			11 3/90

SPOON	CASING SIZE	HOLE TYPE
"O.D. "I.D.		Mud rotary
HAMMER 140 # FALL 30 "	HAMMER # FALL	
DRILLER J Kowalski		
INSPECTOR		

GROUND WATER LEVEL

Date	Time	Depth	Remarks

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
Rotary Bit	0				ASPHALT	0.3
					CRUSHED STONE (N.J. Ballast)	1.0'
			12"	1		2.0'
			24"	2		4.0'
	5					
			24"	3		6.0'
Auger		6-11				
1'		5-4	6"	4		8.0'
		2-2				
↓	10	3-2	16"	5		10.0'
	15					

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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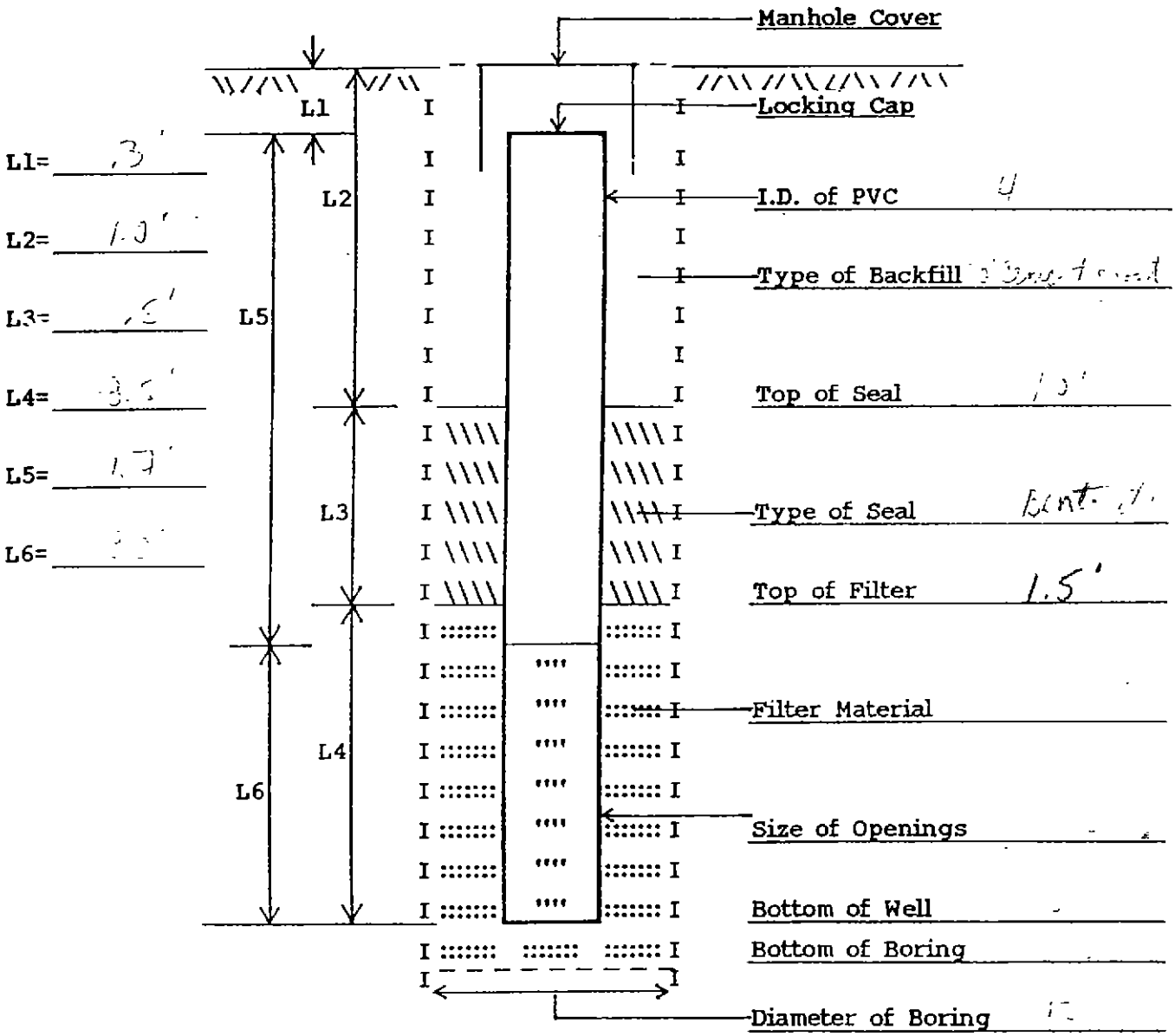
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Sheet 1 of 1

Project: [illegible]		Contract No.: [illegible] 94 [illegible]
Location: Outside wet [illegible]		Contractor: Cruz C
Driller: J Kovacs	Inspector: T Lam	
Well No.: P2S-3	Type of Well: Monitor	Date: 11/13/94

Well Development

Date: 11/14/94	Water Level Before: 2.0'	Water Level After: 2.0'
Note: Water level readings from top of PVC	Taken 15 min. After Development	



Remarks: At well location No. P2-S3

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Materials Engineering Section

BORING REPORT

PHASE II — TANK E 34

SHEET 1 OF 4

PROJECT: NJ Marine Terminal Bldg 2270 A	NAME OF CONTRACTOR: Lucas	BORING NO.: MW E34-1	SURFACE ELEV.
LOCATION: 7.0' East of BH E34-1		CONTRACT NO.: 426-94-001	DATE: 2/4/94
SPOON: 3" O.D. 2 3/8" I.D.	CASING SIZE: 10 Augers	HOLE TYPE: Monitor "A"	
HAMMER: 140# FALL 30"	HAMMER: — # FALL —		
DRILLER: G McAuley			
INSPECTOR:			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/4/94	8:15	7.0'	while Hand Augering

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS LINE LOCATES CHANGE OF PROFILE
					0.0' Asphalt
					0.5' Base Graded Aggregate Base Course.
					1.0'
Hand Auger		Hand Auger	20"	1	FILL Red/Br m-f Sand, tr Silt, tr Gravel.
		Hand Auger	24"	2	FILL Same
	5'	Hand Auger	24"	3	FILL Same
		5 5 6	16"	4	FILL Same
					9.0'
	10	5 4 4 4	10"	5	FILL Red Gravel, some Br. m-f Sand to Silt.
		WO.			11.0'
10" HS Auger			OBSTRUCTION		▽
					BOTTOM OF BORING ▽
	15'				NOTE OBSTRUCTION AT 11.0' FOR SECOND TIME - POSSIBLE TANK BED LEFT IN PLACE AFTER ITS REMOVAL
	20				
	25				

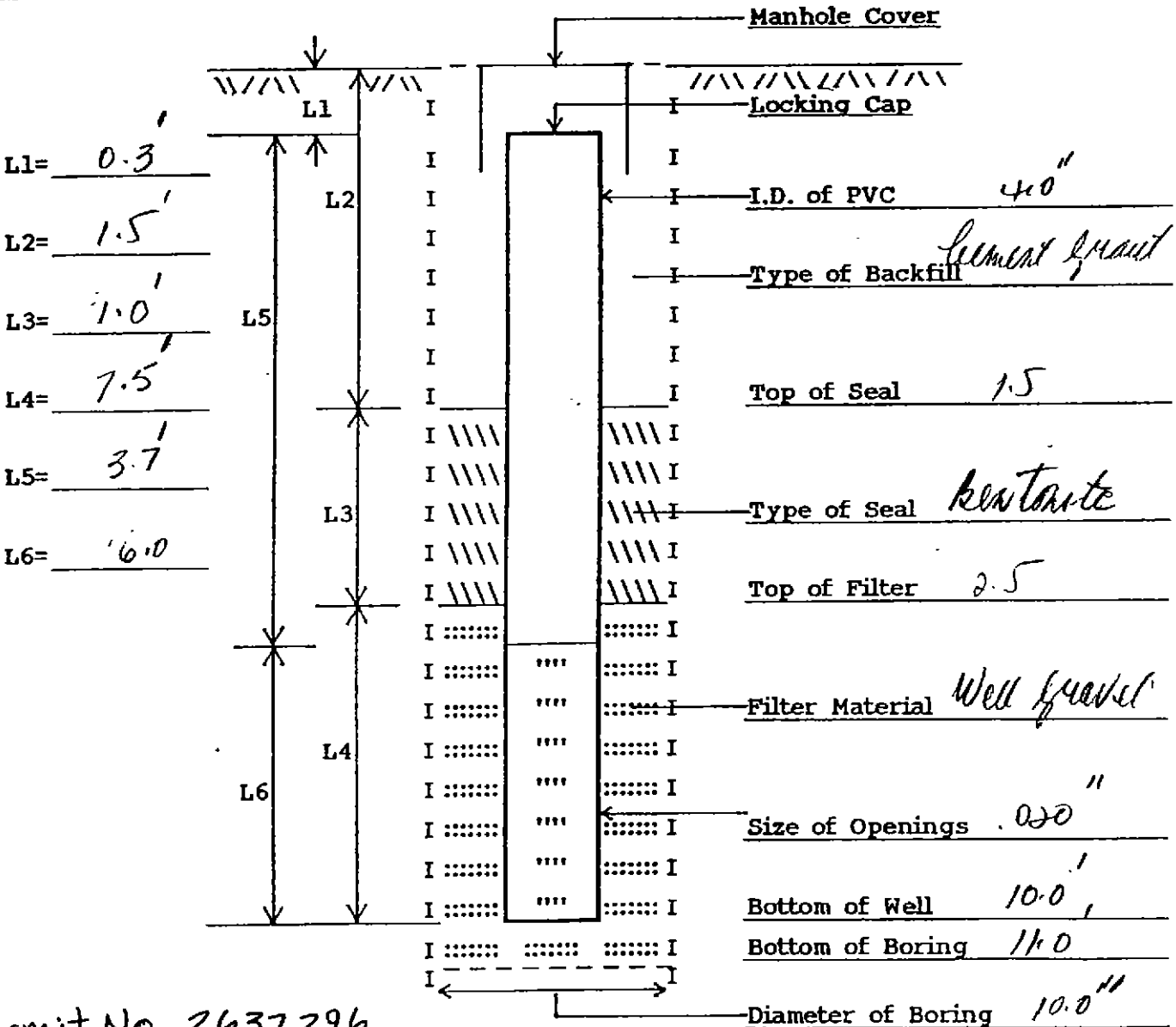
NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.T Dugway Terminal Bldg #2270	Contract No.: 436-94-001
Location: 20 East of BN MW 34-1	Contractor: Geary
Driller: C MC Kinley	Inspector: [illegible]
Well No.: MW 34-1	Type of Well: Monitor A
	Date: 2/4/94

Well Development

Date: 2/4/94	Water Level Before: 6.9	Water Level After: 6.7
Note: Water level readings from top of PVC	Taken X min. After Development	



Permit No. 2637296

Remarks: Old tank platform suspected at 11.0'. Augers unable to seal off hole completely enabling some material to remain in hole - Well terminated at 10.6'.

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Construction Division
Materials Engineering Section

BORING REPORT

Phase II — Jack E 34

SHEET 1 OF 4

PROJECT: NY. Marine Terminal Bldg 2270	NAME OF CONTRACTOR: Craig	BORING NO.: MW E34-2	SURFACE ELEV.:
LOCATION: Pls Land out by Consultant		CONTRACT NO.: 456-94-001	DATE: 2/7/94
SPOON: 3 "O.D. 2 3/8 "I.D.	CASING SIZE: H.S Auger	HOLE TYPE: Mone for A	
HAMMER: 140 # FALL 30	HAMMER: # FALL		
DRILLER: G Inc, Kerry			
INSPECTOR: R. M. Lebert			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/7/94	9.15 AM	5.5'	while Hand Augering

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Hand Auger		Hand Auger	18"	1	Asphalt 0.0' / 0.5' FILL Red/br m-F Sand, tr Silt, tr Gravel
Hand Auger		Hand Auger	24"	2	FILL Same
Hand Auger	5	Hand Auger	24"	3	FILL Same 6.0'
10' H.S Auger		6 7 8 9	16"	4	FILL grey/br m-F Sand, tr Silt
		9 9 10 11	14"	5	FILL Same
	10	9 10 11 9	11"	6	FILL grey/br F Sand, tr Silt 12.0'
		3 2 2 2 3 2	20"	7	grey/br Silt & clay, tr F Sand 14.0'
	11				Bottom of Boring @ 11'
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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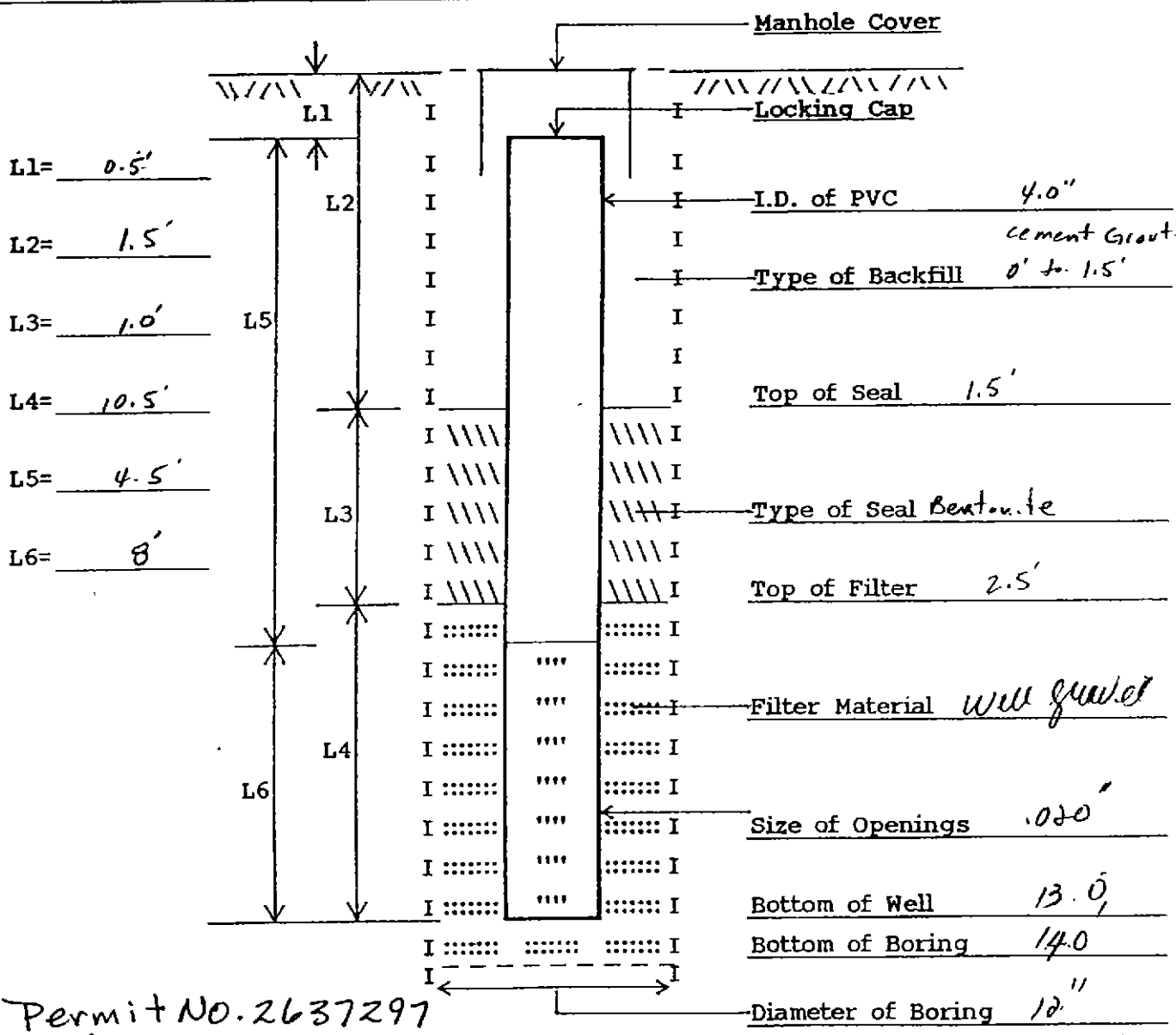
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Sheet 2 of 4

Project: NJ Interim Terminal Bldg 2270		Contract No.:	426-94-001
Location: No land use by consultant		Contractor:	Craig
Driller: G. McEneny	Inspector:	L.M. Lidell	
Well No.: MW E 34-2	Type of Well: Monitor 'A'	Date:	2/7/94

Well Development

Date:	Water Level Before:	Water Level After:
Note: Water level readings from top of PVC	Taken	min. After Development



Permit NO. 2637297

Remarks: Intended to set well at 13.0'. However PVC pipe sank to 13.0 while being installed - driller unable to pull it back because of well graded around it.

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Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

PHASE II — TAX/X E 34

SHEET 1 OF 4

PROJECT: NJ. Marine Terminal Bldg #2270	NAME OF CONTRACTOR: Kwaig	BORING NO.: MW E34-3	SURFACE ELEV.
LOCATION: As laid out by Consultant		CONTRACT NO.: 426-94-001	DATE: 2/4/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8" I.D.	10 Auger	MONITOR "A"
HAMMER 140 # FALL 30"	HAMMER — # FALL —	
DRILLER: G McAneny		
INSPECTOR: R-M Lebert		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/4/94	12 45 hr	6.5'	while hand Augering

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- COV'D [1]	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
					ASPHALT 0.0 to 1.0
Hand Auger		Hand Auger	18"	1	Fill Br m-f sand, tr silt.
		Hand Auger	24"	2	Fill Same
	5	Hand Auger	24"	3	Fill Same 6.0
10" H.S. Auger		6 7 9 9	16"	4	Fill grey m-f sand, tr silt, tr wood fragments 8.0
		7 7 7 9	20"	5	Fill Br f sand, tr silt
	10	5 4 4 4	17"	6	Fill grey f and Br f sand, tr silt 12.0
		4 4 4 3	19"	7	Br silt and grey silt to grey f sand 14.0
	15				BOTTOM OF BORING
	20				
	25				

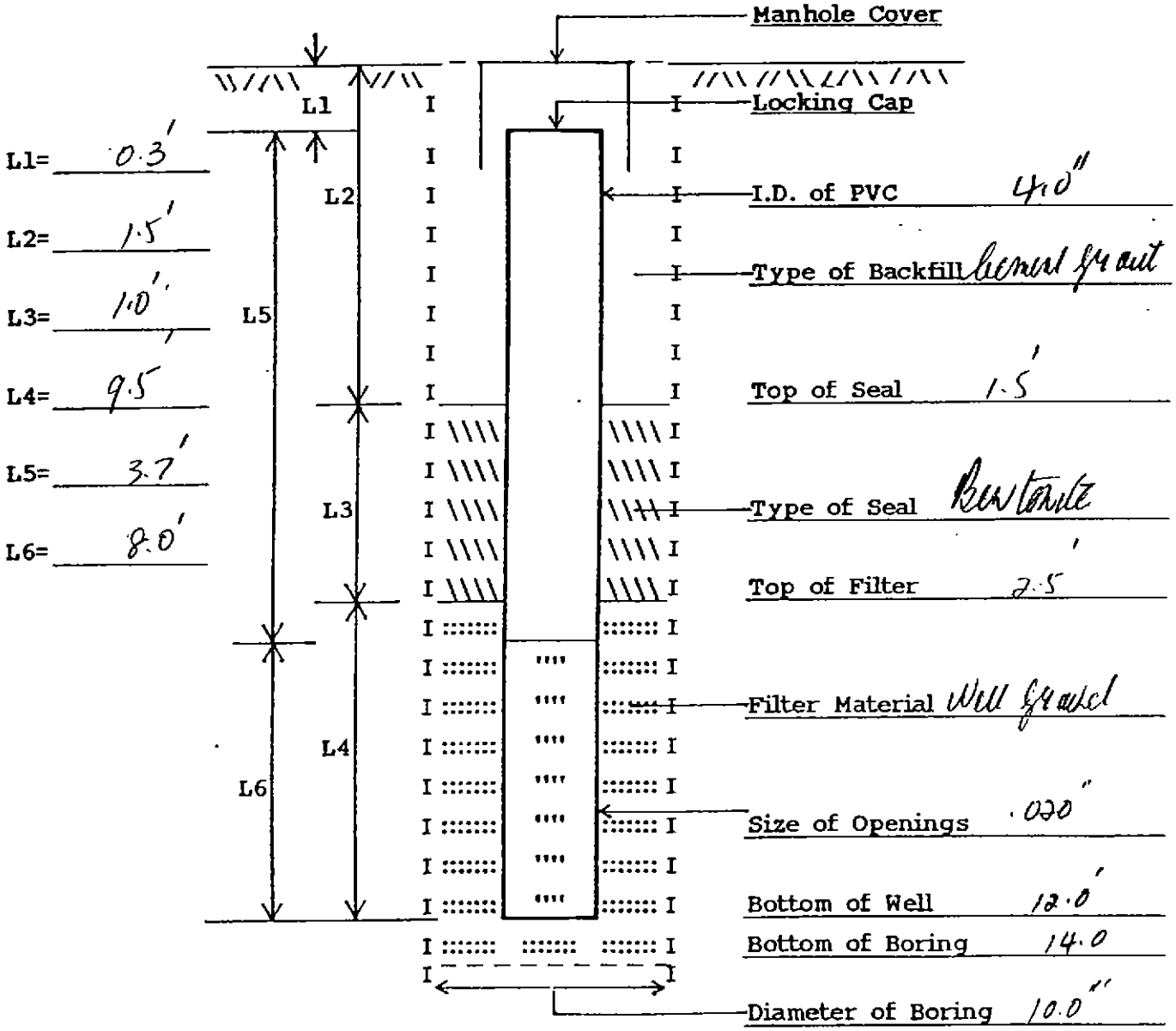
NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ Marine Terminal Bldg 2270			Contract No.: 426-94-00
Location: No. 1 and Port Ivy Terminal			Contractor: Bragg
Driller:		Inspector: R M. Lovell	
Well No.: MW E34-3	Type of Well: Monitor A.		Date: 2/4/94

Well Development

Date: 2/8/94	Water Level Before: 6.2"	Water Level After: 6.0
Note: Water level readings from top of PVC	Taken 15 min. After Development	



L1= 0.3'
L2= 1.5'
L3= 1.0'
L4= 9.5'
L5= 3.7'
L6= 8.0'

Remarks: Permit No. 2637298

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BORING REPORT

SHEET 1 OF 4

PROJECT: NJ Marine ust Phase II	NAME OF CONTRACTOR: Craig	BORING NO.: MW-C21-1	SURFACE ELEV.:
LOCATION: As laid out in field south of bldg. 173		CONTRACT NO.: 426-94-001	DATE: 2/19/94
SPOON: 3 "O.D. 2 3/8 "I.D.	CASING SIZE: Driven	HOLE TYPE: 4" monitor	
HAMMER: 140 # FALL 30 "	HAMMER: # FALL "		
DRILLER: G. McAneny			
INSPECTOR: T Ryan			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/19/94	8:30 #	4.5'	In sample #3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
Rotary Bit	0				ASPHALT	0.5'
					CCABC	1.0
		Hollow Auger	12"	1	Fill C-F Red Br. sand, some gravel, tr silt	2.0'
				2	Fill - C-F red sand, tr silt, tr gravel	
			24"			
	5			3	Same as above (Duplicate sample taken)	
		V	24"			6.5'
Driven		5-4		4	Fill C-F Brown sand, some gravel, tr silt.	
		4-3	14"			8.0'
		3-3		5	Dk grey/brn silty clay interbedded w/ sand	
V	10	4-3	14"			10.5'
					Bottom of Boring	
	20					
	25					

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

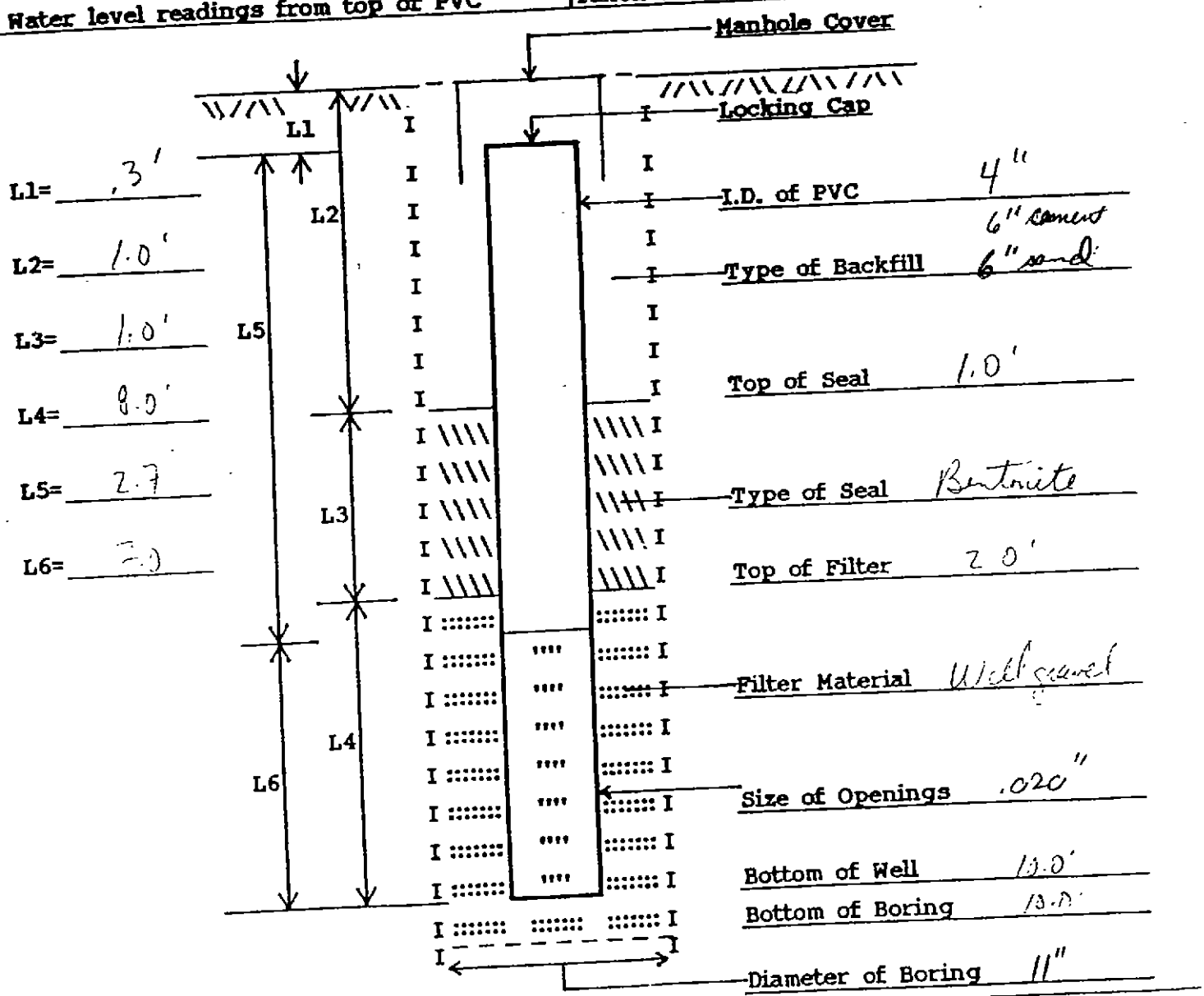
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine UST Phase II	Contract No.: 426-94-001
Location: As laid out in field south of Bldg. 173	Contractor: Craig
Driller: G. McAneny	Inspector: T. Ryan
Well No.: MW-C21-1	Type of Well: A' monitor
	Date: 2/19/94

Well Development

Date: 2/19/94	Water Level Before: 4.5'	Water Level After: 5.0'
Note: Water level readings from top of PVC	Taken 30 min. After Development	



Remarks: NJ Well Permit No. 26-29261

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BORING REPORT

SHEET 1 OF 1

PROJECT: N.J. Marine UST	NAME OF CONTRACTOR: Craig	BORING NO.: MW-C20-1	SURFACE ELEV.:
LOCATION: As laid out in field east of Bldg 173		CONTRACT NO.: 426-94-001	DATE: 1/14/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 1/3 "I.D.	Auger	Hollow stem

HAMMER	HAMMER
140 # FALL 30	# FALL

DRILLER: J. Kozarski

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
1/14/94	11:30A	4.0'	In sample #2

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
	0				ASPHALT	0.3'
					R.C.A.	0.5'
		Hand Auger	12"	1	Fill- M-F Br. sand, trace silt, trace gravel, trace cobble	1.0
		Hand			Same as above	
		Auger	24"	2		
	5	Hand			Same as above	
		Auger	24"	3		
Auger		9-11			Same as above	
1'		11-11	16"	4		8.0'
		2-2			Grey fine clayey silt to fine sand, trace	
1.1'	10	2-3	11"	5		11.1'
					Bottom of boring	
	15					
	20					
	25					

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

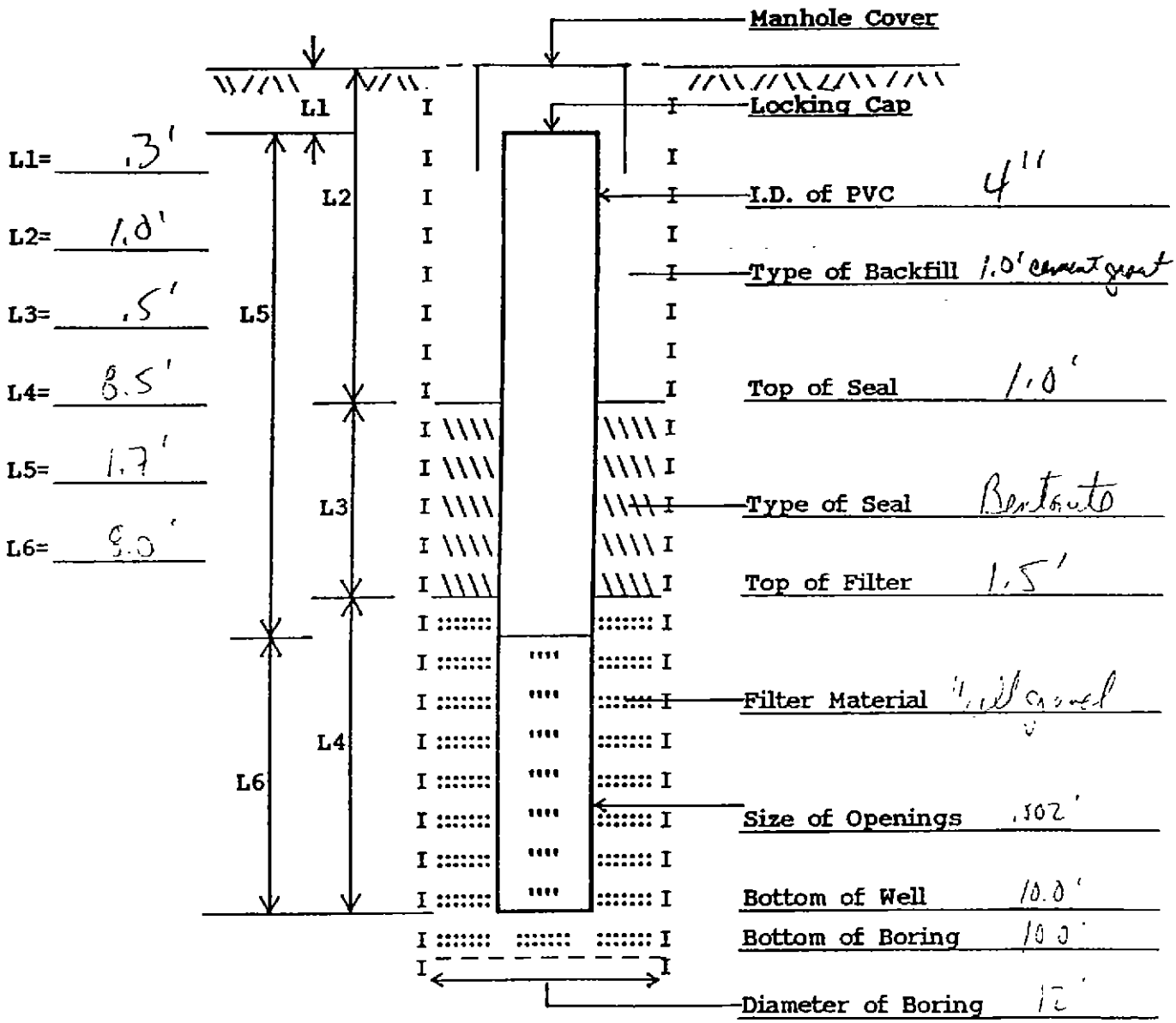
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine - UST		Contract No.: 426-94-001
Location: As laid out in field east of Bldg 173		Contractor: Craig
Driller: J. Kozarski	Inspector: T. Ryan	
Well No.: MW-C20-1	Type of Well: A monitor	Date: 1/14/94

Well Development

Date: 1/24/94	Water Level Before: 2.0'	Water Level After: 1.5'
Note: Water level readings from top of PVC	Taken 80 min. After Development	



Remarks: N. Well Point No. [illegible]

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BORING REPORT

SHEET 1 OF 4

PROJECT: N.J. Marine - U.S.T.	NAME OF CONTRACTOR: Craig	BORING NO.: MW-C20-2	SURFACE ELEV.:
LOCATION: As laid out in field east of bldg 173		CONTRACT NO.: 426-94-001	DATE: 1/24/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/4 "I.D.	Auger 12"	A Monitor

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

ORILLER: J. Kozarski

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
1/24/94	8:00A	3.5'	In sample # 2

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
Pulled Out	0					
					ASPHALT	0.4
					DGABC	1.0'
		Hand Auger	12"	1	Fill - C-F Br. sand, some gravel, tr silt	2.0'
		Hand Auger	24"	2	Fill - C-F Red Br. sand, tr silt, tr gravel (Duplicate jar sample taken)	
	5	Hand Auger	24	3	Same as above	
		3-2		4A	Same as above	7.5'
		8-7	14"	4B	Gray & Black org. clayey silt, some M-F sand,	8.5'
	10				Bottom of Boring @ 10'	
	15					
	20					
	25					

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

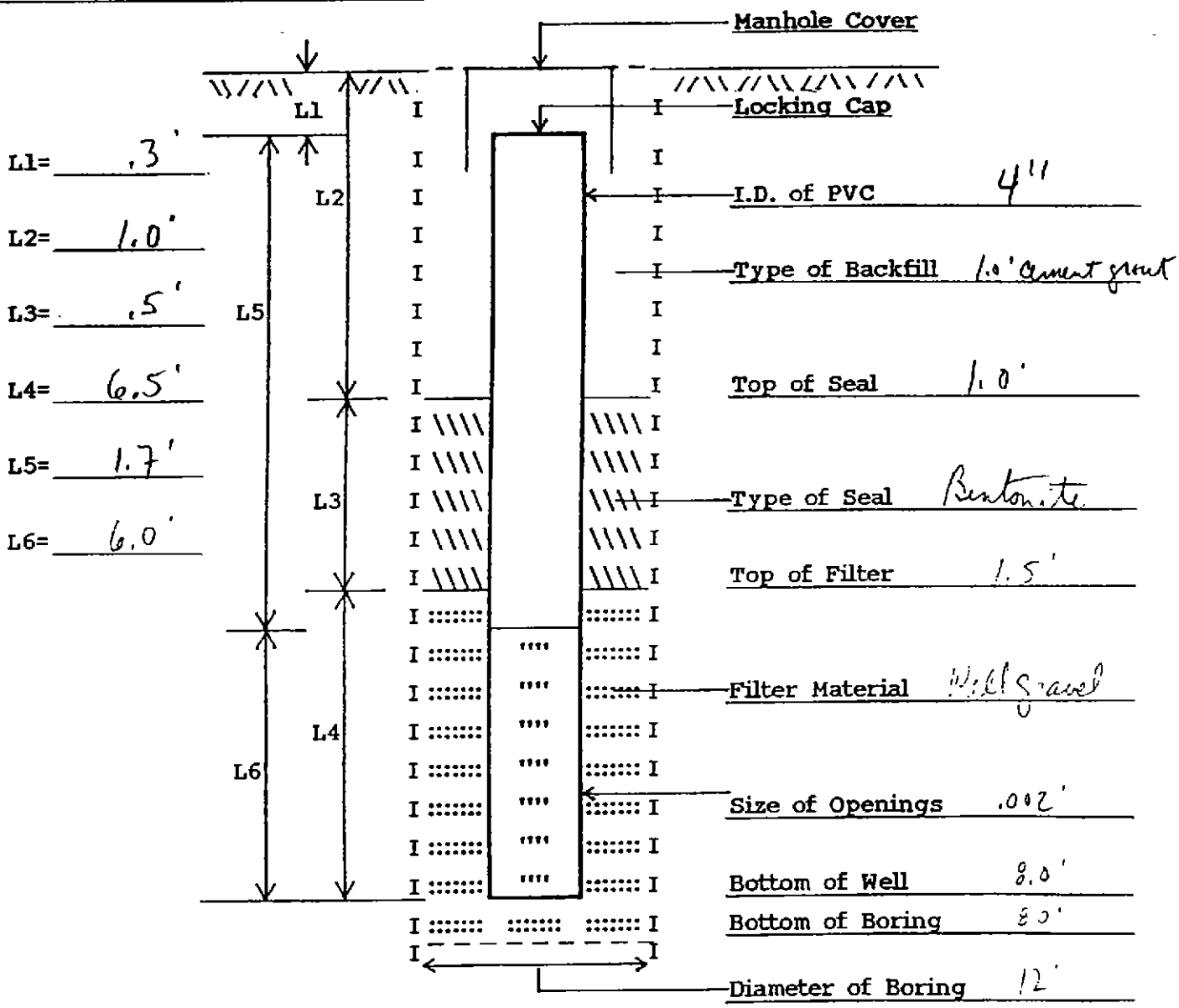
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ Marine - U.S.T		Contract No.: 426-94-001
Location: As landed in field east of Bldg 173		Contractor: Craig
Driller: J Kozarski	Inspector: T. Ryan	
Well No.: MW-C20-2	Type of Well: A monitor	Date: 1/24/94

Well Development

Date: 1/25/94	Water Level Before: 2.0'	Water Level After: 2.0'
Note: Water level readings from top of PVC	Taken 15 min. After Development	



Remarks: NJ NJ Dept. No. 94-37001

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: N.J. Marine - UST	NAME OF CONTRACTOR: Craig	BORING NO.: MW-C20-3	SURFACE ELEV.
LOCATION: 10' West of original location (Bldg 173)		CONTRACT NO.: 426-94-001	DATE: 1/24/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Twelve	Augerator

HAMMER	HAMMER
140 # FALL 30	# FALL

DRILLER: J. Kozarsky

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
1/24/94	1135	3.0'	Insample = 2

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D[1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Roller Bit	0				ASPHALT 0.4'
					DGABC 1.0'
		Hand Auger	12"	1	Fill - C-F Br. Sand, tr silt, tr gravel 2.0'
		Hand		2	Misc Fill - Gray & Br. clayey silt, some F sand, tr glass
		Auger	24"		(fuel odor) 4.0
	5	Hand		3	Misc Fill C-F Br. Sand, tr silt, tr glass (fuel odor)
		Auger	24"		6.0'
		2-1		4	Black & gray org clayey silt, tr F sand
		2-3	18"		8.0'
	10				Bottom of Boring
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

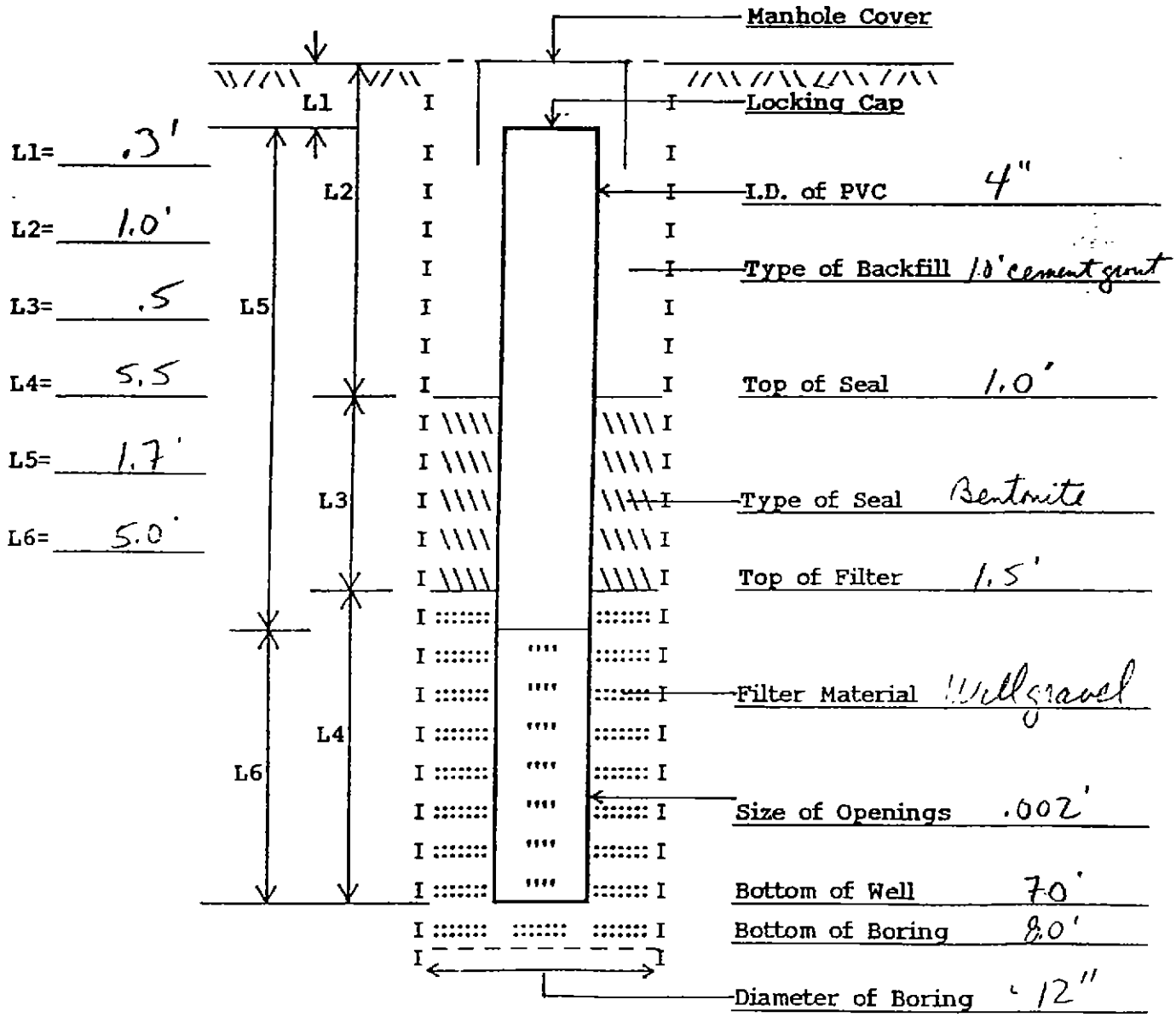
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine - U.S.T.			Contract No.: 426-94-001
Location: 10' west of original location			Contractor: Craig
Driller: J. Kozaraki		Inspector: T. Ryan	
Well No.: MW-C20-3	Type of Well: A' monitor		Date: 1/24/94

Well Development

Date: 1/25/94	Water Level Before: 2.5'	Water Level After: 2.5'
Note: Water level readings from top of PVC	Taken 15 min. After Development	



Remarks: Backfilled with bentonite from 7.0' to 8.0'

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: NJ Marine UST	NAME OF CONTRACTOR: Crain	BORING NO.: MW-E33-1	SURFACE ELEV.:
LOCATION: As laid out in field west of Bldg. 2270		CONTRACT NO.: 426-94-001	DATE: 2/22/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Auger	4" monitor

HAMMER	HAMMER
140 # FALL 30"	# FALL

DRILLER: G. McAneney

INSPECTOR: T Ream

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/22/94	9:00A	5.5'	4 hr reading ± 3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D	SAMP. NO.	SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Roller Bit	0				FILL
		Hand Auger	19"	1	Fill-M-F Red Brn sand, tr gravel, tr silt
			24"	2	Same as above
	5		24"	3	Same as above (Duplicate sample taken.) 6.0'
Auger		6-10		4	Fill - M-F Brown sand, little silt
		12-9	18"		
		5-5		5	Fill - Red silt, some f sand, tr plant fibers
	10	3-6	20"		(wet + saturated) 10.5'
		3-2		6	Fill silty fine sand
		2-2	14"		
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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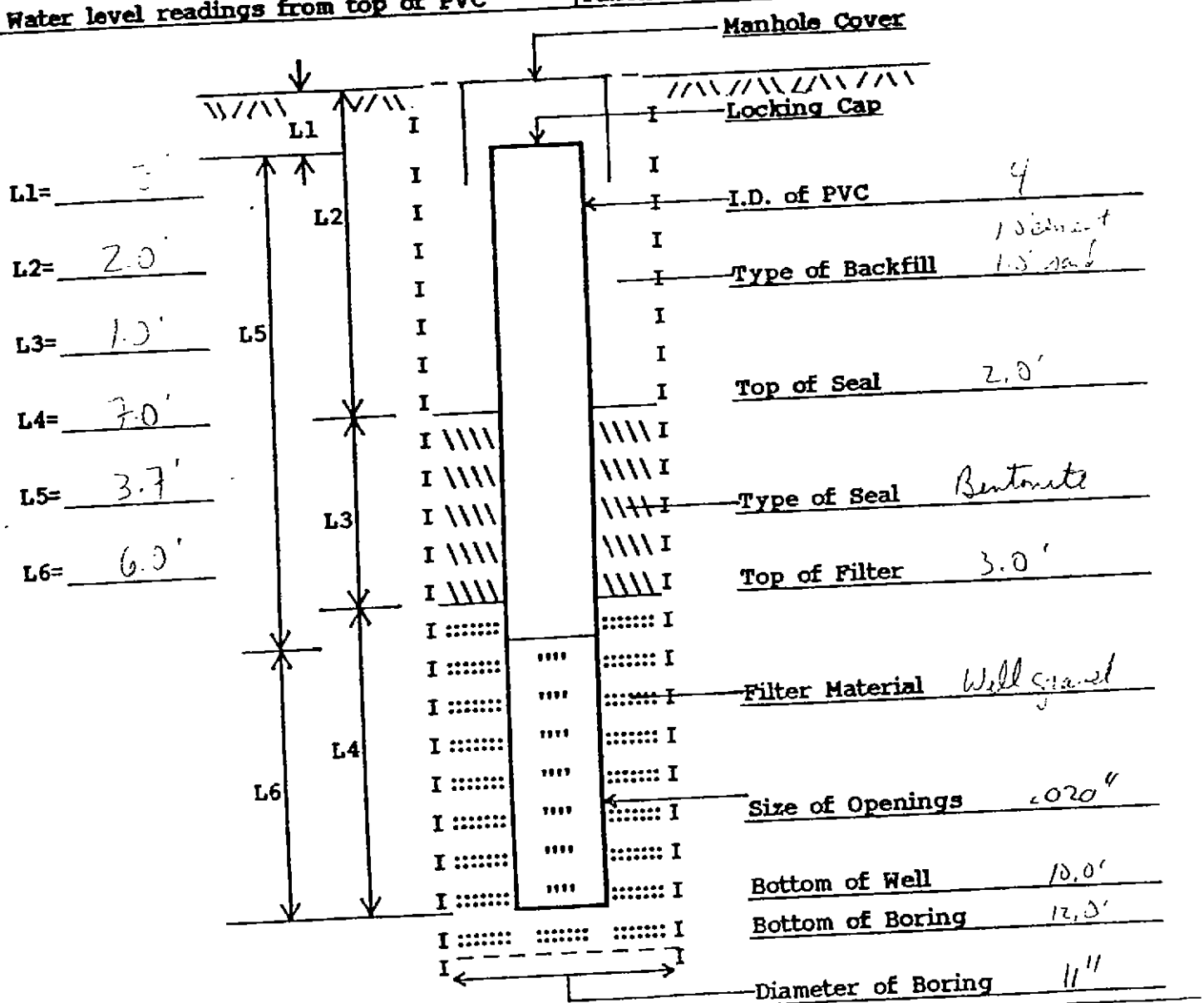
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: [illegible]	Contract No.: 426-94-551
Location: [illegible]	Contractor: Trace
Driller: G McAneny	Inspector: T Kam
Well No.: 33-1	Type of Well: [illegible]
	Date: 2/22/94

Well Development

Date: 2/22/94	Water Level Before: 5.5'	Water Level After: 6.0'
Note: Water level readings from top of PVC	Taken 20 min. After Development	



Remarks: Backfilled w/ bentonite from 12.0' to 10.0'
NJ Well Permit No. 20-37295

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: NJ - Marine - UST Phase II	NAME OF CONTRACTOR: Cranston	BORING NO.: MW-P48-1	SURFACE ELEV.
LOCATION: Accident in field north of Bldg 158 (Bldg 158 demolished)		CONTRACT NO.: 426-94-001	DATE: 2/17/94
SPOON: 3 O.D. 2 3/8 I.D.	CASING SIZE: Augers	HOLE TYPE: Monitor	
HAMMER: 140 # FALL 30	HAMMER: # FALL		
DRILLER: G. McAnaney			
INSPECTOR: T. Ryan			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/17/94	11:30A	4.0'	In sample #3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Rotary	0				Asphalt .7'
					Gravel & cobbles .7'
		Hand	12"	1	Fill - C-F Br. sand & gravel, tr silt 2.0'
		Auger		2	Fill - C-F Br sand, some gravel, little silt 4.0'
	5		24"		
		↓	24"	3	Fill - M-F Br. Sand & silt, tr gravel 6.0'
Augers		2-2		4	Fill - Red silty clay, tr C-F sand, little gravel, (slight fuel odor)
		3-3	18"		
		3-3		5	Same as above 10.0'
	10	3-4	10"		
		3-2		6	Red clayey silt, tr f sand, tr gravel (2 attempts made to retrieve sample) 12.0'
↓		2-2	6"		
					Bottom of Boring
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

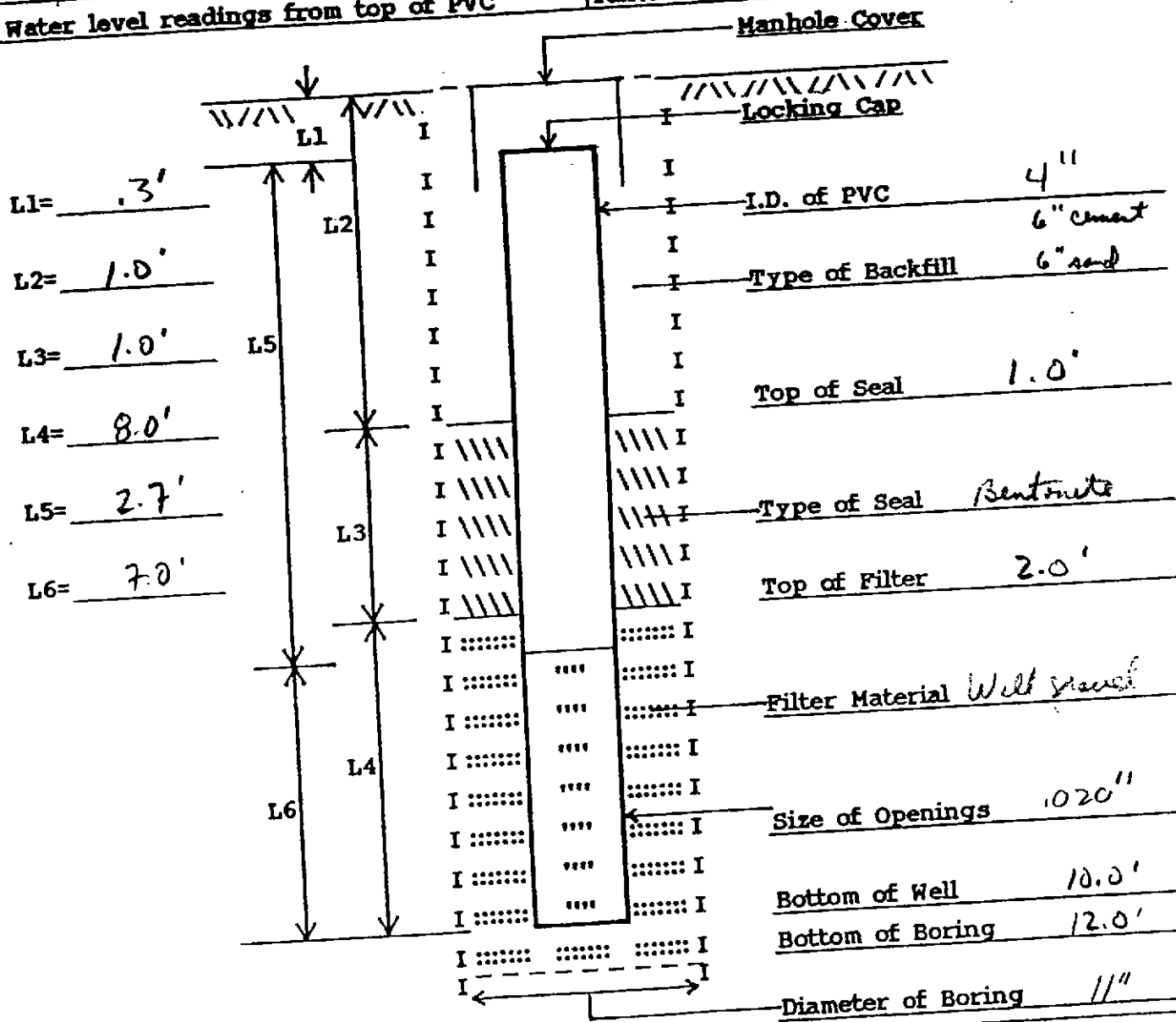
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine-4ST Phase II	Contract No.: 426-94-001
Location: As laid out in field north of Bldg. 158	Contractor: Craig
Driller: G. McAneny	Inspector: T. Egan
Well No.: P48-1	Type of Well: A'monitor
	Date: 2/17/94

Well Development

Date: 2/18/94	Water Level Before: 4.0'	Water Level After: 4.0'
Note: Water level readings from top of PVC	Taken 20 min. After Development	



Remarks: Backfilled w/ Bentonite from 12.0' to 10.0'
NJ Well Permit No. 26-37260

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: N.S. Marine - UST Phase II	NAME OF CONTRACTOR: Craig	BORING NO.: MW-P48-2	SURFACE ELEV.:
LOCATION: As laid out in field north of Bldg 158 (Bldg 158 demolished)		CONTRACT NO.: 426-94-001	DATE: 2/17/94

SPOON	CASING SIZE	HOLE TYPE
3" O.D. 2 3/8" I.D.	Augers	4" monitor

HAMMER	HAMMER
140 # FALL 30"	# FALL "

DRILLER: G. McAneny

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/17/94	1:45p	4.0'	In sample #3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Roller Bit	0				ASPHALT 0.4'
					GRAVEL 1.0'
		Hand Auger	12"	1	Fill - C-F Br sand, some gravel, tr silt
			24"	2	Same as above (Dup sample taken) 4.0'
	5				
			24"	3	Fill: C-F Br sand & gravel, tr silt; tr shell
Augers		4-4			
		4-3	16"	4	Same as above
					9.5'
		3-3			
		3-2	13"	5	Ltd silty clay, tr gravel
	10				10.5'
					Bottom of Boring
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

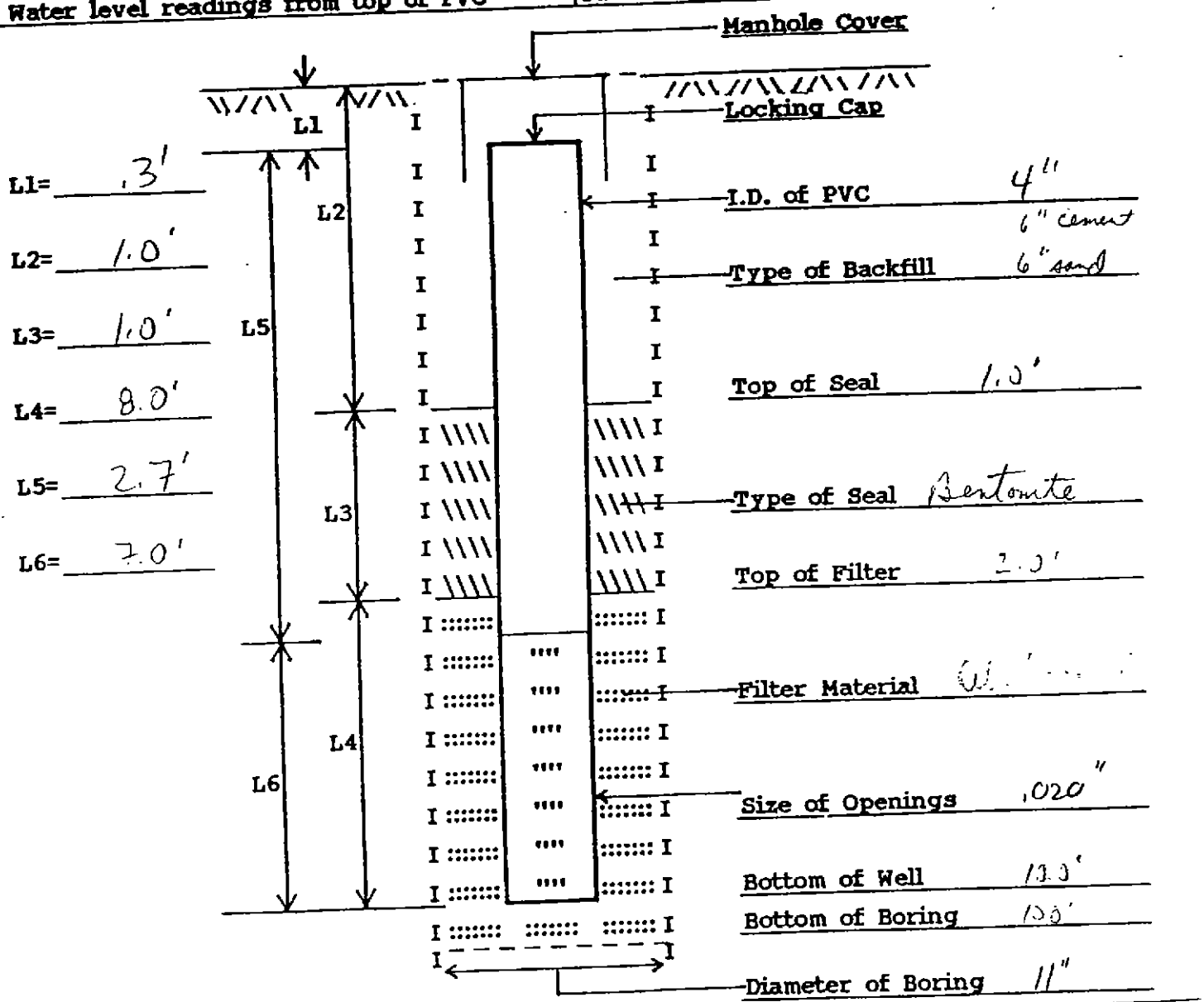
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine - UST - Phase II	Contract No.: 426-94-001
Location: As laid out in field north of Bldg 153	Contractor: Craig
Driller: G. McAneny	Inspector: T. Ryan
Well No.: MW-P48-2	Type of Well: A monitor
	Date: 2/17/94

Well Development

Date: 2/17/94	Water Level Before: 4.0'	Water Level After: 4.0'
Note: Water level readings from top of PVC	Taken 20 min. After Development	



Remarks: NJ Well Permit No. 24-37261

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: N.S. Marine UST Phase II	NAME OF CONTRACTOR: Craig	BORING NO.: MW-P4-3	SURFACE ELEV.
LOCATION: As laid out in field north of Bldg 158 (Bldg 158 Demolished)		CONTRACT NO.: 426-94-001	DATE: 2/18/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Auger	4" monitor

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: G. McAneny

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/18/94	6:00 P	5.0'	In sample # 3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS LINE LOCATES CHANGE OF PROFILE	
Roller Bit	0				ASPHALT	0.6'
					SAND & GRAVEL	1.8'
		Hand Auger	12"	1	Fill - C-F Br. sand, tr silt, tr gravel (slight odor)	2.0'
		1	24"	2	Same as above	
	5	V	14"	3	Same as above	
Augers		5-4				
1		3-3	16"	4	Same as above	8.0'
		3-2				
V		3-3	13"	5	Red silty clay, little gravel, tr F sand	
	10					10.0'
	20					
	25					

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

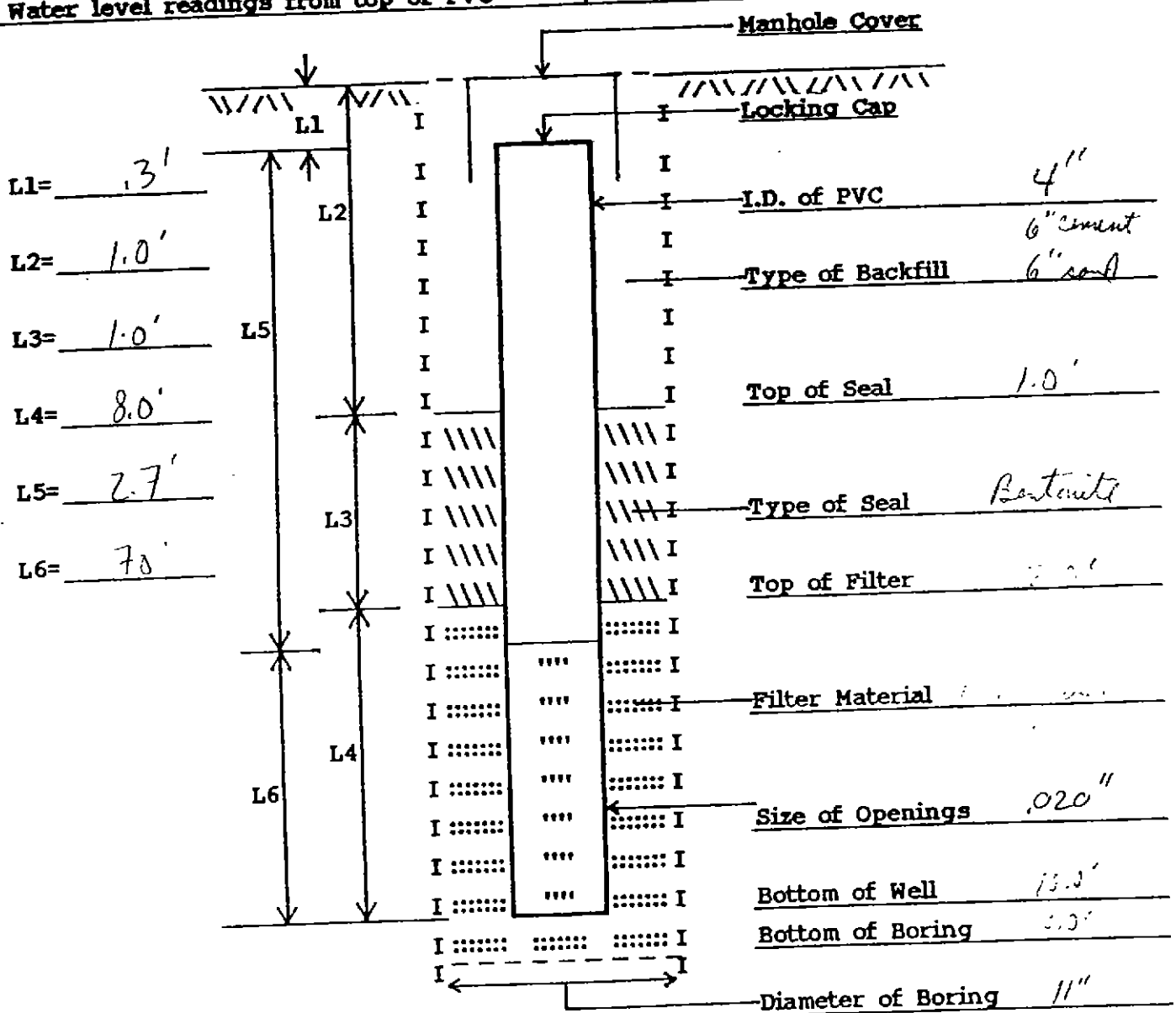
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine UST Phase II	Contract No.: 426-94-201
Location: As laid out in field north of bldg 158	Contractor: Craig
Driller: G. McAneny	Inspector: T. Ryan
Well No.: P48-3	Type of Well: A' monitor
	Date: 2/18/94

Well Development

Date: 2/18/94	Water Level Before: 5.5'	Water Level After: 6.0'
Note: Water level readings from top of PVC	Taken 20 min. After Development	



Remarks: NJ Well Permit No. 26-27222

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
N.J. Marine UST Phase II	Craig	MW-C17-1	
LOCATION		**CONTRACT NO.**	**DATE**
As laid out in field east of bldg 195		426-94-001	3/8/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Augers	4" monitor

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: G. McAneny

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3-8-94	2 PM	4.2'	FOUND IN SAMPLE NO. 3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
12 0/4 BIT	0				ASPHALT 0.5'
Hollow Stem Auger		Hand Auger	18"	1	FILL RED-BR C-F SAND, Tr. Si, F. Little Gravel
		HAND AUGER	24"	2	SAME
	5	HAND AUGER	24"	3	SAME
		4-5	16"	4	Fill DK. Grey-C-F SAND, Tr. Wood, Tr. Wet & Soft Th. Silt
		5-5		5	SAME 7.5
	10				HIT GROUND WATER AT 8.5 SAME
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

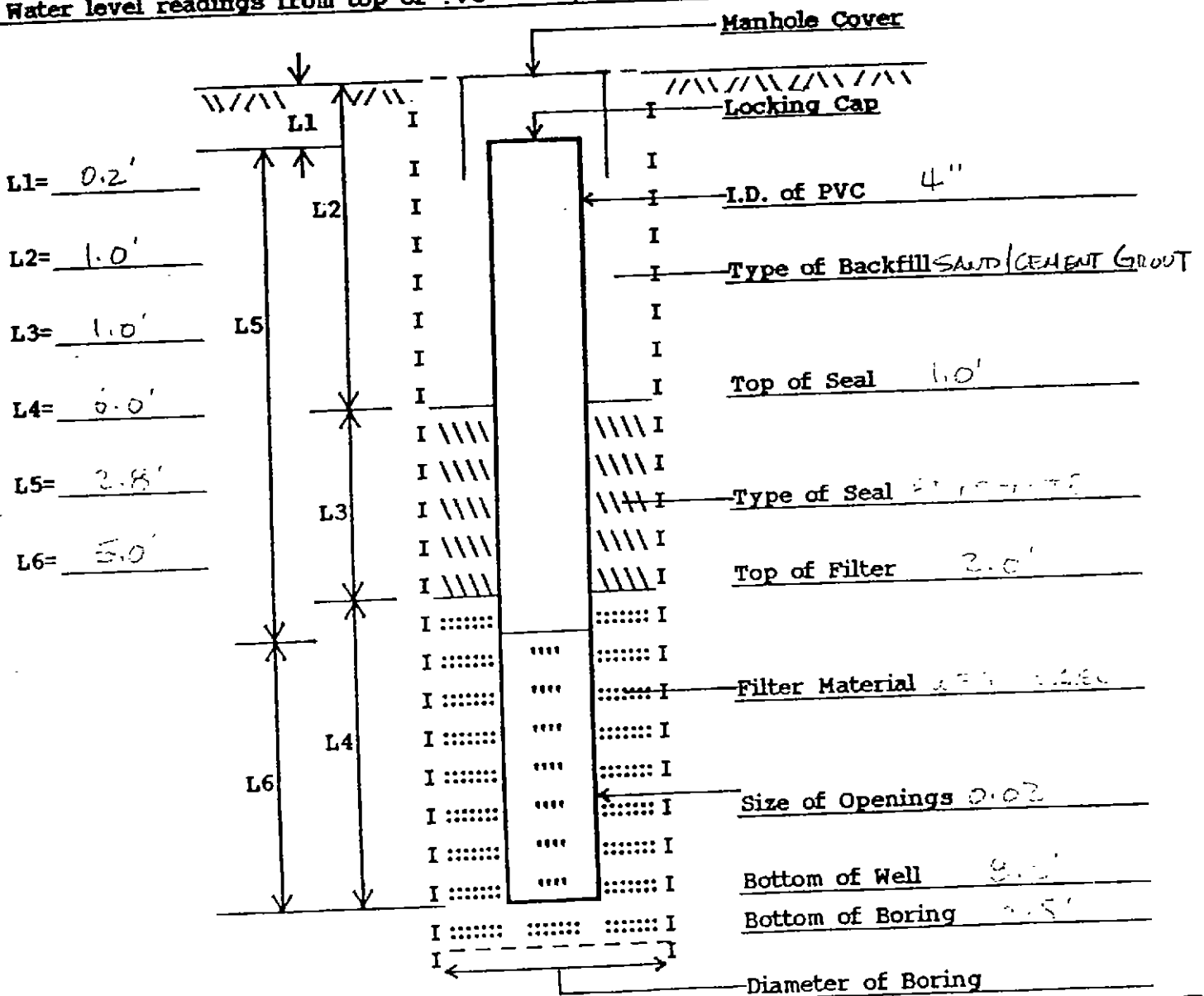
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine UST Phase II	Contract No.: 426-94-001
Location: As laid out in field east of Site 195	Contractor: Craig
Driller: G. McAneny	Inspector: M. OUDEH
Well No.: MW-C17-1	Type of Well: A'monitor
	Date: 3/8/94

Well Development

Date: 3-9-94	Water Level Before: 4.0'	Water Level After: 4.1
Note: Water level readings from top of PVC	Taken 60 min. After Development	



Remarks: NJ Mon Form No. [illegible]

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: NJ MARINE TERMINAL - UST-PHASE II	NAME OF CONTRACTOR: CRAIG DRILLING	BORING NO.: MW-C17-2	SURFACE ELEV.:
LOCATION: AS LAID OUT IN THE FIELD - EAST of Building 195		CONTRACT NO.: 426-94-001	DATE: 3-9-94

SPOON	CASING SIZE	HOLE TYPE
3 O.D. 2 3/8 I.D.	AUGER	4" Monitor

HAMMER	HAMMER
140 # FALL 30	# FALL

DRILLER: G. McANENY

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3.9.94	8 30 AM	4.1'	FOUND IN SAMPLE No. 3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
ROLLER BIT	0				ASPHALT 0.5'
Hollow		Hand AUGER	18"	1	Fill BR. M-F SAND, tr. silt, tr. gravel
STEM		HAND			
AUGERS		AUGER	18"	2	Fill TAN-BR M-F SAND, tr. silt, tr. gravel
	5	HAND	14"		
		AUGER		3	Fill Grey-BR. m-f SAND, tr. silt, tr. gravel
		4-4	18"	4A	SAME 6.5'
		4-5		4B	Misc. Fill Grey PEAT, M-F SAND, Clay & silt
		2-2	20"	5	SAME
	10	1-1			
		1-2		6	SAME
		2-2	18"		
		1-2	15"	7A	Misc F [illegible] 13.5'
		1-2		7B	Grey [illegible]
	15				
					BOTTOM OF BORING
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

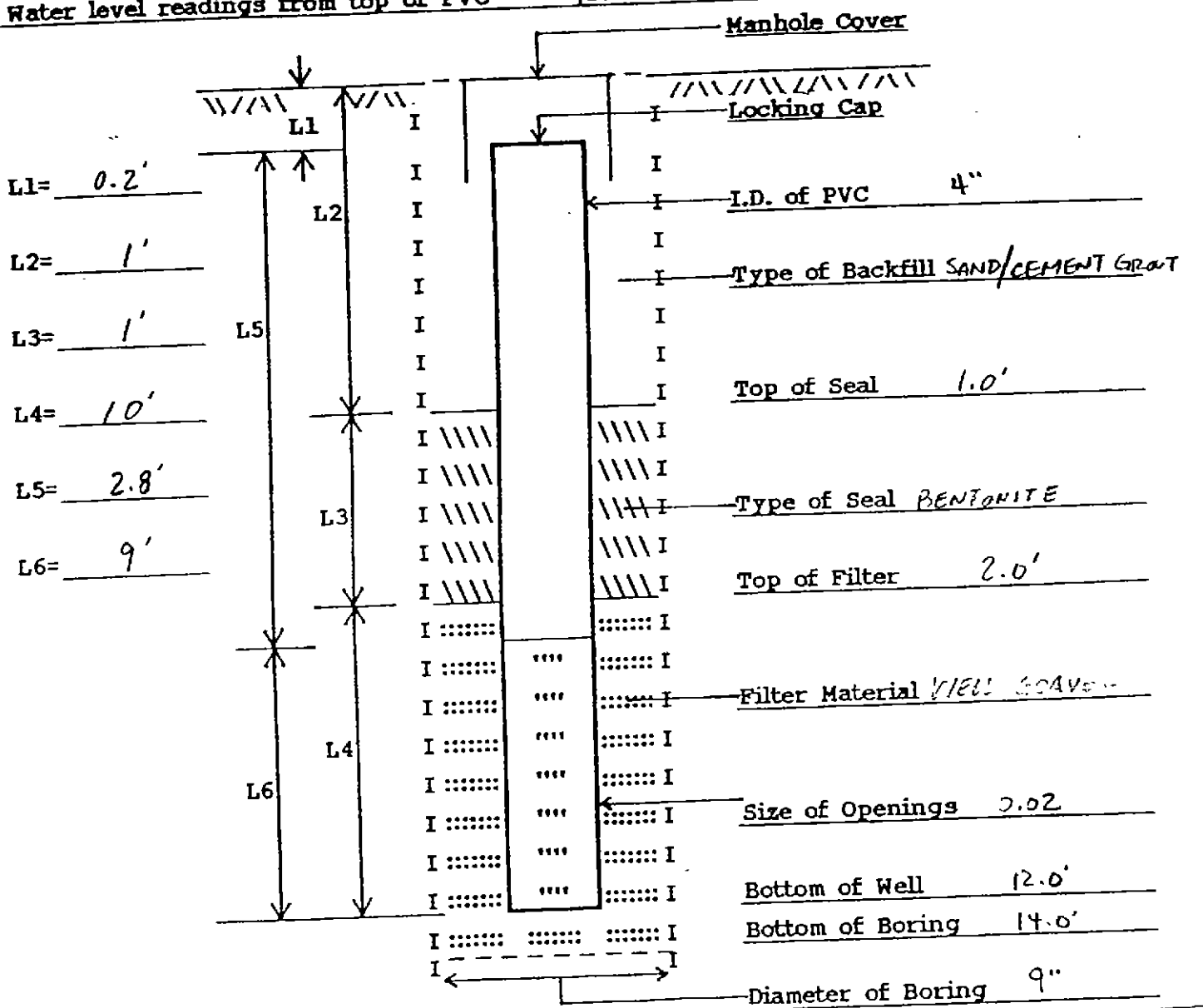
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ MARINE TERMINAL - UST. PHASE II	Contract No.: 4-26-94-001
Location: AS LAID OUT IN THE FIELD - EAST OF BLDG. 195	Contractor: CRAIG DRILLING
Driller: G. McANENY	Inspector: M. OUDEH
Well No.: MW-C17-2	Type of Well: "A" monitor
	Date: 3-9-94

Well Development

Date: 3-9-94	Water Level Before: 6.1'	Water Level After: 6.4'
Note: Water level readings from top of PVC	Taken 60 min. After Development	



Remarks: BACKFILLED WITH BENTONITE FROM 14' to 12'

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
NJ MARINE TERMINAL-UST- PHASE I	CRAIG DRILLING	MW-C17-3	
LOCATION		**CONTRACT NO.**	**DATE**
AS LAID OUT IN THE FIELD- EAST of BLDG. 195		426-94-001	3-9-94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGER	"A" Monitor

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: G. MCANENY

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3.9.94	10 20 pm	4.2'	FOUND IN SAMPLE NO. 3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS LINE LOCATES CHANGE OF PROFILE
ROLLER BIT	0	HAND			ASPHALT 0.5'
Hollow		AUGER	18"	1	FILL BR. M-F SAND, tr. SILT, tr. GRAVEL
STEM		HAND			FILL BR. M-F SAND, tr. SILT, tr. GRAVEL
AUGER		AUGER	24"	2	(DUPLICATE SAMPLE TAKEN)
	5	HAND			FILL GREY-BR M-F SAND, tr. SILT, little GRAVEL
		AUGER	24"	3	
		4-2		A	FILL GREY C-F SAND, tr. SILT, little GRAVEL 7.5'
		2-3	18"	4	B FILL DK. GREY CLAY & SILT, tr. FINE SAND
		2-2	20"	5	FILL GREY - BLACK CLAY & SILT, little M-F SAND
	10	3-3			
		1-2	17"	6	A SAME 11.0'
		2-2			B MISC. FILL, DK. GREY M-F SAND, SHELL, CINDERS
		2-2	15"	7	A SAME 13.5'
		2-2			D DK GREY ORGANIC SILTY CLAY, LITTLE PEAT FIBERS 14.0
	15				
					Bottom of Boring
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

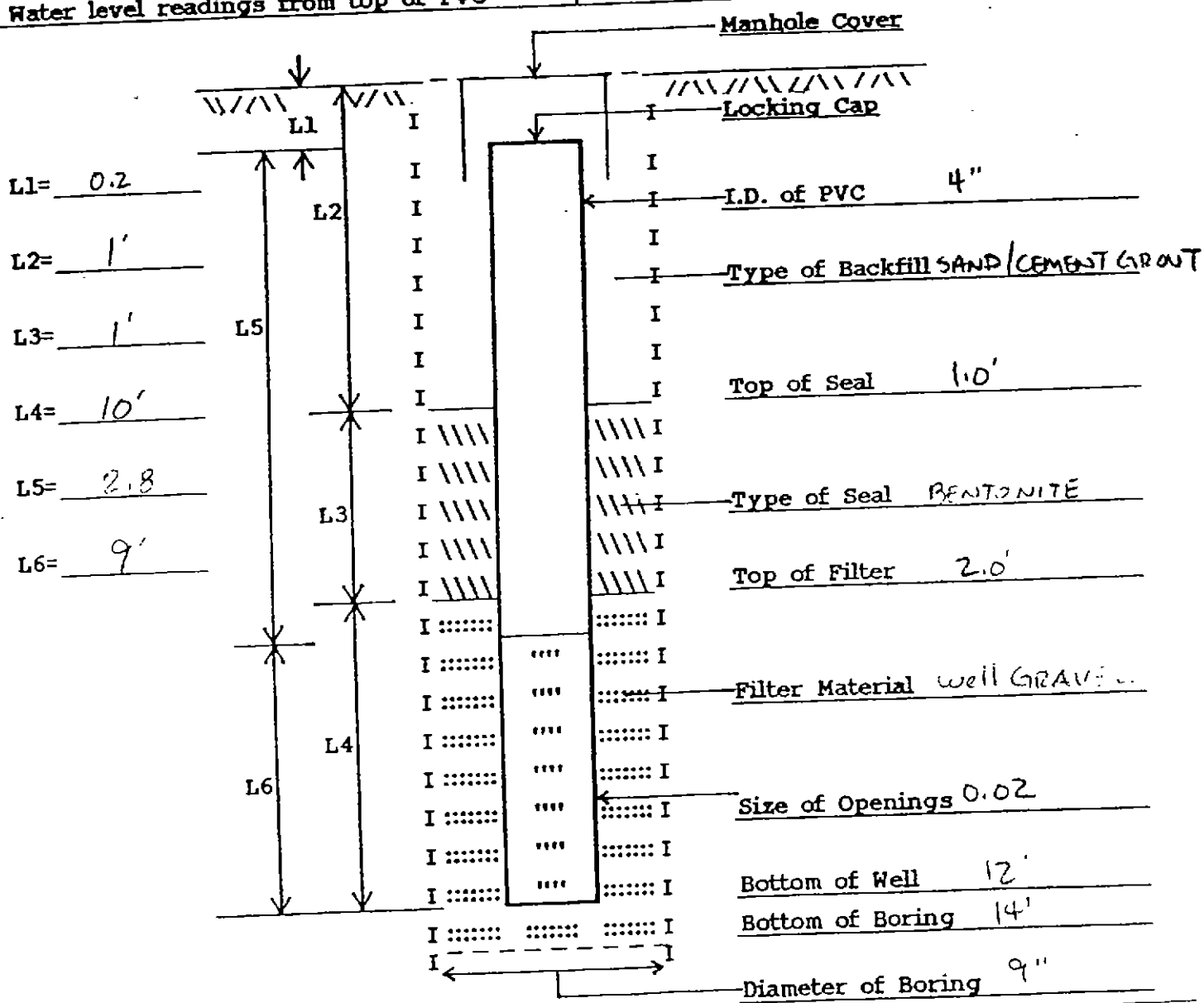
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ MARINE TERMINAL - UST - PHASE	Contract No.: 426-94-001
Location: AS LAID OUT IN THE FIELD - EAST OF BLDG. 195	Contractor: CRAIG DRILLING
Driller: G. McANENY	Inspector: M. OUDEH
Well No.: MW-C17-3	Type of Well: "A" Monitor
	Date: 3-9-94

Well Development

Date: 3-9-94	Water Level Before: 5.9'	Water Level After: 6.2'
Note: Water level readings from top of PVC	Taken 60 min. After Development	



Remarks: Backfilled with Bentonite From 14' to 12'

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: NJ Access US 1 Phase II	NAME OF CONTRACTOR: Craig	BORING NO.: MW-C4-1	SURFACE ELEV.:
LOCATION: As Ordered in field west of Rds. 296		CONTRACT NO.: 426-94-001	DATE: 2/7/94

SPOON	CASING SIZE	HOLE TYPE
" O.D. 2 1/2 " I.D.	4" over 12'	Augers

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: E. Krawiecki

INSPECTOR: T. Clyne

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/7/94	1:30 P	6.0'	In sample #3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. NO. [2]	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Fall on Rock	0				ASPHALT 0.2'
		Hand auger	18"	1	Fill - C-F Brown sand, little gravel, tr brick, tr. coal 0.2'
			24"	2	Fill - M-F Gray sand, some silt, tr gravel 4.5'
	5		24"	3	Fill - M-F Gray sand, tr silt, tr gravel. (Spoon sample #3)
Augers		7-9		4	Same as above 8.5'
		14-16	13"		
		2-5		5	Fill - M-C Gray sand, tr silt, tr gravel 10.5'
	10	11-9	16"		
		4-3		6	Fill - M-F Gray sand, some clayey silt in tip of spoon 12.5'
		2-2	14"		
					Top of Rock @ 13.5'
					Bottom of Hole @ 15'
	20				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

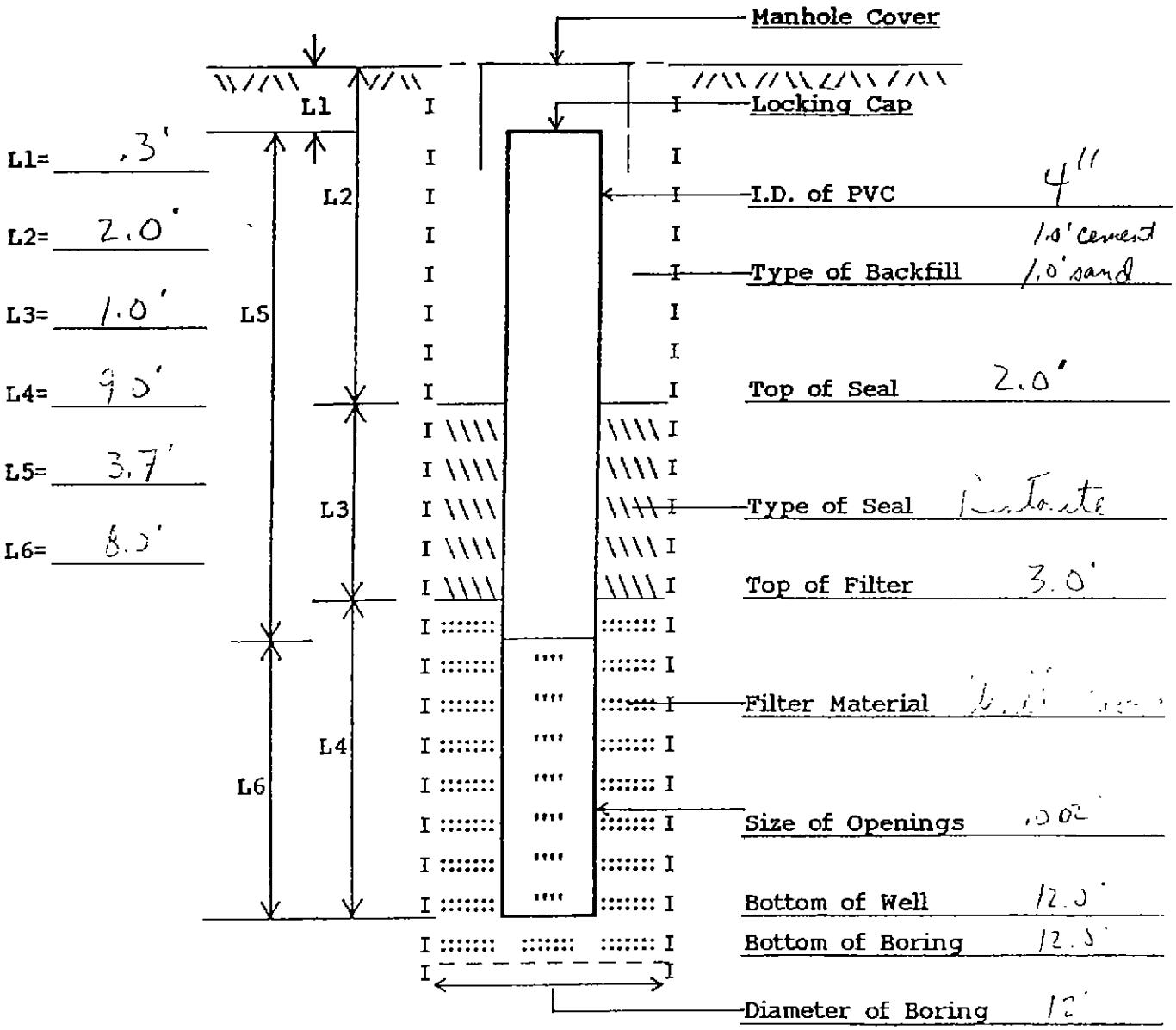
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ-Marine-US T Phase II		Contract No.: 426-94-001
Location: As laid out in field west of Bldg 296		Contractor: Craig
Driller: T. Kozarski	Inspector: T. Ryan	
Well No.: MW-C4-1	Type of Well: Monitor	Date: 2/7/94

Well Development

Date: 2/7/94	Water Level Before: 7.0'	Water Level After: 8.0'
Note: Water level readings from top of PVC	Taken 30 min. After Development	



Remarks:

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: N.J. Marine - U.S.T Phase II	NAME OF CONTRACTOR: Craig	BORING NO.: MW-94-2	SURFACE ELEV.
LOCATION: As laid out in field west of bldg 296		CONTRACT NO.: 426-94-001	DATE: 2/14/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Augers	4" mw

HAMMER	HAMMER
140 # FALL 30"	# FALL "

DRILLER: J. Kozarski

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/14/94	8:15	6.0'	In sample #3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Rollerbit	0				Asphalt 0.4
					Ogabe 1.0
		Hand auger	12"	1	Fill- M-F Red Br. sand, some silt to gravel. 2.0
		Hand auger	24"	2	Mix Fill - Gray silt, some sand, ± clay, some M-F Red sand (fuel odor) 4.0'
	5'	Hand auger	24"	3	Fill M-F Gray sand, little silt, to gravel 6.0'
Augers		7-4		4	Fill - M-F Red & Gray sand to silt.
		4-6	18"		
		11-12		5	Same as above
	10	13-11	18"		
		4-5		6	Same as above
		3-3	18"		12.0'
		4-4		7	br. peat fibers, some gray clay & silt
		7-9	20"		14.0'
	15				
					Bottom of Hole
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

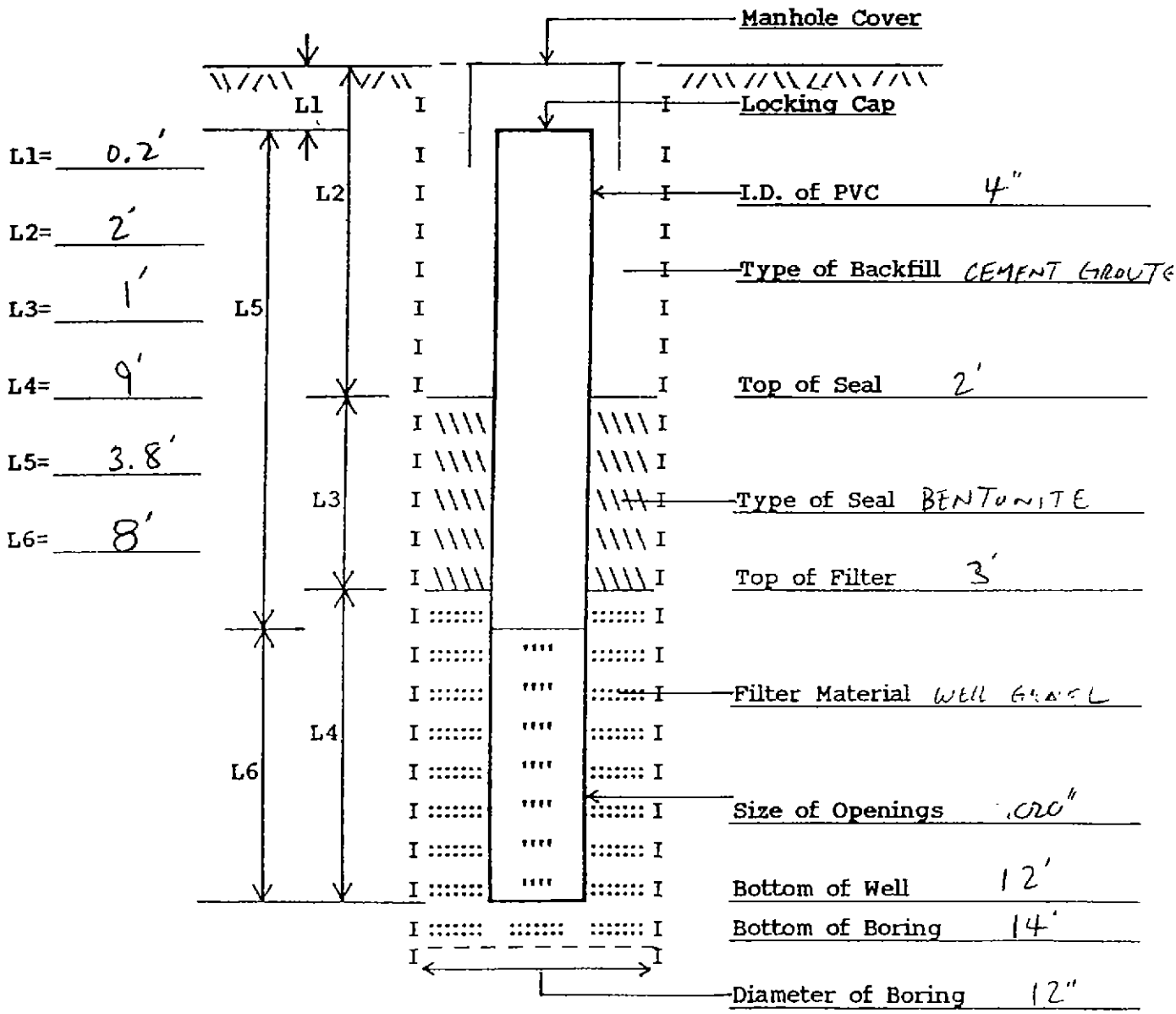
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.S Maine - UST Phase II	Contract No.: 426-94-001
Location: As laid out in field west of Hdg 256	Contractor: Craig
Driller: J. Kozarski — Inspector: T. Ryan	
Well No.: MW-C4-2 — Type of Well: A monitor	Date: 2/14/94

Well Development

Date: 2/15/94	Water Level Before: 6.0'	Water Level After: 6.0'
Note: Water level readings from top of PVC	Taken 20 min. After Development	



Remarks: Backfilled with Bentonite from 14' to 12'

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
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Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: N.J. Marine U.S.T. - Phase II	NAME OF CONTRACTOR: Craig	BORING NO.: MW-C4-3	SURFACE ELEV.
LOCATION: As laid out in field west of Bldg 296		CONTRACT NO.: 426-94-001	DATE: 2/8/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Casing	4¼ mono

HAMMER	HAMMER
140 # FALL 30	# FALL

DRILLER: T. Kozarski

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/8/94	9:00A	6.0'	In sample # 3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Rotary Bit	0				ASPHALT 0.5'
		Hand Auger	18"	1	Fill - M-F Red sand, some silt, tr gravel, tr cobbles
			24"	2	Same as above
	5		24"	3	Same as above
Augers		5-6		4	Fill Red silt, tr clay, tr F sand, tr asphalt, tr gravel
		8-8	14"		9.5'
		4-6		5	Fill [illegible]
	10	6-5	12"		(Attempted split spoon sample #4)
		3-4		6	
V		4-4	14"		
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

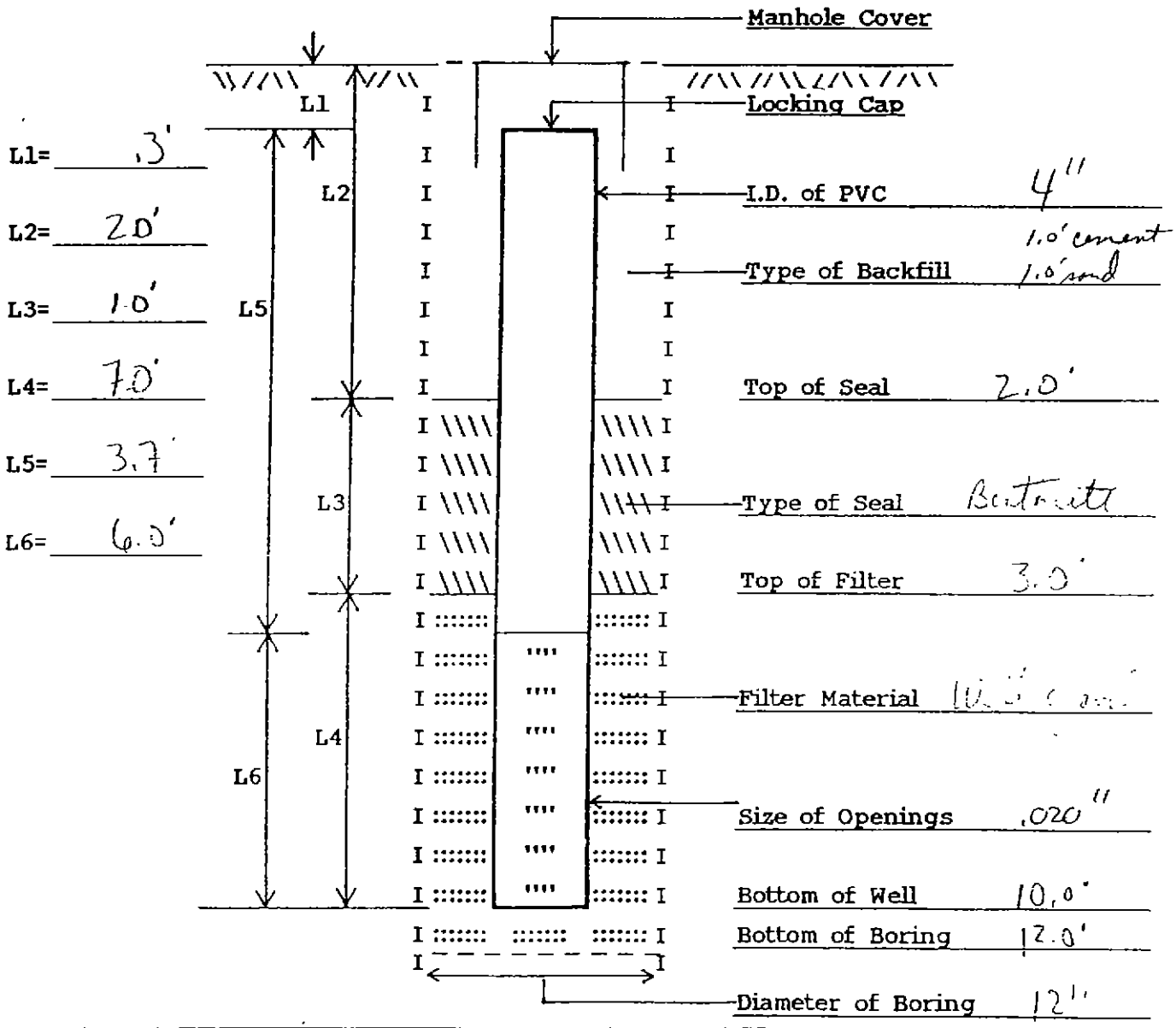
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine UST Phase II		Contract No.: 426-94-001
Location: As laid out in field west of		Contractor: 426-94-001
Driller: J. Kozaraki	Inspector: T. Ryan	
Well No.: MW-C4-3	Type of Well: A monitor	Date: 2/8/93

Well Development

Date: 2/10/94	Water Level Before: 6.0'	Water Level After: 7.5'
Note: Water level readings from top of PVC	Taken 15 min. After Development	



Remarks: Backfilled w/ bentonite from 12.0' to 10.0'

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 1

PROJECT: N.J. Marine UST	NAME OF CONTRACTOR: Craig	BORING NO.: MW-C20-1	SURFACE ELEV.:
LOCATION: As staked out in field west of Bldg 173		CONTRACT NO.: 426-94-001	DATE: 1/14/94
SPOON: 3 O.D. 2 1/8 I.D.	CASING SIZE: Auger	HOLE TYPE: Hollow stem	
HAMMER: 140 # FALL 30	HAMMER: # FALL		
DRILLER: J. Kozanski			
INSPECTOR: T. Ryan			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
1/14/94	11:30A	40'	In sample # 2

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
	0				Asphalt	0.5'
					R.C.A.	1.0'
		Hand Auger	12"	1	Fill- M-F Br. sand, trace silt, trace gravel, trace cobble	
		Hand		2	Same as above	
		Auger	24"			
	5	Hand		3	Same as above	
		Auger	24"			
Auger		9-11		4	Same as above	
		11-11	16"			8.0'
		2-2		5	Brn. f-c clayey silt, trace f sand, trace	
		2-3	16"		f-c gravel	11.5'
	10					
					Bottom of Hole	
	15					
	20					
	25					

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

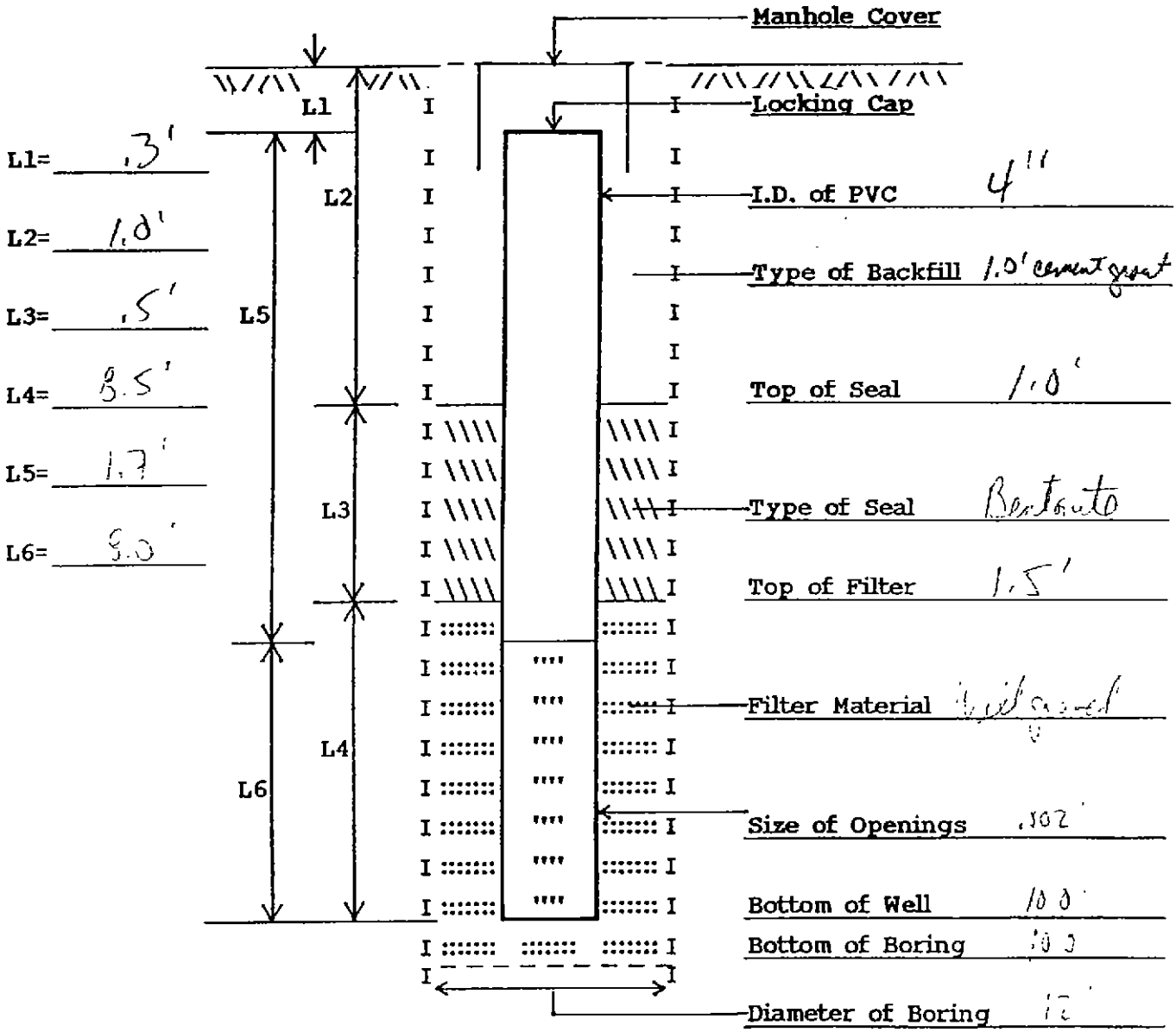
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine - UST			Contract No.: 426-94-001
Location: Orleid out in field east of Bldg 173			Contractor: Craig
Driller: J. Kozarski		Inspector: T. Rynn	
Well No.: MW-C20-1	Type of Well: A monitor		Date: 1/14/94

Well Development

Date: 1/24/94	Water Level Before: 2.0'	Water Level After: 1.5'
Note: Water level readings from top of PVC	Taken 80 min. After Development	



Remarks:

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THE PORT AUTHORITY OF NY & NJ

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Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: N.J. Marine - U.S.T.	NAME OF CONTRACTOR: Craig	BORING NO.: MW-C20-2	SURFACE ELEV.:
LOCATION: As laid out in field east of bldg 173		CONTRACT NO.: 426-94-001	DATE: 1/24/94
SPOON: 3 O.D. 2 3/8 I.D.	CASING SIZE: Auger 12"	HOLE TYPE: 4" monitor	
HAMMER: 140 # FALL 30	HAMMER # FALL		
DRILLER: J. Kozarski			
INSPECTOR: T. Ryan			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
1/24/94	8:00 A	3.5'	On sample # 2

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D[1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
Pulled Out	0				ASPHALT	0.3
					DG Abs	1.0'
		Hand Auger	12"	1	Fill - C-F Br. sand, some gravel, tr silt	2.0'
		Hand		2	Fill - C-F Red Br. sand, tr silt, tr gravel	
		Auger	24"		(Duplicate jar sample taken)	
	5	Hand		3	Same as above	
		Auger	24			
		3-2		4A	Same as above	7.5'
		8-7	14"	B	Gray & Black org. silty, c-f, some m-f sand	8'
	10				Bottom of Boring @ 10'	
	15					
	20					
	25					

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

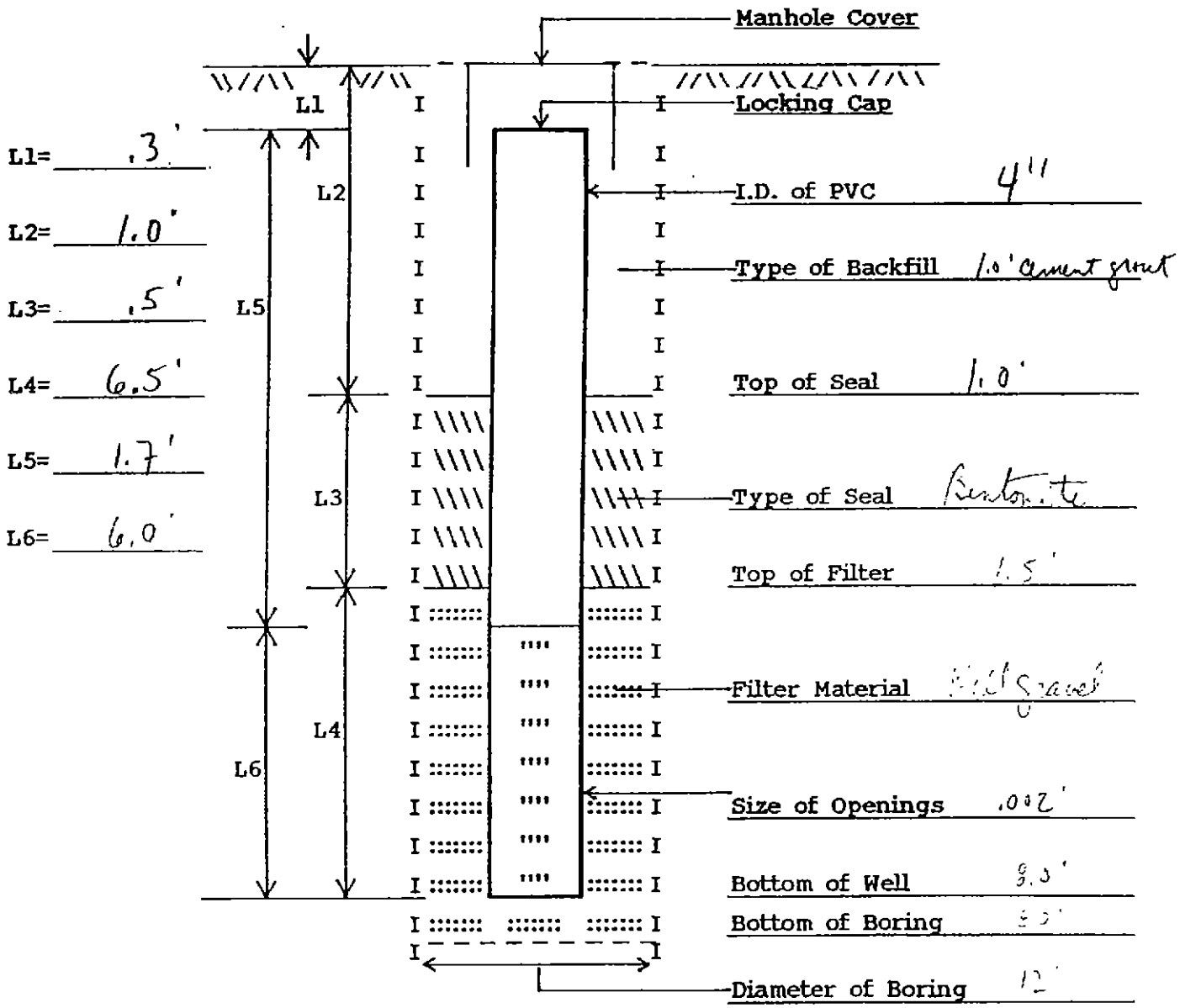
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ Marine U.S.T		Contract No.: A26-94-001
Location: As laid out in field east of Bldg 173		Contractor: Craig
Driller: J Kozarski	Inspector: T. Ryan	
Well No.: MW-C20-2	Type of Well: A' monitor	Date: 1/24/94

Well Development

Date: 1/25/94	Water Level Before: 2.0'	Water Level After: 2.0'
Note: Water level readings from top of PVC	Taken 15 min. After Development	



Remarks:

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 1

PROJECT: N.J. Marine - UST	NAME OF CONTRACTOR: Craig	BORING NO.: MW-02S-S	SURFACE ELEV.
LOCATION: 10' West of original location (Bldg 173)		CONTRACT NO.: 426-94-001	DATE: 1/24/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/4 "I.D.	Flush	Augered

HAMMER	HAMMER
140 # FALL 30	# FALL

DRILLER: J. Kozarski

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
1/24/94	11:35	3.0'	Encountered

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Rotary Bit	0				ASPHALT 0.4'
					DGABC 1.0'
		Hand Auger	12"	1	Fill - C-F Br. Sand, trsilt, tr gravel 2.0'
		Hand Auger	24"	2	Misc Fill - Gray & Br. clayey silt, som M-F sand, tr glass (fuel odor) 4.0'
	5	Hand Auger	24"	3	Misc Fill C-F Br. Sand, trsilt, tr glass (fuel odor) 6.0'
		2-1		4	Black & gray org clayey silt, tr F-sand
		2-3	18"		8.5'
	10				Bottom of Boring
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss or water, artesian water, sand heave in casing, etc.

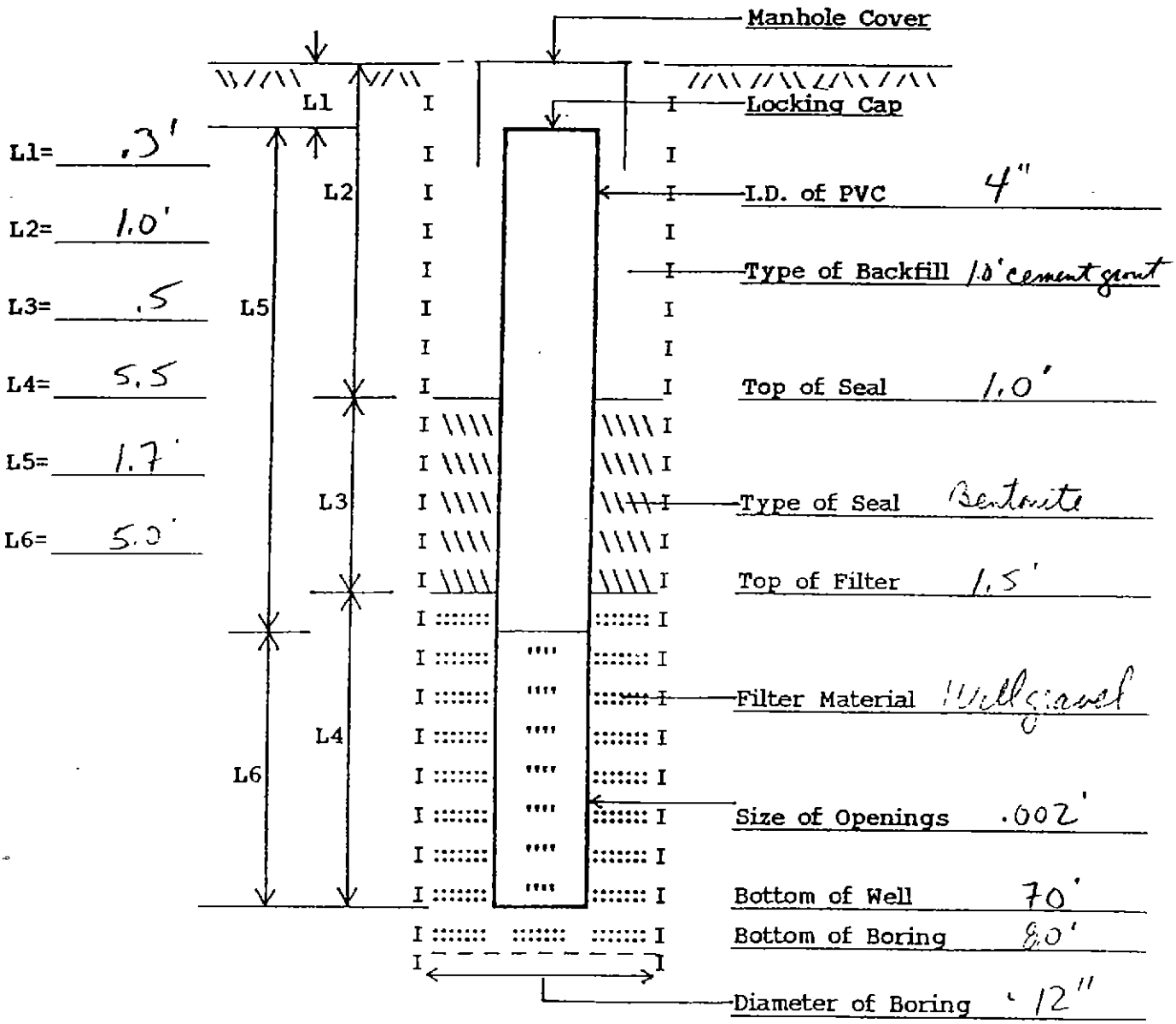
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine - U.S.T.		Contract No.: 426-94-001
Location: 10' west of original location		Contractor: Craig
Driller: J. Kozaruk	Inspector: T. Ryan	
Well No.: MW-C25-3	Type of Well: A' monitor	Date: 1/24/94

Well Development

Date: 1/25/94	Water Level Before: 2.5'	Water Level After: 2.5'
Note: Water level readings from top of PVC	Taken 15 min. After Development	



Remarks: Backfilled with bentonite from 7.0' to 8.0'

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: NJ MARINE TERMINAL - UST	NAME OF CONTRACTOR: CRAIG	BORING NO.: MW - P42-5	SURFACE ELEV.:
LOCATION: AS LAID OUT IN THE FIELD, WEST OF BLDG. 186		CONTRACT NO.: 426-94-001	DATE: 3-12-94

SPOON "O.D." "I.D."	CASING SIZE: AUGER	HOLE TYPE: "A" MONITOR
HAMMER # FALL	HAMMER # FALL	
DRILLER: G. McANENY		
INSPECTOR: M. OUDEH		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3-12-94	9:20 AM	4.1'	FOUND IN SAMPLE NO. 3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D[1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0	HAND AUGER	24"	1	FILL BR-GREY C-F SAND, tr. SLT, tr. GRAVEL
		HAND AUGER	24"	2	FILL BR C-F SAND, SOME CLAY & SILT, tr. GRAVEL (DUPLICAT SAMPLE TAKEN)
	5	HOLLOW STEM AUGERS	24"	3	FILL BR C-F SAND, SOME CLAY & SILT, tr. GRAVEL (OIL ODOR)
		H.S. AUGERS	24"	4	SAME 8.0
		H.S. AUGERS	24"	5	FILL BR. CLAY & SILT, SOME M-F SAND (SLIGHT OIL ODOR)
	10	H.S. AUGERS	24"	6 A	FILL BR-GREY CLAY & SLT, LITTLE M-F SAND 11.0'
				B	GRY. BR PEAT 12.5'
	15				BOTTOM OF BORING
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water loss of water, artesian water, sand heave in casing, etc.

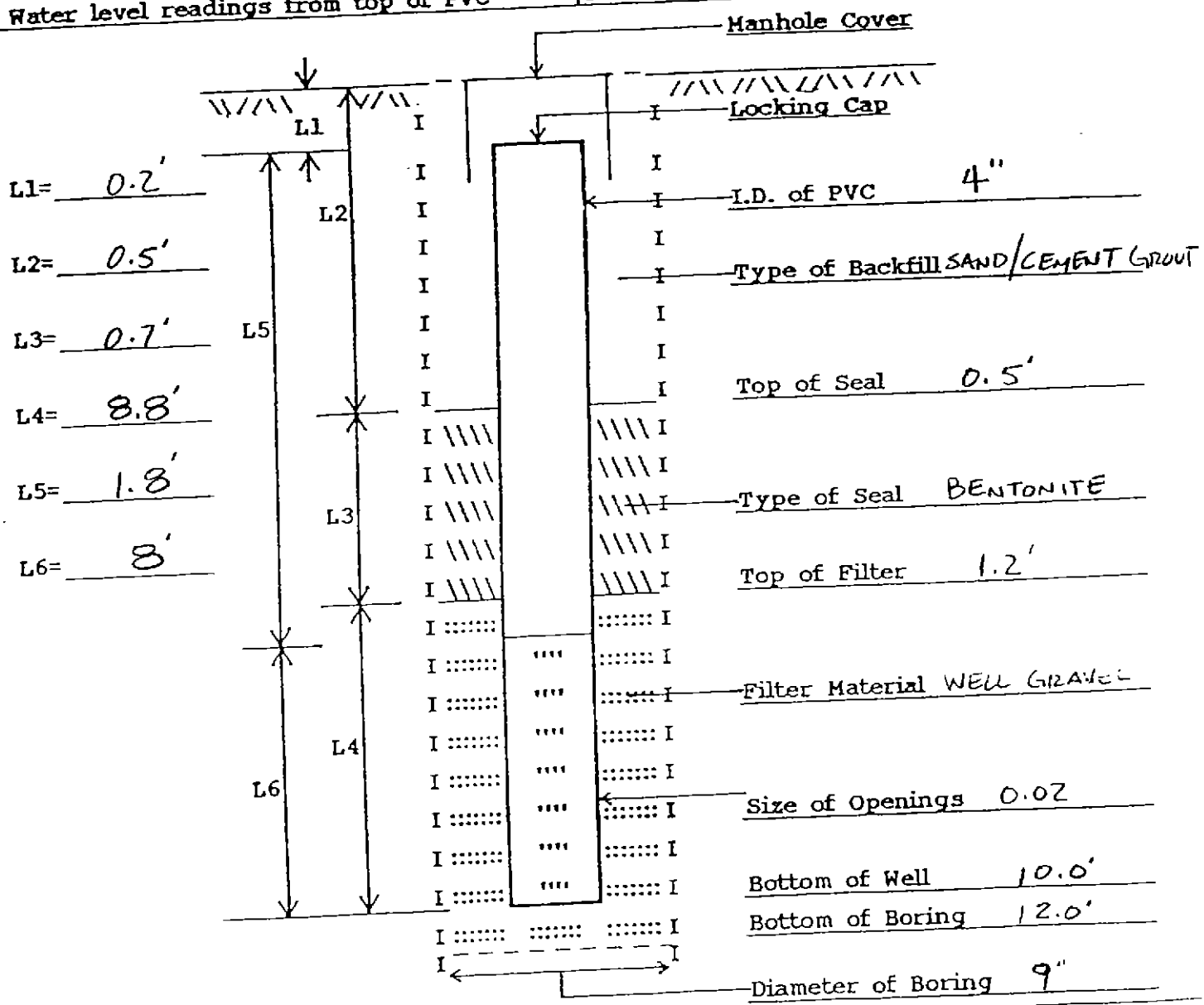
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ MARINE TERMINAL - UST	Contract No.: 426-94-001
Location: AS LAID OUT IN THE FIELD, EAST of BLDG. 186	Contractor: CRAIG
Driller: G. McANENY	Inspector: M. OUDEH
Well No.: MW- P42-5	Type of Well: "A" MONITOR
	Date: 3-12-94

Well Development

Date: 3-12-94	Water Level Before: 4.5'	Water Level After: 4.7'
Note: Water level readings from top of PVC	Taken 60	min. After Development



Remarks: BACKFILLED WITH BENTONITE FROM 12' to 10'

NJ Well Permit No. 26-[illegible]

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Materials Engineering Division

BORING REPORT

SHEET 1 OF 1

PROJECT	NAME OF CONTRACTOR	BORING NO.	SURFACE ELEV.
N.S. Marine - UST	Craig	MW-P43-1	
LOCATION		**CONTRACT NO.**	**DATE**
As laid out in field south of bldg. 186		426-94-001	2/7/94

SPOON	CASING SIZE	HOLE TYPE
3 O.D. 2 3/8 I.D.	Augers	4" monitor

HAMMER	HAMMER
140 # FALL 30	# FALL

DRILLER: J. Kozaraski

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/7/94	7:35A	5.0'	In sample #3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Rubber Boot					CONCRETE 0.7'
		Hand auger	24"	1	Fill - C-F Br. sand, tr silt, tr gravel, tr cobbles
			24"	2	Same as above
	5		24"	3	Same as above 6.5'
Augers		8-4		4	Fill. Gray silty clay, tr concrete 5.5'
1		10-10	12"		
1		3-12		5	Fill - Red clayey silt, some F Red sand 10.0'
1	10	1-3	16"		
1		4-4		6	Red clayey silt trace f Gray org silt in tip of spoon 12.5'
		5-5	12"		
	15				End of Boring
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

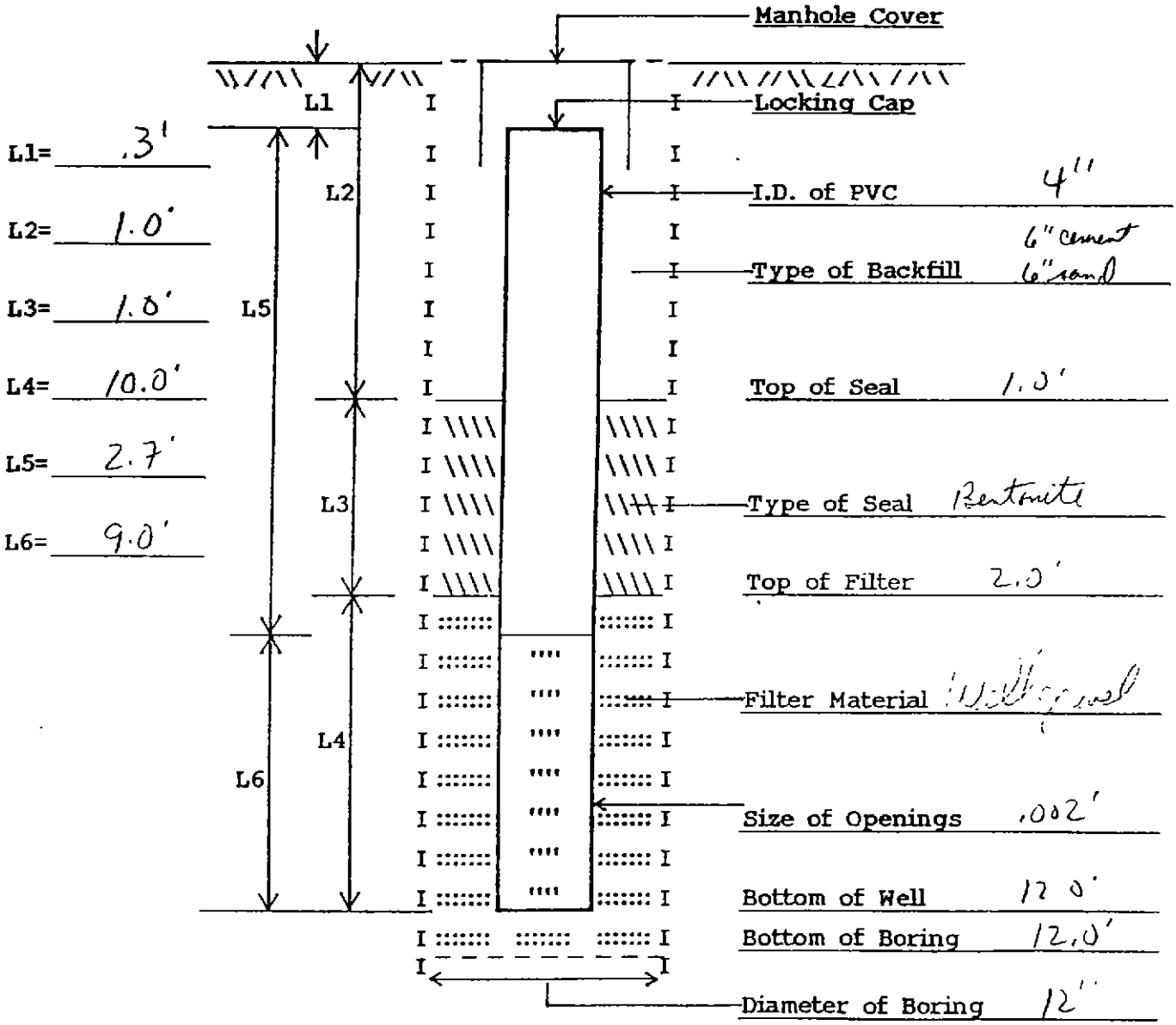
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ Marine UST			Contract No.: 426-94-001
Location: As laid out in field south of Bldg 186			Contractor: Craig
Driller: J. Kozaraki		Inspector: T. Ryan	
Well No.: MW-P43-1	Type of Well: A monitor		Date: 2/7/94

Well Development

Date: 2/15/94	Water Level Before: 6.0'	Water Level After: 6.0'
Note: Water level readings from top of PVC	Taken 15 min. After Development	



Remarks:

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Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: N.J. Marine - UST	NAME OF CONTRACTOR: Craig	BORING NO.: MW-P43-2	SURFACE ELEV.
LOCATION: As laid out in field south of Bldg 186		CONTRACT NO.: 4216-94-001	DATE: 2-4-94
SPOON: 3 "O.D. 2 3/8 "I.D.	CASING SIZE: Augers 12"	HOLE TYPE: Air rotation	
HAMMER: 140 # FALL 30	HAMMER: # FALL		
DRILLER: J. Kozarsky			
INSPECTOR: T. Ryan			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/4/94	11.10 A	5.5'	In sample #3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
	0				CONCRETE	0.0 / 0.7
		Hand Auger	16"	1	Fill-C-F red sand, some gravel, little silt, trglass.	
			24"	2	Same as above	4.0'
	5		24"	3	Fill-M-F Gray Br. sand, some shell, little silt, little gravel (Duplicate jar sample taken)	6.0'
Augers		2-3		4	Fill-M-F Red sand, some silt, some gravel, trace trglass	
		14-H	18"			
		12-10		5	Same as above	
	10	10-9	12"			10.0
		4-5		6	Fill-F-F Red sand, some silt	
		7-7	18"		(Gray one silty clay in tip of spoon)	12.0'
	15				Bottom of Boring	
	20					
	25					

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

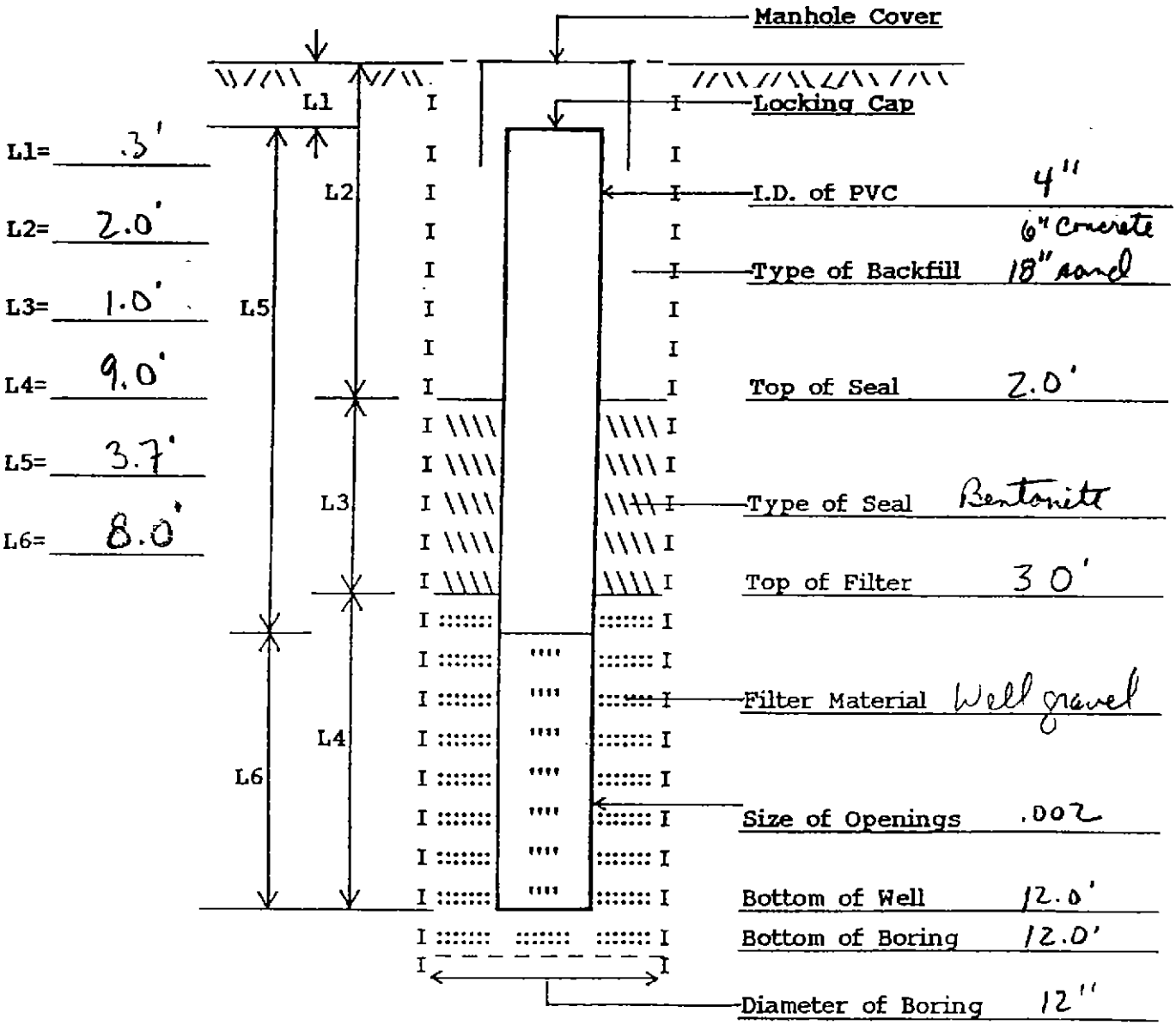
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine - 4ST	Contract No.: 426-94-001
Location: As laid out in field south of Pier 186	Contractor: Craig
Driller: J. Kozarski / Inspector: T. Ryan	
Well No.: P43-2 / Type of Well: 'A' monitor	Date: 2/4/94

Well Development

Date: 2/4/94	Water Level Before: 4.5'	Water Level After: 5.0'
Note: Water level readings from top of PVC	Taken 20 min. After Development	



Remarks: [illegible]

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: Tc Marine - UST — Phase II of I	NAME OF CONTRACTOR: Craig	BORING NO.: MW-C27-1	SURFACE ELEV.
LOCATION: As laid out in field west of Bldg 170		CONTRACT NO.: 426-94-001	DATE: 2-2-94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Flush 12"	4" Mud rotary

HAMMER	HAMMER
140 # FALL 30"	# FALL "

DRILLER: J. Knowaski

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/2/94	9 45 A	3.0'	In sample #2

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[2]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0	Hand Auger	24"	1	Fill-C-F Br. sand, little gravel, tr silt
			24"	2	Same as above (Duplicate sample taken)
	5		24"	3	Same as above
WOH/2		4-6		4	Fill clayey silt, tr F sand, tr gravel 8.0'
		9-9	16"		
		3-3		5	Blk + fill mc silty clay, tr F sand & gravel 10.5'
WOH	10	4-3	18"		
					End of Boring
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

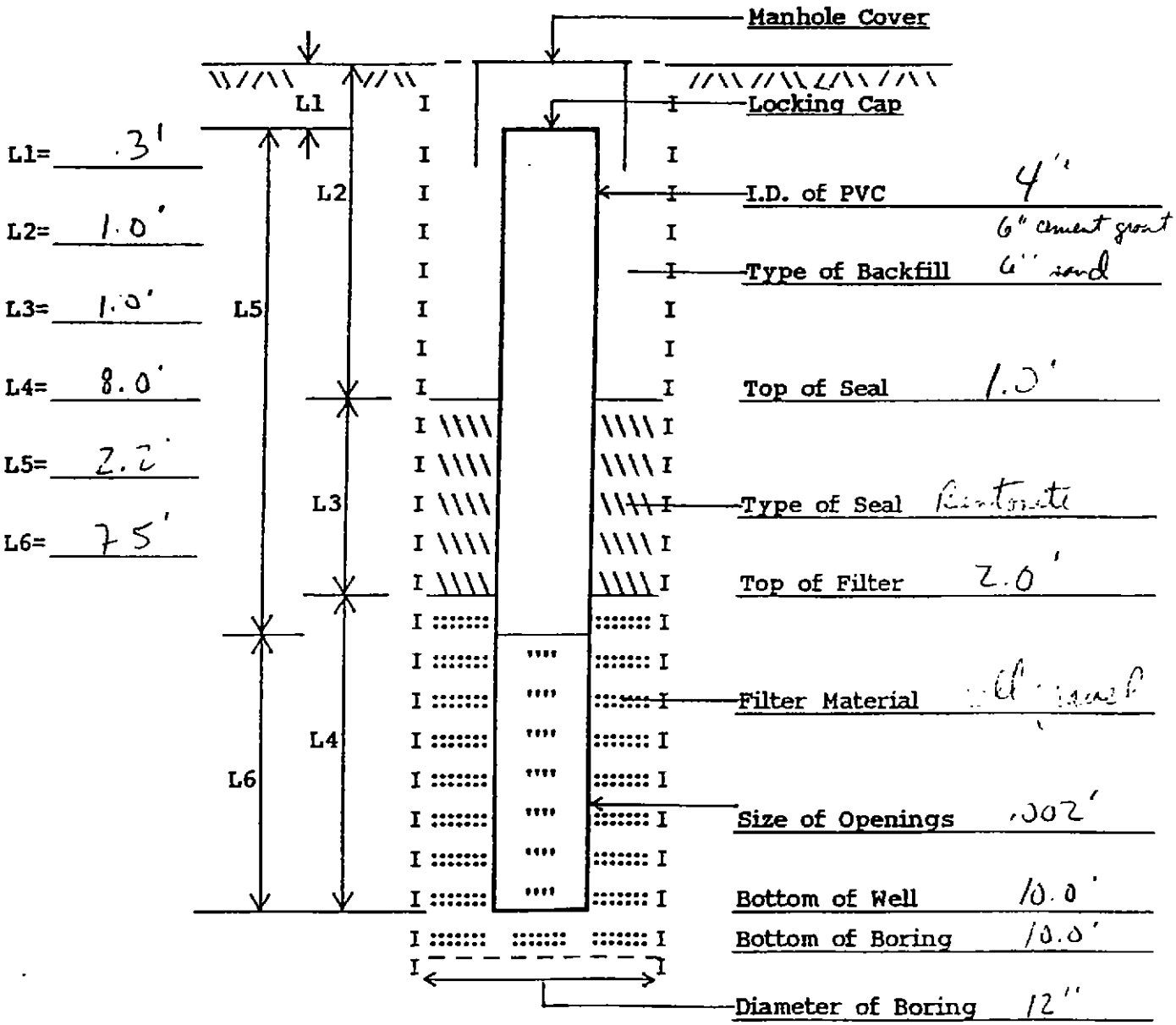
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine U.S.T. — Phase II		Contract No.: 426-94-001
Location: As laid out in field west of bldg. 170		Contractor: Craig
Driller: J. Kozarski	Inspector: T Ryan	
Well No.: MW-27-1	Type of Well: Monitor	Date: 2-2-94

Well Development

Date: 2/3/94	Water Level Before: 3.0'	Water Level After: 3.0'
Note: Water level readings from top of PVC	Taken 20 min. After Development	



Remarks:

THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: N.J. Marine - UST	NAME OF CONTRACTOR: Craig	BORING NO.: MW-E28-1	SURFACE ELEV.
LOCATION: As laid out in field East of Islip 170		CONTRACT NO.: 426-94-001	DATE: 2/1/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.		Augerite

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: J. Kozarski

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/1/94	1230	3.0	Auger cave = 2

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS (LINE LOCATES CHANGE OF PROFILE)
	0	Hand		1	Fill - C-f to m. Sand, some gravel, trace
		Auger	24"		
		Hand		2	Same as above (Duplicate Sample taken)
		Auger	24"		
		Hand		3	Sand as above 4.0'
	5	Auger	24"		
		3-5		4	Wet clayey silt, trace fine sand, trace gravel 8.0'
		5-4	16"		
		2-2		5	Wet f to m sandy silty clay, trace fine sand 11.0'
		3-2	16"		
	10				
					Bottom of Hole
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OEP = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

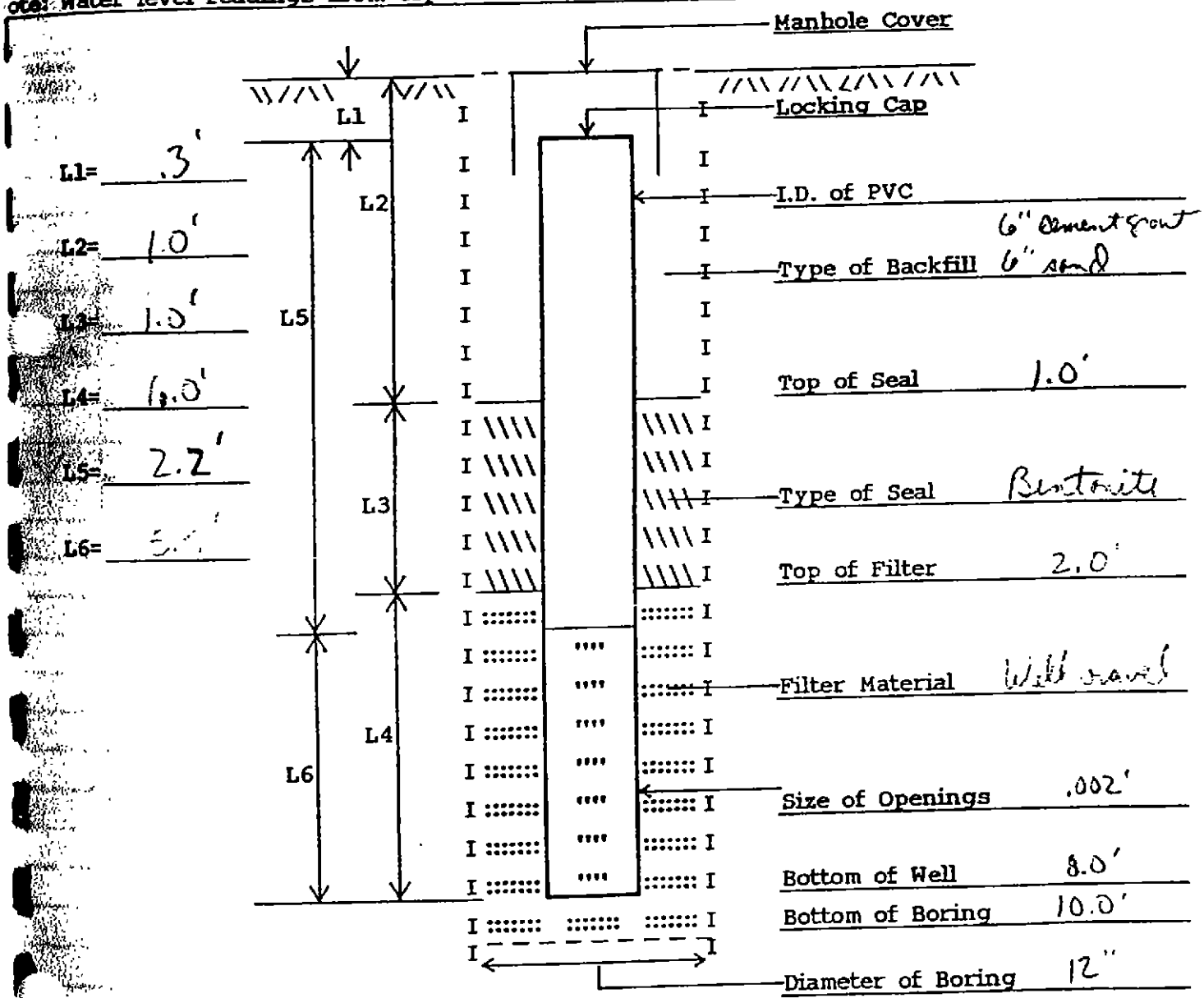
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J Marine - UST	Contract No.: 426-94-001
Location: As laid out in field east of bldg. 170	Contractor: Craig
Driller: J Kozaneki	Inspector: T. Ryan
Well No.: MW-E23-1	Type of Well: Monitor
	Date: 2/1/94

Well Development

Date: 2/2/94	Water Level Before: 3.5'	Water Level After: 5.0'
Note: Water level readings from top of PVC	Taken 15 min. After Development	



Remarks: Backfilled from 8' to 10' with Bentonite

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: N.J. Marine - U.S.T.	NAME OF CONTRACTOR: Craig	BORING NO.: MW-C29-1	SURFACE ELEV.:
LOCATION: As laid out in field west of Bldg. 170		CONTRACT NO.: 426-94-001	DATE: 2-1-94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Auger 12"	A' monitor

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: J. Kozanski

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/1/94	9:30 A	3.5'	In sample # 2

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0	Hand		1	Fill- C-F Br. Sand, some gravel, tr silt
		Auger	24"		
		Hand		2	Same as above (Cup jar sample taken)
		Auger	24"		
	5	Hand		3	Same as above
		Auger	24"		
		4-5		4	Same as above
		5-6	18"		8.0'
		5-3		5	C-F Br. sand, some gravel to silt w/brn/gry clay silt
	10	7-7	16"		in tip of spoon 10.0'
					(Continued Form C)
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

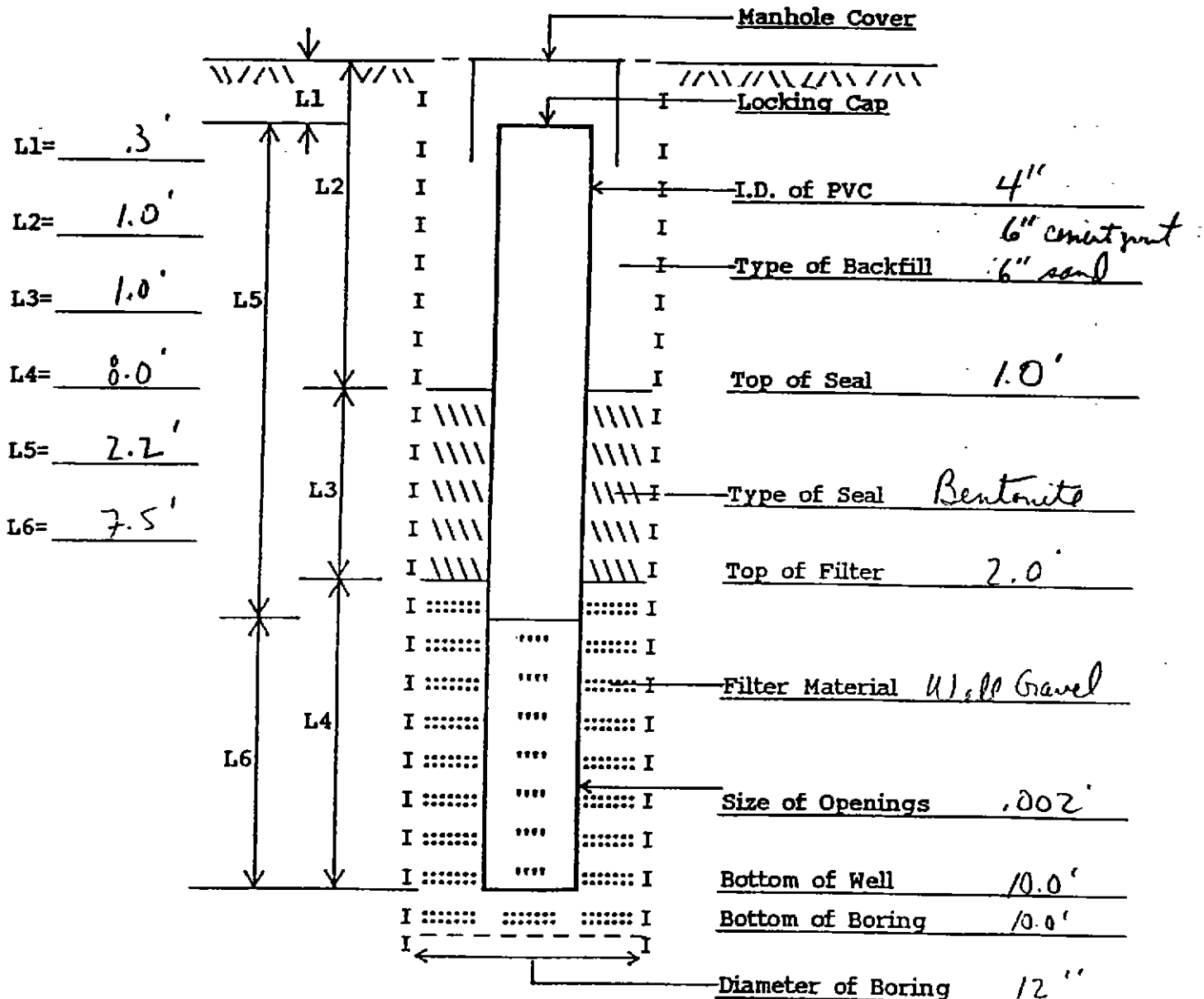
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine - U.S.T.			Contract No.: 426-94-001
Location: As laid out in field west of bldg 170			Contractor: Craig
Driller: J. Kozaraki		Inspector: T. Ryan	
Well No.: MW-C29-1	Type of Well: A' monitor		Date: 2/1/94

Well Development

Date: 2/1/94	Water Level Before: 3.0'	Water Level After: 4.0'
Note: Water level readings from top of PVC	Taken 15 min. After Development	



Remarks:

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: N.J. Marine - UST	NAME OF CONTRACTOR: Craig	BORING NO.: MW-P43-1	SURFACE ELEV.
LOCATION: As laid out in field south of bldg. 186		CONTRACT NO.: 426-94-001	DATE: 2/7/94

SPOON: 3 "O.D. 2 3/8 "I.D. | CASING SIZE: Augers | HOLE TYPE: Hollow stem

HAMMER: 140 # FALL 30 | HAMMER # FALL

DRILLER: J. Kozaraski

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/7/94	7:35A	5.0'	In sample = 3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Rotary Bit	0				CONCRETE 0.7'
		Hand auger	24"	1	Fill - C-F Br. sand, tr silt, tr gravel, tr cobbles
		↓	24"	2	Same as above
	5	↓	24"	3	Same as above 6.0'
Augers		8-4		4	Fill. Gray silty clay, tr concrete 9.0'
		10-10	12"		
		3-12		5	Fill - Red clayey silt, some F Red sand 12.0'
	10	4-8	16		
		4-4		6	Red clayey silt, trgravel & Gray org silt in typ of spoon 13.5'
↓		5-5	12"		
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

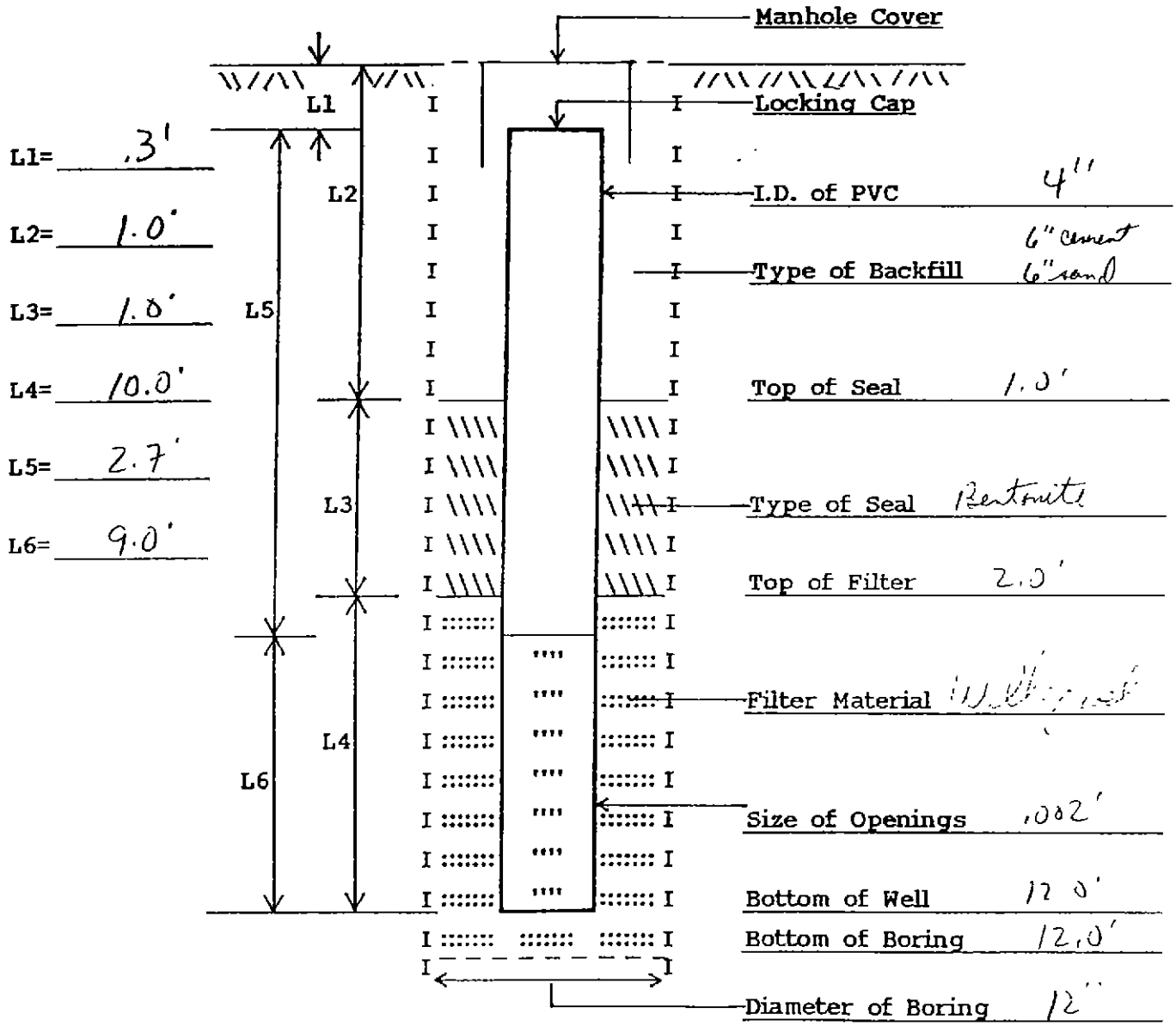
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ Marine UST		Contract No.: 426-94-001
Location: As laid out in field south of Bldg 186		Contractor: Craig
Driller: J. Kozaroski	Inspector: T. Ryan	
Well No.: MW-P93-1	Type of Well: A monitor	Date: 2/7/94

Well Development

Date: 2/15/94	Water Level Before: 6.0'	Water Level After: 6.0'
Note: Water level readings from top of PVC	Taken 15 min. After Development	



Remarks:

THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
HNU READINGS

PROJECT: N.J. Marine UST
BORING No. MW-P43-1
FIELD READINGS BY: T. Ryan
LAB READINGS BY:

DATE	SAMPLE No.	FIELD READING	DATE	LAB READING	REMARKS
2/7/94	1	6			
	2	2			
	3	4			
	4	0			
	5	0			
	6	0			

THE PORT AUTHORITY OF N.Y & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
CHAIN OF CUSTODY RECORD

Sheet 4 of 4

PROJECT: N.J. Marine UST	
LOCATION: As laid out in field south of Bldg 186	DATE: 2/7/94
BORING No: MW-P43-1	TOTAL No. OF SAMPLES: 6

SIGNATURE OF ALL
PRESENT AT SAMPLING T Egan

RELINQUISHED	DATE 2/7/94	RECEIVED
BY (SIGN)	TIME	BY (SIGN) Joe Solomon
RELINQUISHED	DATE	RECEIVED
BY (SIGN)	TIME	BY (SIGN)
RELINQUISHED	DATE	RECEIVED
BY (SIGN)	TIME	BY LAB

REMARKS: 6 samples in 6 one pint jars & 1 small jar

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: N.J. Marine - UST	NAME OF CONTRACTOR: Craig	BORING NO.: MW-P43-2	SURFACE ELEV.:
LOCATION: As laid out in field south of Bldg 186		CONTRACT NO.: 426-94-001	DATE: 2-4-94
SPOON: 3 "O.D. 2 3/8 "I.D.	CASING SIZE: Augers 12"	HOLE TYPE: Monitor	
HAMMER: 140 # FALL 30 "	HAMMER: # FALL "		
DRILLER: J. Kozarsky			
INSPECTOR: T. Ryan			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/4/94	11.10 A	5.5'	In sample #3

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				0.0' CONCRETE 0.7'
		Hand Auger	16"	1	Fill - C-F red sand, some gravel, little silt, trace glass.
				2	Same as above 4.0'
			24"		
	5			3	Fill - M-F Gray Br. sand, some shell, little silt, little gravel (Duplicate jar sample taken) 6.0'
			24"		
Augers		2-3		4	Fill - M-F red sand, some silt, some gravel, trace glass
		14-14	18"		
		12-10		5	Same as above 10.0'
	10	10-9	12"		
		4-5		6	Fill - F-F Red sand, some silt.
		7-7	18"		(Grey org. silty clay in tip of spoon) 12.0'
					Bottom of Hole
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

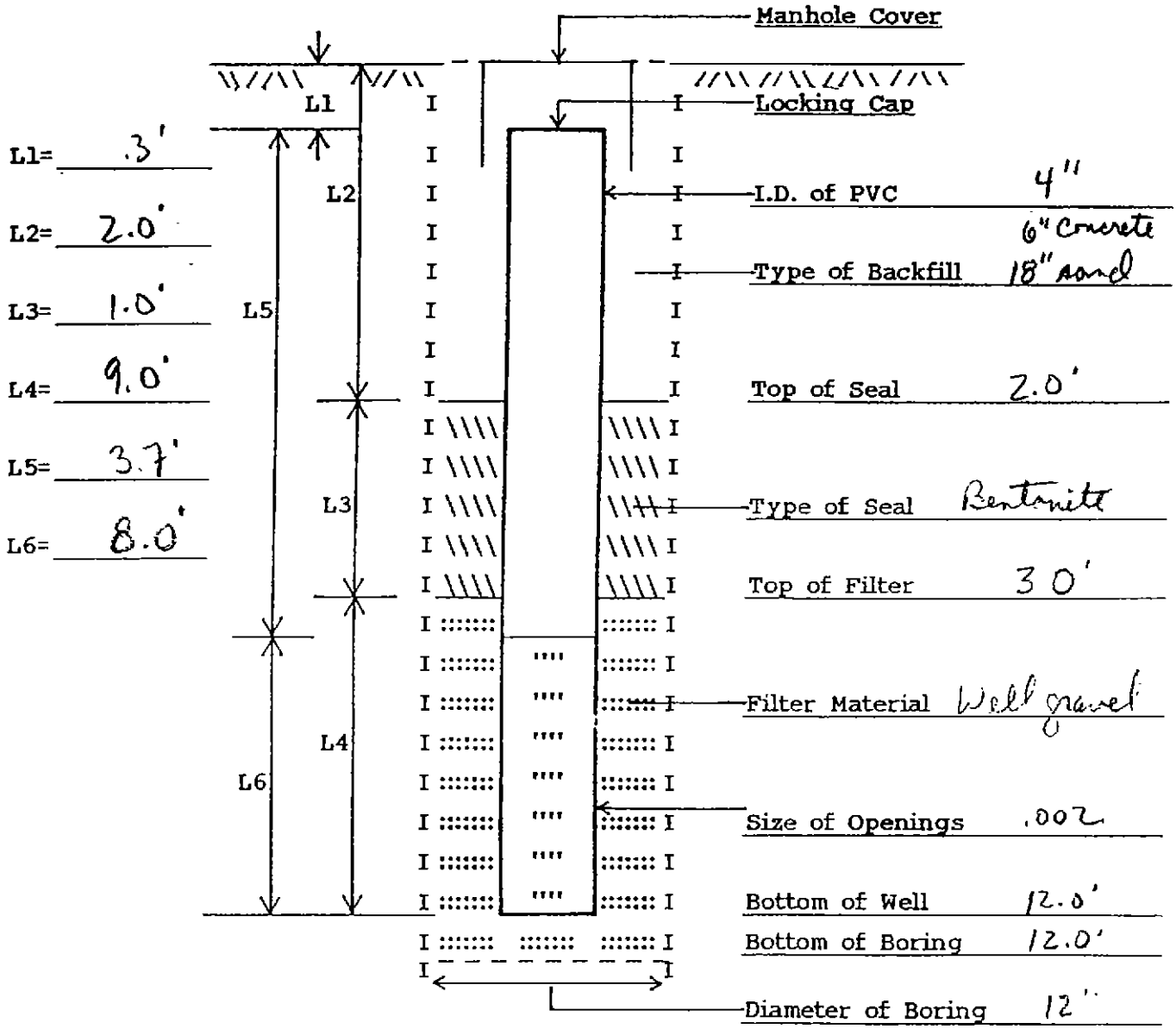
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine - 4ST		Contract No.: 426-94-001
Location: As laid out in field south of Pier 186		Contractor: Craig
Driller: J. Kozarski	Inspector: T. Ryan	
Well No.: P43-2	Type of Well: 'A' monitor	Date: 2/4/94

Well Development

Date: 2/4/94	Water Level Before: 4.5'	Water Level After: 5.0'
Note: Water level readings from top of PVC	Taken 20 min. After Development	



Remarks:

THE PORT AUTHORITY OF N.Y & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
HNU READINGS

PROJECT: P.J. Marine - UST
BORING No. MW-P43-2
FIELD READINGS BY: T. Ryan
LAB READINGS BY:

DATE	SAMPLE No.	FIELD READING	DATE	LAB READING	REMARKS
2/4/94	1	0			
↓	2	0			
	3	0			
	4	0			
↓	5	0			

THE PORT AUTHORITY OF N.Y & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
CHAIN OF CUSTODY RECORD

Sheet 4 of 4

PROJECT: N.J. Marine - UST	
LOCATION: As laid out in field south of Bldg. 186	DATE: 2/4/94
BORING No: MW-243-2	TOTAL No. OF SAMPLES: 5

SIGNATURE OF ALL
PRESENT AT SAMPLING T. Ryan

RELINQUISHED	DATE 2/4/94	RECEIVED
BY (SIGN) T. Ryan	TIME	BY (SIGN) Am Solomon
RELINQUISHED	DATE	RECEIVED
BY (SIGN)	TIME	BY (SIGN)
RELINQUISHED	DATE	RECEIVED
'Y (SIGN)	TIME	BY LAB

REMARKS: 5 samples in 6 one pint jars & 2 small jars.

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

TANK E31

SHEET 1 OF 4

PROJECT: N.J. Howard Terminals Bldg 330	NAME OF CONTRACTOR: Lully	BORING NO.: MW E31-1	SURFACE ELEV.
LOCATION: No land out by consultant		CONTRACT NO.: 486-94-001	DATE: 2/1/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Auger	MONITOR A

HAMMER	HAMMER
140 # FALL 30 .	— # FALL — .

DRILLER: G Mc Rapery

INSPECTOR: R. M. Le Hunt

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/1/94	8.52	4.5	while hand augering

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				0.0'
4" Auger					ASPHALT 0.5'
					CRABC 0.9'
		Hand Auger	17"	1	Fill Br m-f Sand, Tr Silt, Tr Gravel
		Hand Auger	24"	2	Fill Br m-f Sand, Tr Silt
	5	4 5 7	16"	3	Fill Same DUPLICATE SAMPLE
10" HS Rotary		7 9 9 12	14"	4	Fill Br m-f and grey m-f Sand, Tr Silt
		5 4 4 9 4	16"	5A	Fill grey c-f Sand, Silt, 9.5'
	10			5B	Brown Silt and grey Silt 10.5'
					BOTTOM OF BORING
	15				
	20				
	25				

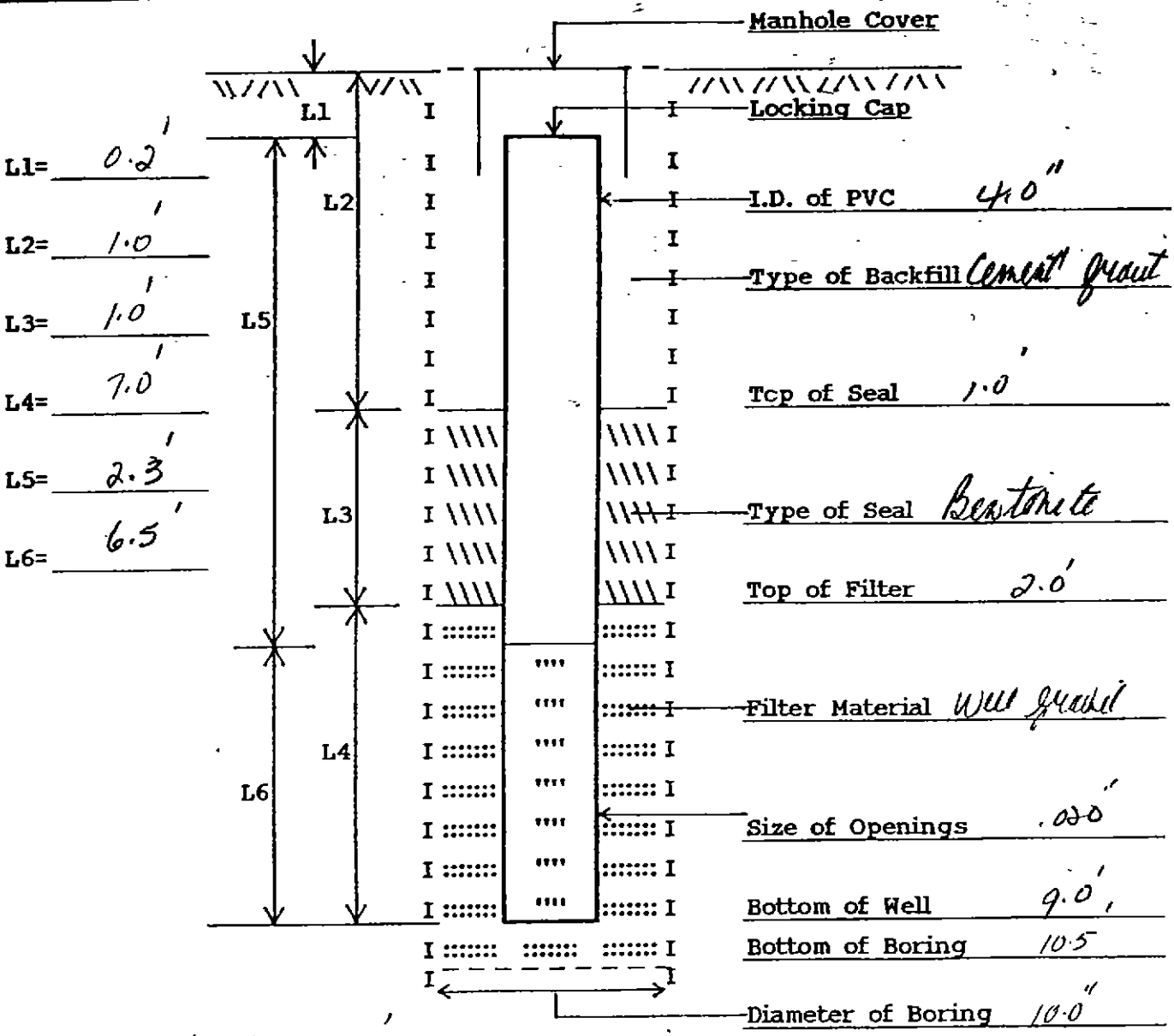
NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J Marine Terminals Bldg #220		Contract No.: 426-94-001	
Location: As laid out by consultant		Contractor: Levaig	
Driller: G. McAuley	Inspector: R.M. Likens		
Well No.: MW-E-31-1	Type of Well: Monitor "A"	Date: 2/1/94	

Well Development

Date: 2/1/94	Water Level Before: 4.5'	Water Level After: 4.5'
Note: Water level readings from top of PVC	Taken 11 min. After Development	



Remarks: 9.0' to 10.5 was filled with well gravel

NJ Well Permit No. 26-31233

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

TANK E31

SHEET 1 OF 4

PROJECT: N.J Marine Terminals	NAME OF CONTRACTOR: Craig	BORING NO.: NWE31-2	SURFACE ELEV.
LOCATION: As laid out by Consultant Bldg. 220		CONTRACT NO.: 436-94-001	DATE: 1/31/94

SPOON: 3 "O.D. 2 3/8 "I.D.
CASING SIZE: Auger
HOLE TYPE: Monitor
HAMMER: 140 # FALL 30
HAMMER: — # FALL —
DRILLER: G McEneny, J
INSPECTOR: R Van Liberd

GROUND WATER LEVEL

Date	Time	Depth	Remarks
1/31/94	1.45 P	4.3	while hand Augering

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS LINE LOCATES CHANGE OF PROFILE
	0				Asphalt 0.0'
Hand Auger		Hand Auger	24"	1	Fill Br m-f Sand, tr Silt, tr Gravel 1.0'
		Hand Auger	20"	2	Fill Br m-f Sand, tr Silt, tr Gravel 5.0'
	5	4 7 12 14	18"	3	FILL Br m-f Sand, tr Silt
4.5' Auger		12 8 6 5	17"	4	FILL Br m-f Sand tr Silt, tr grey silt at tip of spoon 9.0'
10' H.S.	10				Bottom of Boring
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger, OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

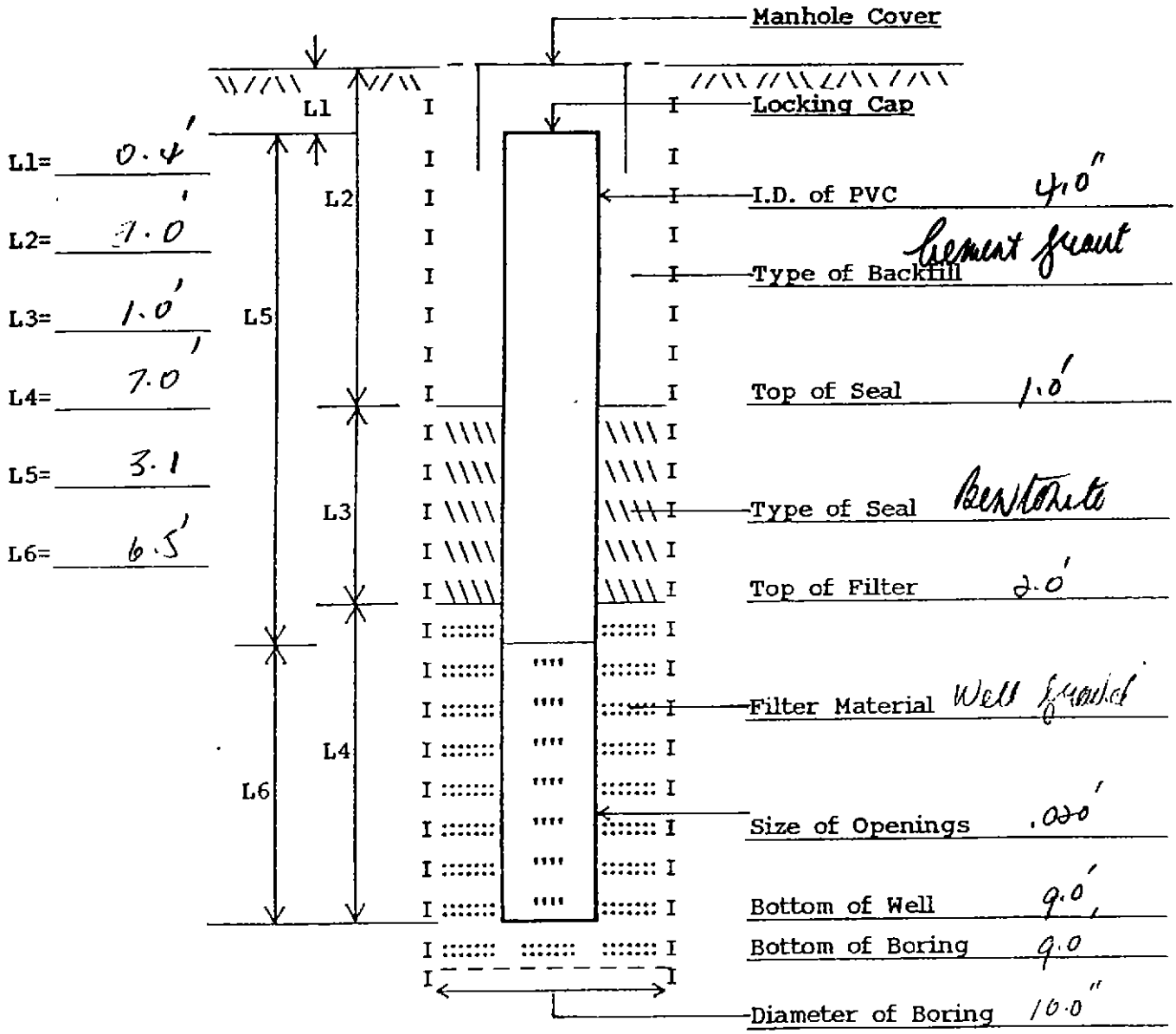
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ - Howard Terminals Bldg 220		Contract No.:	426-94-001
Location: No Land out by consultant		Contractor:	Grang
Driller: G. Mc Kenny	Inspector:	R.M. Lukert	
Well No. MW E 31-2	Type of Well: Monitor A	Date:	1/31/94

Well Development

Date:	Water Level Before:	Water Level After:
Note: Water level readings from top of PVC	Taken	min. After Development



Remarks: NJ Well Permit # - 324

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

TANK E31

SHEET 1 OF 4

PROJECT N.J. Marine Terminal Bldg 220	NAME OF CONTRACTOR Craig	BORING NO. MW E31-3	SURFACE ELEV.
LOCATION R/O laid out by Consultant		CONTRACT NO. 436-94-001	DATE 1/31/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Auger	MONITOR "A"

HAMMER	HAMMER
140 # FALL 30	— # FALL —

DRILLER G McGreevy

INSPECTOR R. M. Tebbett

GROUND WATER LEVEL

Date	Time	Depth	Remarks
1/31/93	9:30	4.5'	while Hand Augering

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS LINE LOCATES CHANGE OF PROFILE	
	0				ASPHALT	0.0'
					BROWN GRAVEL & CONCRETE FILL	0.5'
		Hand Auger	12"	1	FILL f-m SAND, tr SILT, tr GRAVEL	1.5'
		Hand Auger	24"	2	FILL f-m SAND, tr SILT	
		Hand Auger	24"	3	FILL f-m SAND, tr SILT	
	5	4 4 5 5	18"	4	FILL Grey/br f-m SAND, tr SILT (OIL IN SAMPLE)	
4" Augers		1 2 2 2	15"	5	FILL br f-m SAND, tr SILT (OIL ODOR) to grey organic silt at top of spoon	9.5'
15' NS	10					
					BOTTOM OF BORING	
	15					
	20					
	25					

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

THE PORT AUTHORITY OF N.Y. & N.J.

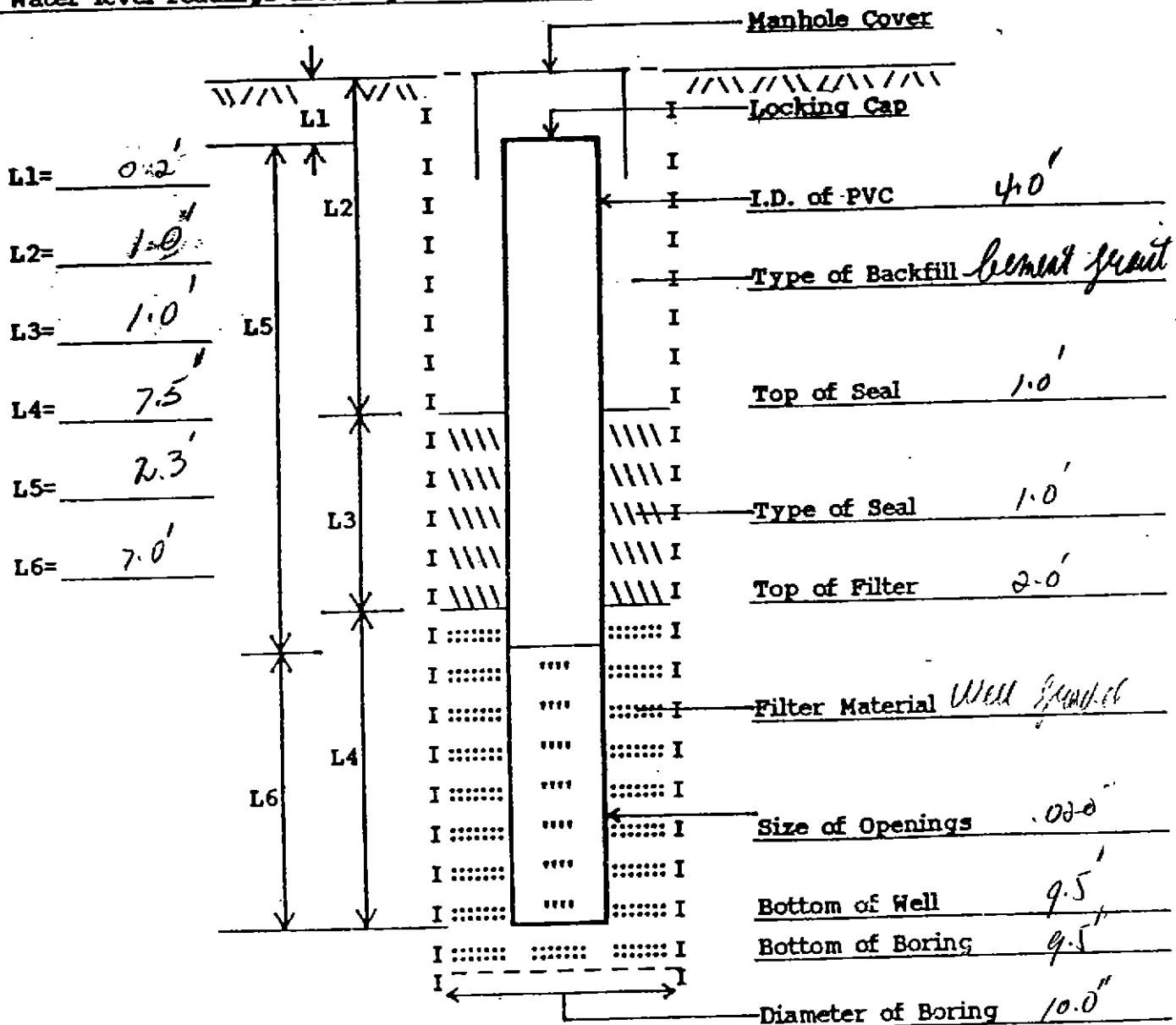
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Sheet 2 of 4

Project: N.J. Marine Terminals Bldg # 220		Contract No.: 456-94-001	
Location: No land grid by consultant		Contractor: Lyng	
Driller: G. McAvoy	Inspector: " "	R.M. Liberti	
Well No.: MWE 31-3	Type of Well: Monitor A	Date: 1/31/94	

Well Development

Date:	Water Level Before:	Water Level After:
Note: Water level readings from top of PVC	Taken	min. After Development



Remarks: N.J. Dept. No. 21-37285

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: N.J Marine - UST - Phase I	NAME OF CONTRACTOR: Crain	BORING NO.: MW-07-1	SURFACE ELEV.
LOCATION: As laid out in field east of bldg 260		CONTRACT NO.: 426-94-001	DATE: 2/15/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	4 inches	Hollow stem auger

HAMMER	HAMMER
140 # FALL 30	# FALL

DRILLER: Gary MacAneny

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/15/94	1:15p	5.5'	In sample # 3

CASING BLOWS/FT.[1]	DEPTH	SPOON BLOWS/6"	RE-COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				ASPHALT 0.5'
		Hand Auger			
		1	18"	1	Fill - M-F Br Sand, tr gravel, tr silt
			24"	2	Same as above
	5				
			24"	3	Same as above (Duplicate Sample taken) 6.5'
Driven		7-5		4	Mix Fill - M-F Br sand, tr gravel, tr silt, tr conc. &
10		10-15	19"		asphalt (Slight hydrocarbon) 9.5'
		5-6		5	Fill - M-F gravel, Med & Coarse Brn & Gray Sand, some conc. frag.
	10	6-6	6"		Lots of Sand 10.5'
					bottom of boring
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

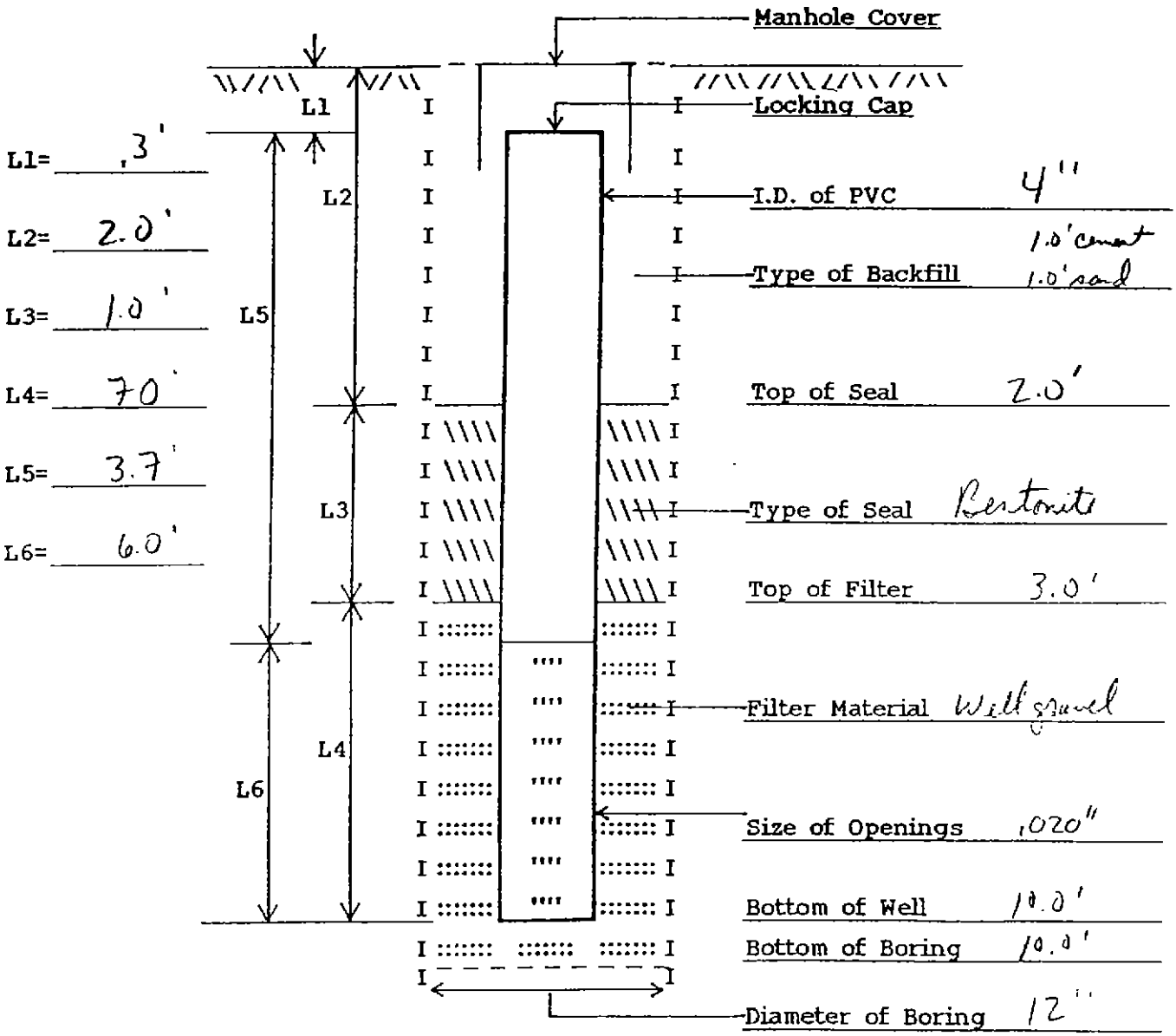
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ Marine - UST Phase II		Contract No.: 426-94-007
Location: As laid out in field east of Bldg 260		Contractor: Craig
Driller: G. McAnarney	Inspector: T. Ryan	
Well No.: E07-1	Type of Well: A monitor	Date: 2/15/94

Well Development

Date: 2/15/94	Water Level Before: 6.5'	Water Level After: 7.0'
Note: Water level readings from top of PVC	Taken 30 min. After Development	



Remarks:

PA 547
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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: NJ Marine-UST Phase II	NAME OF CONTRACTOR: Craig	BORING NO.: MW-E07-2	SURFACE ELEV.
LOCATION: Auditorium in field east of bldg. 260		CONTRACT NO.: 426-94-001	DATE: 2/16/94
SPOON: 3 O.D. 2 3/8 I.D.	CASING SIZE: Auger	HOLE TYPE: Hollow stem auger	
HAMMER: 140 # FALL 30	HAMMER: # FALL		
DRILLER: Gary McAneny			
INSPECTOR: T. Ryan			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/16/94	1:10p	6.5'	In sample #4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Roller bit ↓	0				ASPHALT
Hand Auger		Hand Auger	12"	1	Fill - L-F Brown sand some gravel to brick, trace
			24"	2	Same as above
	5		24"	3	Same as above
Auger		14-13		4	Misc Fill - M-F Brown sand, some brick and wood, trace (Fill color)
		12-9	18"		
		4-3		5	Gray clayey silt, trace
	10	3-2	15"		
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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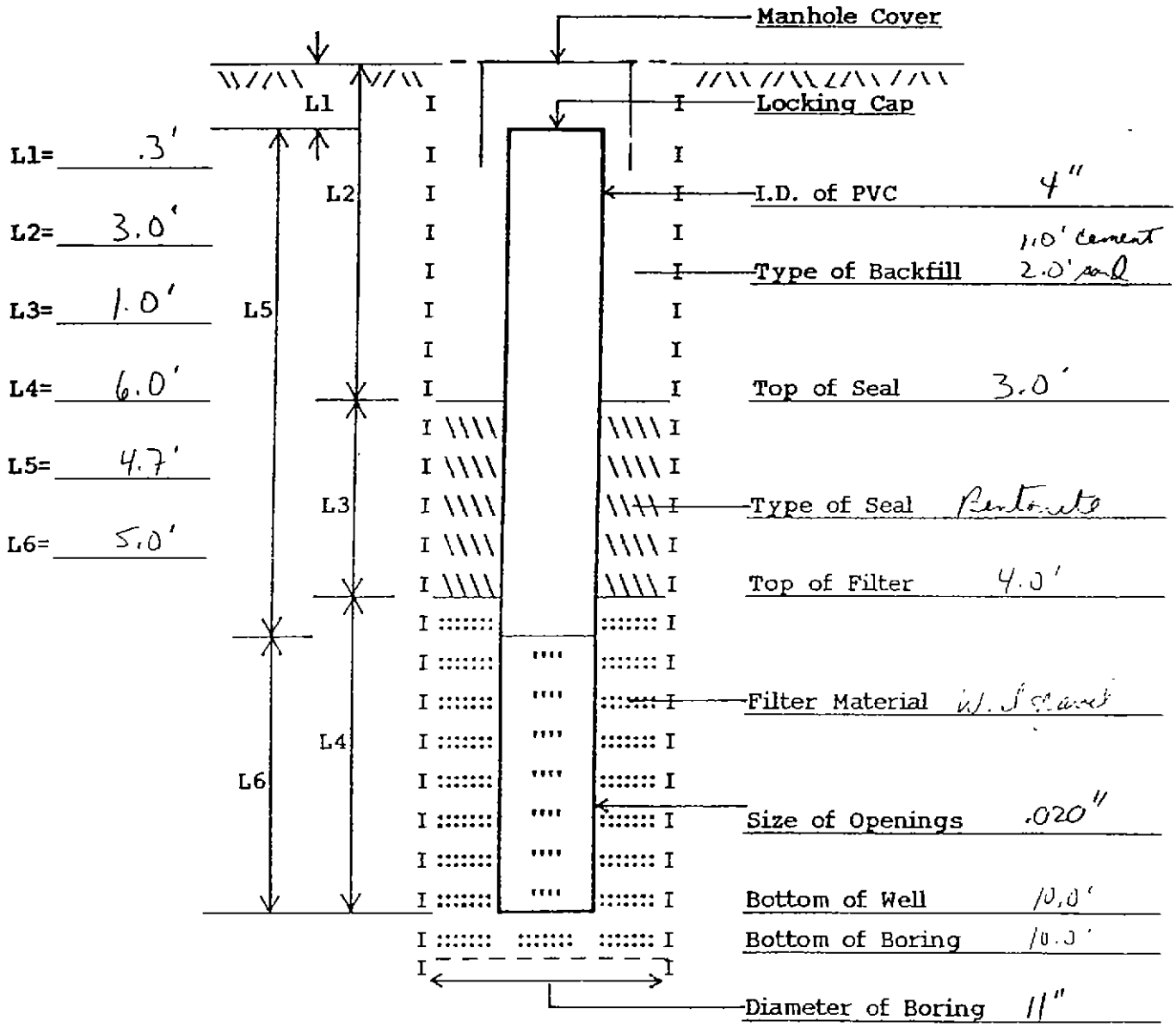
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marina - UST Phase II		Contract No.: 426-94-001
Location: As laid out in field		Contractor: Craig
Driller: G McAneny	Inspector: T. Ryan	
Well No.: MW-E07-2	Type of Well: A monitor	Date: 2/16/94

Well Development

Date: 2/18/94	Water Level Before: 6'	Water Level After: 6'
Note: Water level readings from top of PVC	Taken 25 min. After Development	



Remarks:

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Materials Engineering Division

BORING REPORT

SHEET 1 OF 4

PROJECT: PJ Manor UST Project	NAME OF CONTRACTOR: Craco	BORING NO.: MW-EOG-1	SURFACE ELEV.
LOCATION: As laid out in field east of Rte. 260		CONTRACT NO.: 426-94-001	DATE: 2/16/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Auger	Augered

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: Gary McAneny

INSPECTOR: T Regan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/16/94	10:30 AM	6.5'	In sample # 4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Roller Bit	0				Asphalt .6 Sand & Gravel 4.0'
		Hand Auger	12"	1	Fill - M-F Br sand, tr sand, tr gravel, tr conc.
			24"	2	Same as above 4.0'
	5			3	Fill C-F Black sand, little gravel, tr silt (oil stained) 6.5'
Auger		5-7			min Fill - M-F Br sand, little silt, tr wood, tr conc
		14-9	16"	4	tr gravel - (Env. sample taken)
		5-4		A	Same as above 8.5'
		3-3	19"	B	Gray org clayey silt (peat in tip of spoon) 10.5'
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0"—Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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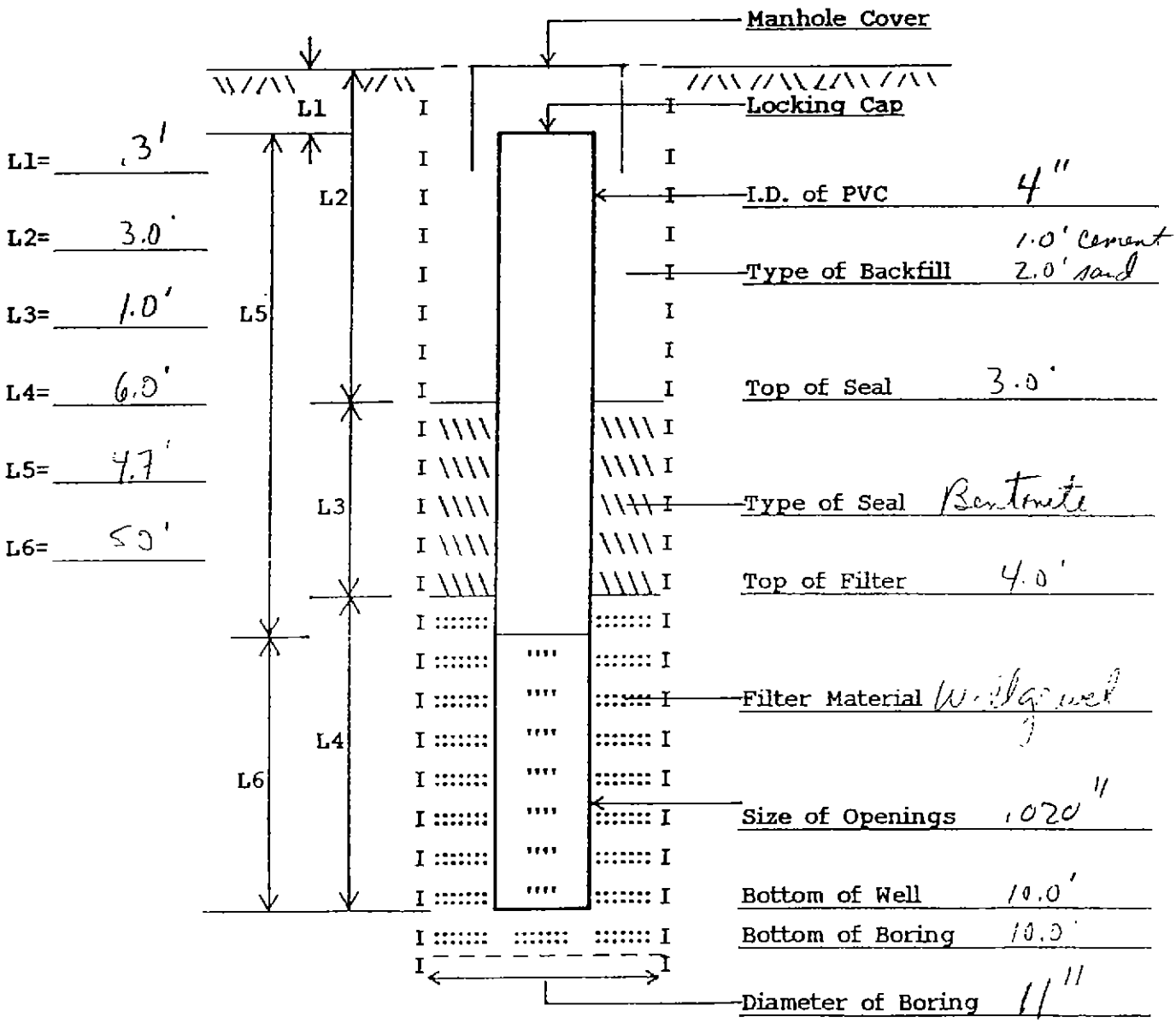
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine UST Phase II		Contract No.: 4/26-94-001
Location: As laid out in field east of Bldg 260		Contractor: Craig
Driller: G. McGreevy	Inspector: T. Ryan	
Well No.: MW-E08-1	Type of Well: A' monitor	Date: 2/16/94

Well Development

Date: 2/18/93	Water Level Before: 6.0'	Water Level After: 6.0'
Note: Water level readings from top of PVC	Taken 35 min. After Development	



Remarks:

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S-90

THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: N.J. Marine UST-	NAME OF CONTRACTOR: Craig	BORING NO.: MW-P39-4	SURFACE ELEV.:
LOCATION: As laid out in field north of Bldg. 263		CONTRACT NO.: 426-94-001	DATE: 2/19/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Augers	4" Monitor

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: G. McAneny

INSPECTOR: T. Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/19/94	10:35A	4.0'	In sample #2

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS _____ LINE LOCATES CHANGE OF PROFILE
Hollow Aut	0				ASPHALT 0.6' Sand Gravel 1.0'
		Hand Auger	12"	1	Fill - C-F Red Br sand, trace silt, little gravel.
			24"	2	Same as above
	5		24"	3	Same as above
Augers		5-5			
↓		5-5	15"	4	Same as above 8.0'
	10				Bottom of Boring Per instructions
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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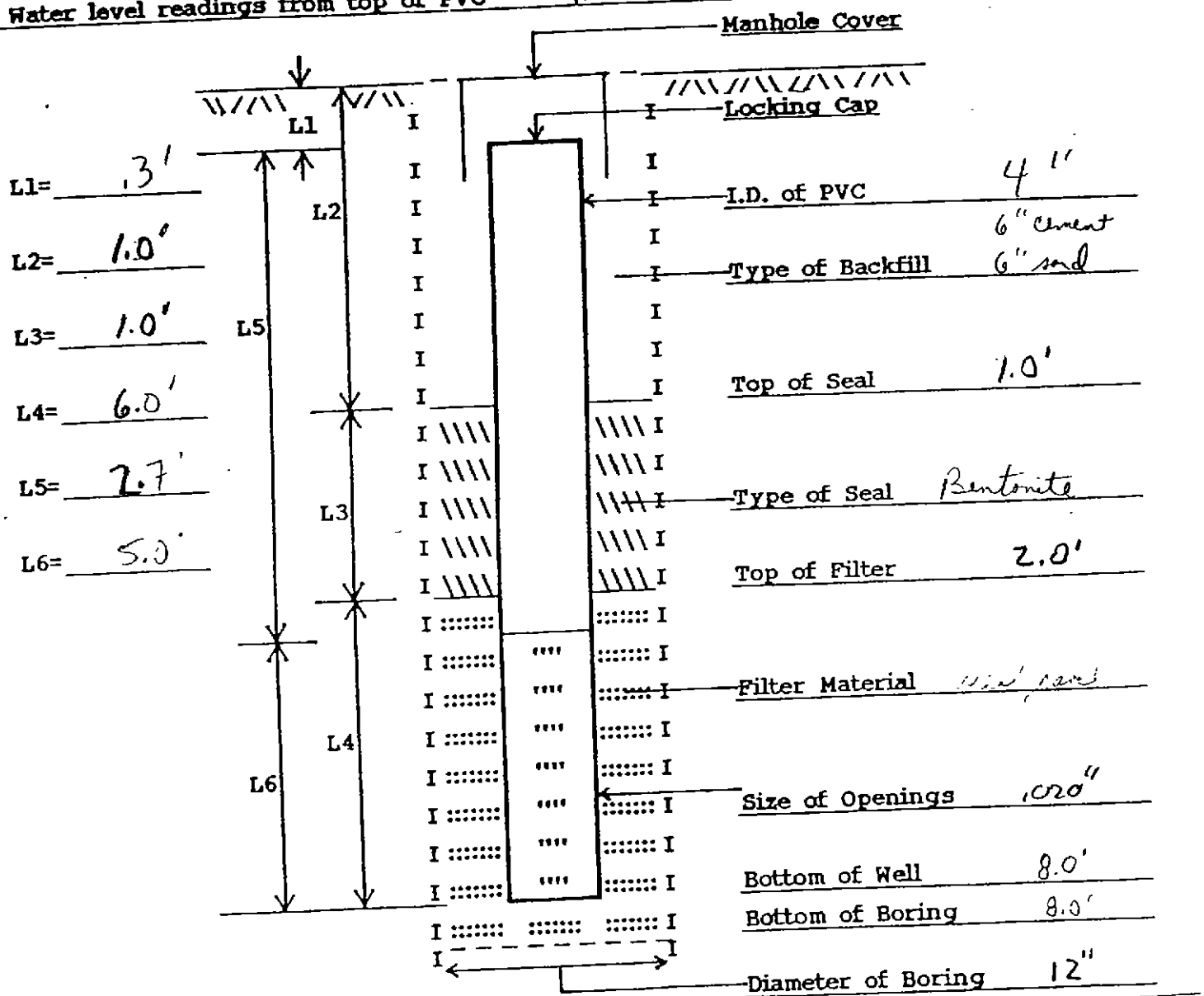
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine UST	Contract No.: 426-94-001
Location: As laid out in field north of Bldg. 263	Contractor: Craig
Driller: G. McEneny	Inspector: T. Ryan
Well No.: MW-P39-4	Type of Well: 'A' monitor
	Date: 2/19/94

Well Development

Date: 2/19/94	Water Level Before: 4.0'	Water Level After: 5.5'
Note: Water level readings from top of PVC	Taken 15 min. After Development	



Remarks: NJ Well Permit No. 24-37289

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

PROJECT: N.J. Marine UST	NAME OF CONTRACTOR: Craig	BORING NO.: MW-P39-5	SHEET 1 OF 1
LOCATION: As laid out in field north of bldg 263		CONTRACT NO.: 426-94-001	SURFACE ELEV.
SPOON: 3 "O.D. 2 3/8 "I.D."	CASING SIZE: Auger	HOLE TYPE: A Monitor	DATE: 2/19/94
HAMMER: 140 # FALL 30"	HAMMER # FALL		
DRILLER: G. McAneny			
INSPECTOR: T. Ryan			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/19/94	12:50p	4.0'	In sample = 2

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
1-2-cut	0				Asphalt
		Hand Auger	12"	1	Fill - C-F Brown sand, some gravel, tr silt 0.5'
			24"	2	Same as above
	5		24"	3	Fill - F-C Brown sand, some silt, tr gravel 4.1'
Auger		5-5			
		5-6	14"	4	Fill - M-F Brown sand, little silt, tr gravel, tr plant fibers 6.0'
		3-3			
	10	2-2	18"	5	Same as above
		2-2			
		2-1	16"	6	Gray org clayey silt 10.0'
					12.0'
	15				Bottom of Boring
					0
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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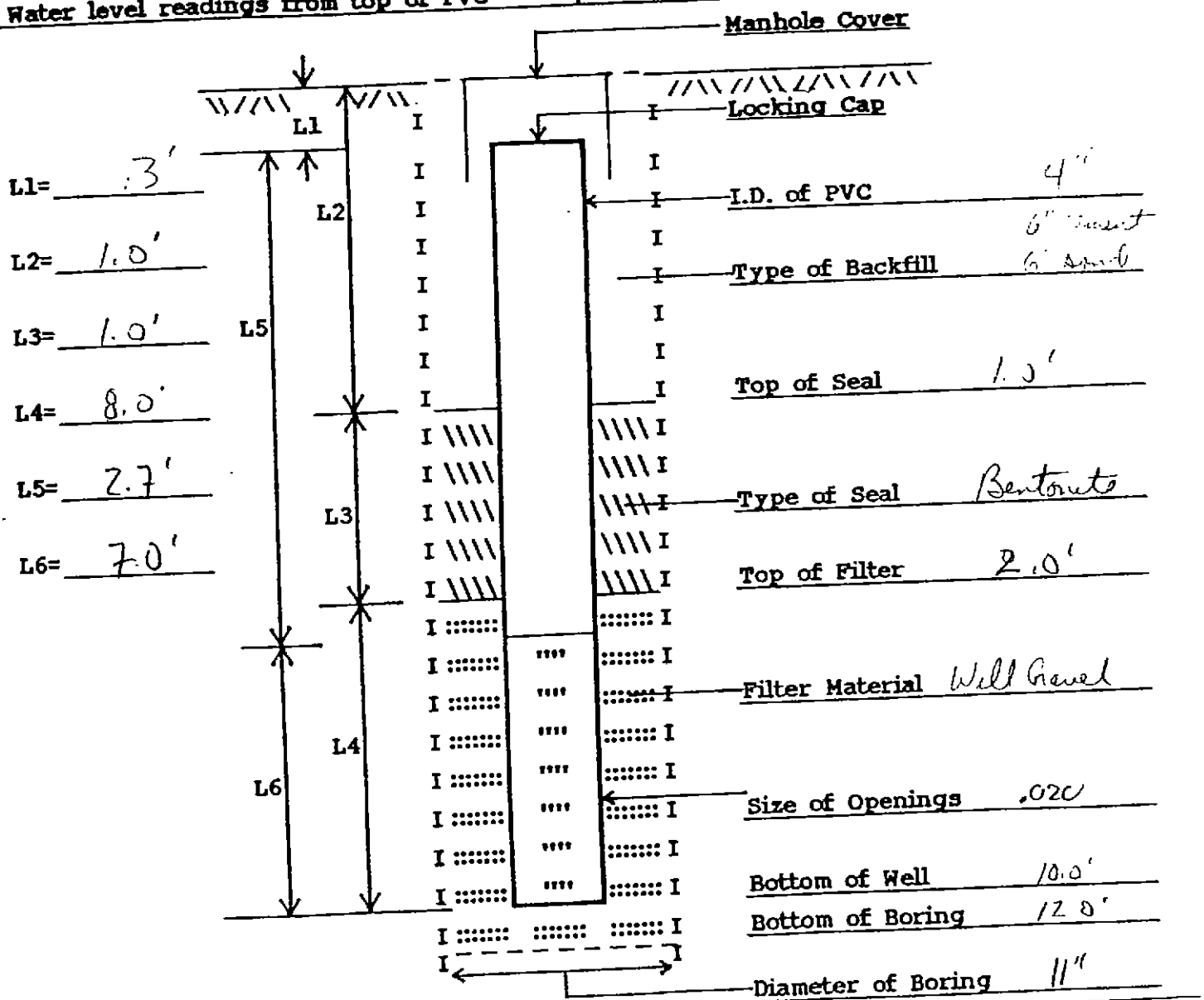
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: I-[illegible] - 95	Contract No.: [illegible]
Location: As laid out in field north of Item 263	Contractor: [illegible]
Driller: G. McAneny	Inspector: T. Ryan
Well No.: P39-5	Type of Well: Monitor
	Date: 2/19/94

Well Development

Date: 2/[illegible]/94	Water Level Before: 4.0'	Water Level After: 4.3'	
Note: Water level readings from top of PVC		Taken 15 min. After Development	



Remarks: Backfilled w/ bentonite from 12.0' to 10.0'
N.J Well Permit No. 26-37290

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Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: NJ Marine - ELT	NAME OF CONTRACTOR: Cranston	BORING NO.: MW-P39-6	SURFACE ELEV.
LOCATION: As landed in field north of Slip 263		CONTRACT NO.: 426-94-001	DATE: 2/21/94

SPOON	CASING SIZE	HOLE TYPE
3 O.D. 2 3/8 I.D.	Auger	Mud rotary

HAMMER	HAMMER
140 # FALL 30"	# FALL

DRILLER: G. McGuire

INSPECTOR: T Ryan

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/21/94	2:30 P	4.0'	Encountered ± 2

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. NO. [2]	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				ASPHALT 0.5'
					GRAVEL 2.0'
		WOH-2	14"	1	FILL - M-F brn sand, little gravel, trace silt
			24"	2	Same as above (Duplicate sample taken)
	5				
		↓	24"	3	Same as above
Augers		6-5			
		12-13	24"	4	Same as above 9.0'
		12-10			
		8-8	16"	5	F Gray sand, some silt lenses. 10.0'
	10	4-3			
↓		2-2	14"	6	Gray organic silt, trace F sand 12.0'
	15				Bottom of Boring
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

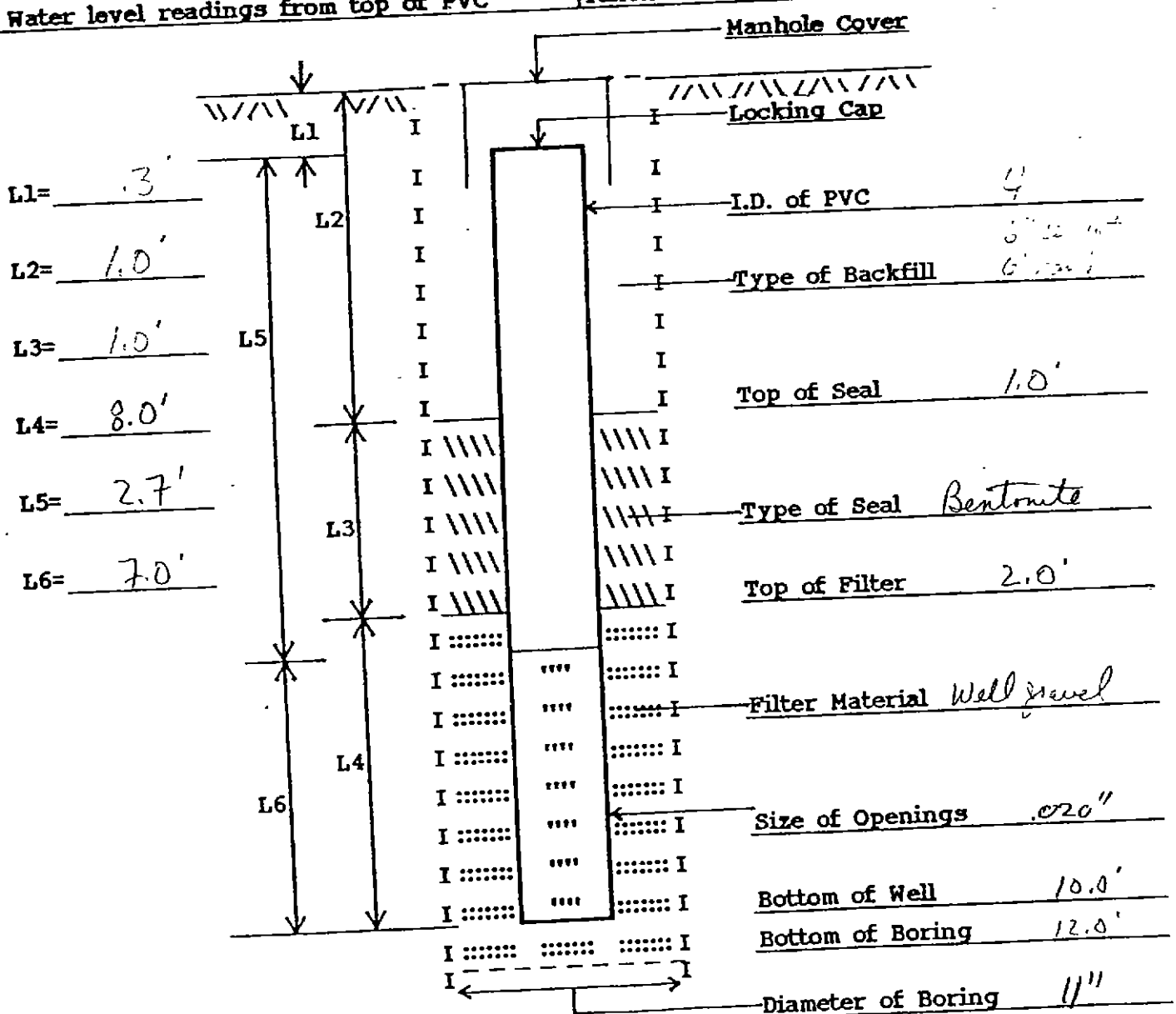
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine UST	Contract No.: 426-94-001
Location: As laid out in field south of Bldg 263	Contractor: Craig
Driller: G. McAneney	Inspector: T Ryan
Well No.: MW-P39-6	Type of Well: A monitor
	Date: 2/21/94

Well Development

Date: 2/21/94	Water Level Before: 4.0'	Water Level After: 4.5'
Note: Water level readings from top of PVC	Taken 25 min. After Development	



L1= .3'
L2= 1.0'
L3= 1.0'
L4= 8.0'
L5= 2.7'
L6= 7.0'

Remarks: Backfilled with bentonite from 12.0' to 10.0'
NJ Well Permit No. 26-37291

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 4

PROJECT: NJ MARINE TERMINAL-UST-PHASE II	NAME OF CONTRACTOR: CRAIG DRILLING	BORING NO.: MW-E26-1	SURFACE ELEV.:
LOCATION: AS LAID OUT IN THE FIELD - WEST OF BUILDING 139		CONTRACT NO.: 426-94-001	DATE: 3-8-94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGER	"A" Monitor

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: G. McANENY

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3-8-94	12 20 PM	1.4'	PERCHED WATER

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
(WATER BIT)	0				ASPHALT 0.5
Hollow		HAND AUGER	18"	1	FILL BR. C-F SAND, tr. silt, little GRAVEL
STEM		TAPPED SPOON	15"	2	SAME
AUGER	5	TAPPED SPOON	18"	3	SAME
		7-8	20"	4	SAME
		10-14			
		5-6	14"	5	SAME
	10	7-7			10.0'
					[BIG OBSTRUCTION @ 10.0 POSSIBLY CONCRETE SLAB]
					BOTTOM OF BORING
	15				
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

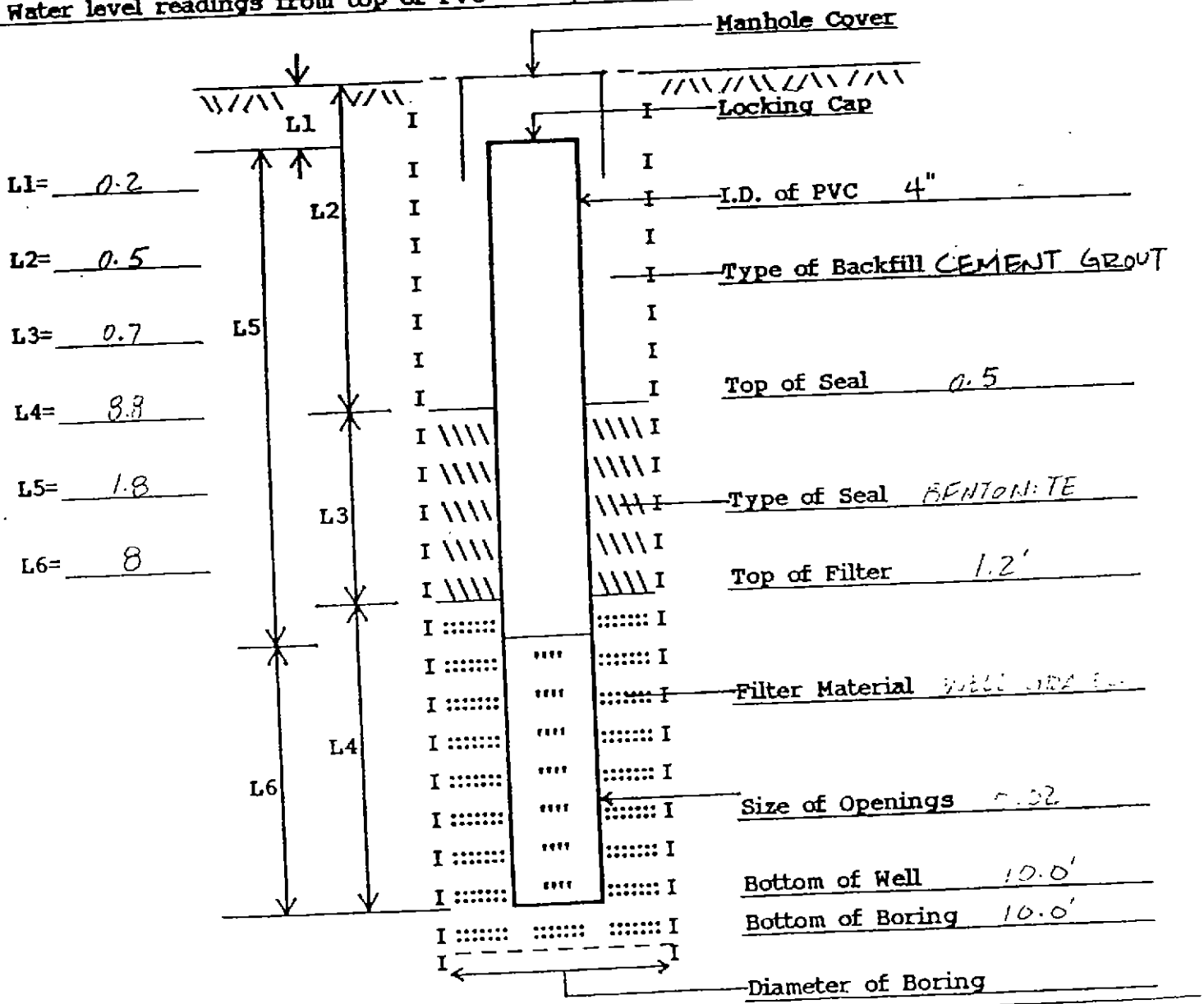
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ MARINE TERMINAL UST - PHASE II	Contract No.: 426-94-001
Location: AS LAID OUT IN THE FIELD - WEST OF Building 139	Contractor: CRAIG DRILLING
Driller: GARY McANENY	Inspector: M. OUDEH
Well No.: MW-E26-1	Type of Well: "A" MONITOR Date: 3-8-94

Well Development

Date: 3-9-94	Water Level Before: 1.6'	Water Level After: 3.1'
Note: Water level readings from top of PVC	Taken 60 min. After Development	



Remarks: NJ Well Permit No. 26-37257

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Materials Engineering Section

BORING REPORT

SHEET 1 OF 1

PROJECT: NJ Marine Terminal - UST - Phase II	NAME OF CONTRACTOR: Craig Drilling	BORING NO.: MW-E26-2	SURFACE ELEV.:
LOCATION: AS LAID OUT IN THE FIELD; WEST OF BLDG. 139		CONTRACT NO.: 426-94-001	DATE: 3-7-94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGER	"A" MONITOR

HAMMER	HAMMER
140 # FALL 30 "	# FALL "

DRILLER: G. McANENY

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3-7-94	2 00 PM	1.0'	PERCHED WATER
—	—	5.0'	FOUND WHEN WESTON PULLED TANK OUT 10/93

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE	
ROLLER-BIT	0				3" ASPHALT 9" BASE	1.0'
HOLLOW STEM AUGERS		TAPPED SPOON	15"	1	FILL DK. GREY C-F SAND, tr. SILT, tr. GRAVEL (FUEL ODOR)	
		TAPPED SPOON	16"	2	FILL BR-GREY C-F SAND, LITTLE GREY-RED-BR. CLAY & SILT, little GRAVEL	
	5	5-4	7"	3	SAME	
		3-1				
		3-4	12"	4	FILL RED-BR. GREY M-F SAND, LITTLE CLAY & SILT, tr. WOOD	
		4-5				
	10	3-3	18"	5A	FILL RED-BR-GREY FINE SAND, SOME SILT	10.0'
		2-2		5B	Blk. PEAT	11.0'
					Bottom of HOLE	
	15					
	20					
	25					

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

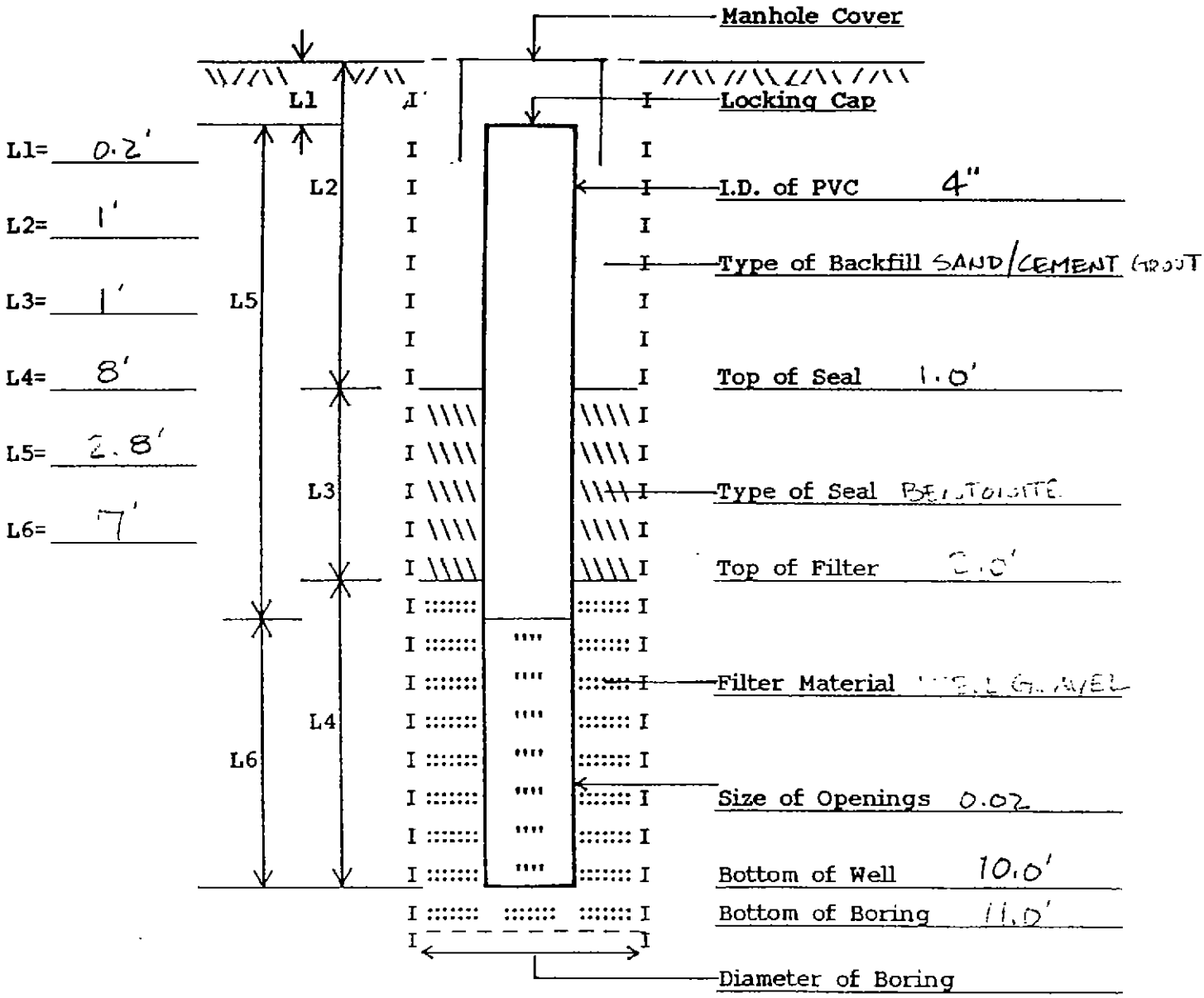
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. MARINE TERMINAL - UST - PHASE II		Contract No.: 426-94-001
Location: AS LAID OUT IN THE FIELD; WEST OF Bldg. 139		Contractor: CRAIG DRILLING
Driller: G. MCANENY	Inspector: M. OUDEH	
Well No.: MW-E26-2	Type of Well: "A" MONITOR	Date: 3-7-94

Well Development

Date: 3-9-94	Water Level Before: 3.8'	Water Level After: 3.9'
Note: Water level readings from top of PVC	Taken 60	min. After Development



Remarks: BACKFILLED WITH BENTONITE FROM 11.0' TO 10.0'

N.J. Well Permit # 24-37253

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Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

SHEET 1 OF 1

PROJECT: N.J MARINE TERMINAL - U.S.T. - PHASE II	NAME OF CONTRACTOR: CRAIG DRILLING	BORING NO.: MW-E26-3	SURFACE ELEV.:
LOCATION: AS LAID OUT IN THE FIELD; WEST OF BLDG. 139		CONTRACT NO.: 426-94-001	DATE: 3-8-94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	AUGER	"A" Monitor

HAMMER: 140 # FALL 30 "

HAMMER: # FALL "

DRILLER: G. McANENY

INSPECTOR: M. OUDEH

GROUND WATER LEVEL

Date	Time	Depth	Remarks
3-8-94	9 30 AM	2.9'	FOUND WHILE HAND AUGERING

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
ROTTER BIT ↓	0				ASPHALT 0.5'
					BASE 1.0'
HOLLOW		HAND	24"	1	FILL Grey-RED-BR M-F SAND, little Silt, tr. GRAVEL
STEM		AUGER			
AUGERS		TAPPED	14"	2	FILL RED-BR M-F SAND, little Silt, little GRAVEL
	5	SPOON			(DUPLICATE SAMPLE TAKEN)
		8-10	10"	3	FILL RED-BR FINE SAND, Little Clay & Silt
		7-5			
		4-4	15"	4 A	FILL Grey-RED-BR Clay & Silt, tr. Fine Sand 8.5'
		4-4		B	FILL Grey FINE SAND
	10	3-3	11"	5 A	FILL Grey-RED-BR FINE SAND, Some Clay & Silt 10.5'
		3-3		B	BR FINE SAND, TR DK Grey ORGANIC Clay-Silt
		2-2	20"	6 A	SAME 12.5'
↓		2-2		B	GREY-BR, PEAT 13.5'
	15				BOTTOM OF BORING
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod, V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

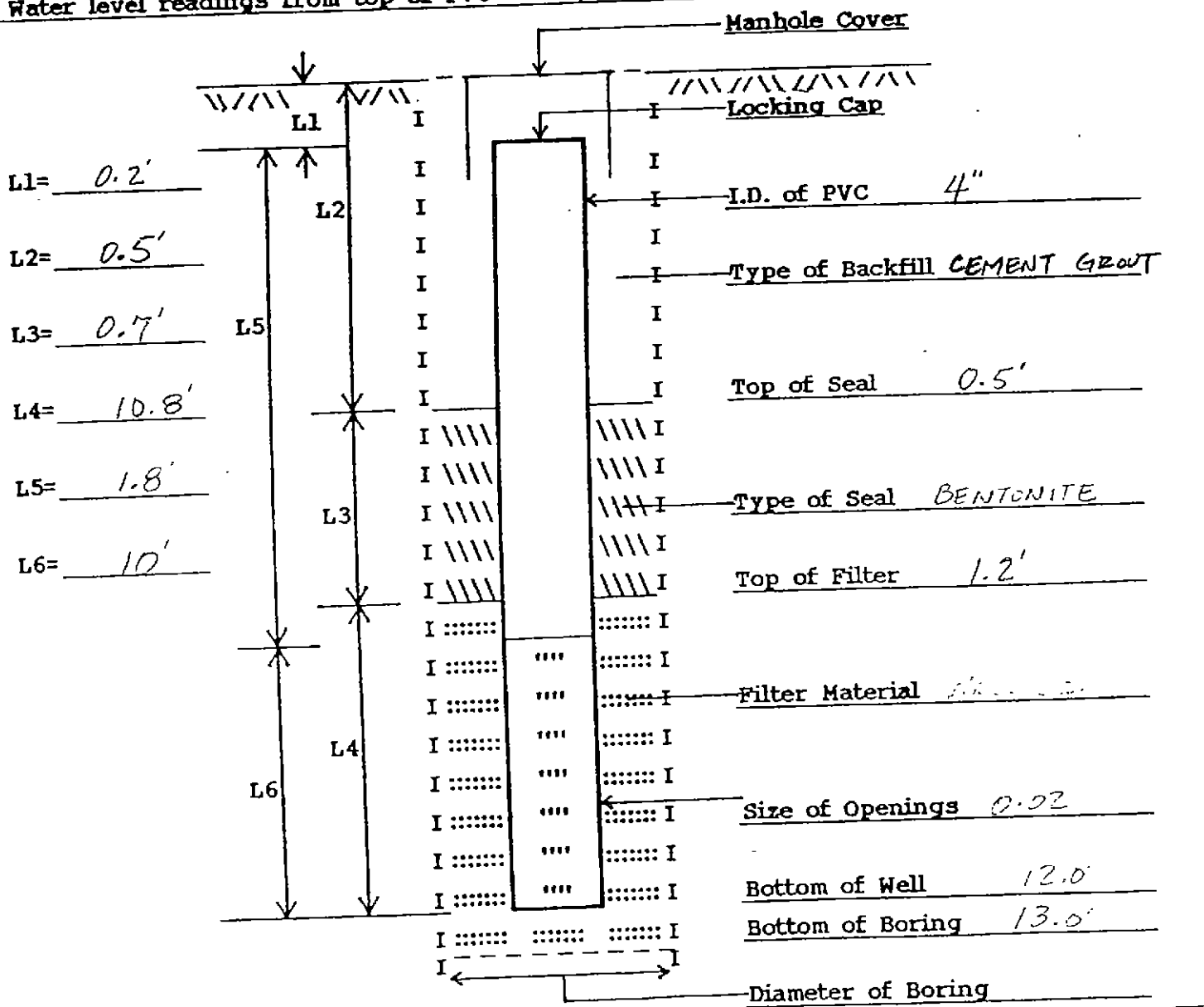
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ MARINE TERMINAL - UST - PHASE II	Contract No.: 426-94-001
Location: AS LAID OUT IN THE FIELD - WEST of BLDG 139	Contractor: CRAIG DRILLING
Driller: G. McANENY	Inspector: M. OUDETT
Well No.: MW-E26-3	Type of Well: "A" MONITOR
	Date: 3-8-94

Well Development

Date: 3-9-94	Water Level Before: 2.2'	Water Level After: 2.9'
Note: Water level readings from top of PVC	Taken 60	min. After Development



Remarks: BACKFILLED WITH BENTONITE FROM 13' to 12'

M. OUDETT 96-373-9

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

Please II — Lark E 46

SHEET 1 OF 4

PROJECT: N.J. Channel Deepening Bldg #87	NAME OF CONTRACTOR: Lovaas	BORING NO.: MW E46-1	SURFACE ELEV.
LOCATION: As laid out by Consultant		CONTRACT NO.: 426-94-001	DATE: 2/7/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D." 2 3/8 "I.D."	10" Auger	Monitor A
HAMMER: 140 # FALL: 30"	HAMMER: — # FALL: —	

DRILLER: G McSherry

INSPECTOR: R M. Lekkell

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/7/94	1.00	5.6	while Sand Augering

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE- [1] COV'D	SAMP. [2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				0.0
Sand Auger		Hand Auger	24"	1	FILL br m-f Sand, tr Silt, tr Gravel
		Hand Auger	24"	2	FILL Same
	5	4 4 4 4	17"	3	FILL Same
Mud Auger		2 2 5 14	13"	4	More FILL grey m-f Sand some silt, tr brick tr concrete 9.0'
	10	3 2 2 1	20"	5	FILL Grey F Sand some Silt 11.0'
		3 3 2 3	16"	6A	Grey clay and Silt, tr f Sand
				B	Brown Peat 13.0'
					Bottom of Boring

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

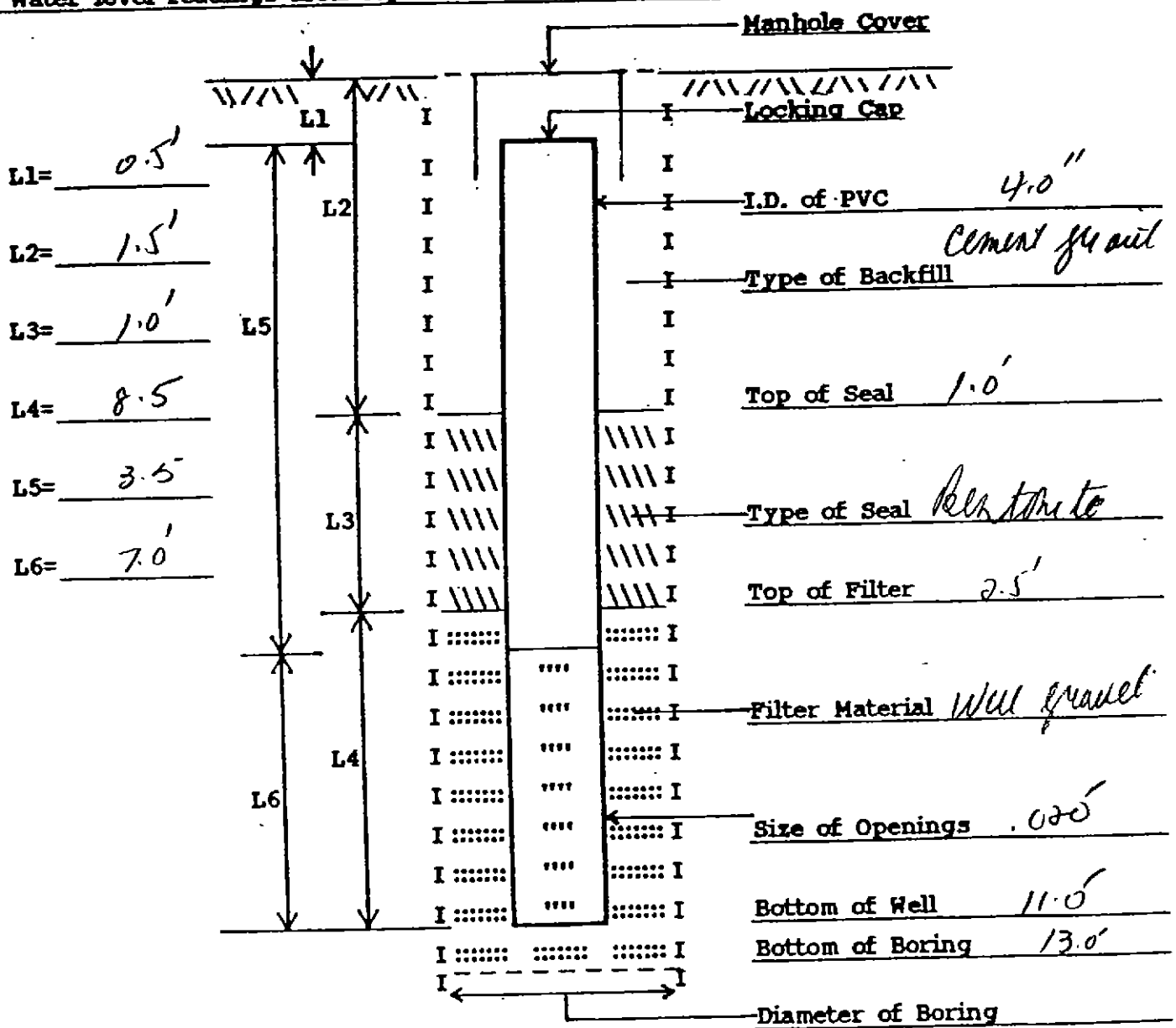
THE PORT AUTHORITY OF N.Y. & N.J.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ Turnpike Secaucus Bldg # 187		Contract No.:	
Location: As laid out by consultant		Contractor:	
Driller: G. Fee Assoc.		Inspector:	Rm. Lubert
Well No.: MW E 46-1	Type of Well: Monitor A	Date:	2/7/94

Well Development

Date: 2/7/94	Water Level Before: 5.5	Water Level After:
Note: Water level readings from top of PVC	Taken	min. After Development



Remarks: 11.0' - 13.0 Backfilled with well gravel

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THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
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BORING REPORT

Phase II — Seek #16

SHEET 1 OF 4

PROJECT: N.J. Marine Terminal	NAME OF CONTRACTOR: Dial	BORING NO.: MW E46-2	SURFACE ELEV.
LOCATION: No land out by Consultant Bldg 187		CONTRACT NO.: 456-94-001	DATE: 2/10/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	10" Auger	Monitor A'

HAMMER	HAMMER
140 # FALL 30"	— # FALL —

DRILLER: G. Joe Riepis
INSPECTOR: R. M. Lekutt

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/10/94	24h	5.5	while hand Augering

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D	SAMP.² NO.	³SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				Steel Flushed Aggregate Surface Cover 0.2'
Hand Augered		Hand Auger	18"	1	FILL Brn m-f Sand and Cinders to Silt, & gravel 0.5'
		Hand Auger	24"	2	FILL Brn m-f Sand, to Silt, to gravel
	5	Hand Auger	24"	3	FILL Same DUPLICATE SAMPLE
10" H.S. Augers		5 4 4 4	17"	4	FILL Brn m-f Sand, 3' Layer Grey Silt 8.0'
		3 2 2 2	14"	5	FILL Grey Silt and F Sand
	10	1 2 2 2	19"	6	FILL Same 12.0'
					Bottom of Boring
	15				
	20				

NOTES: 1 — Length recovered; 0" = Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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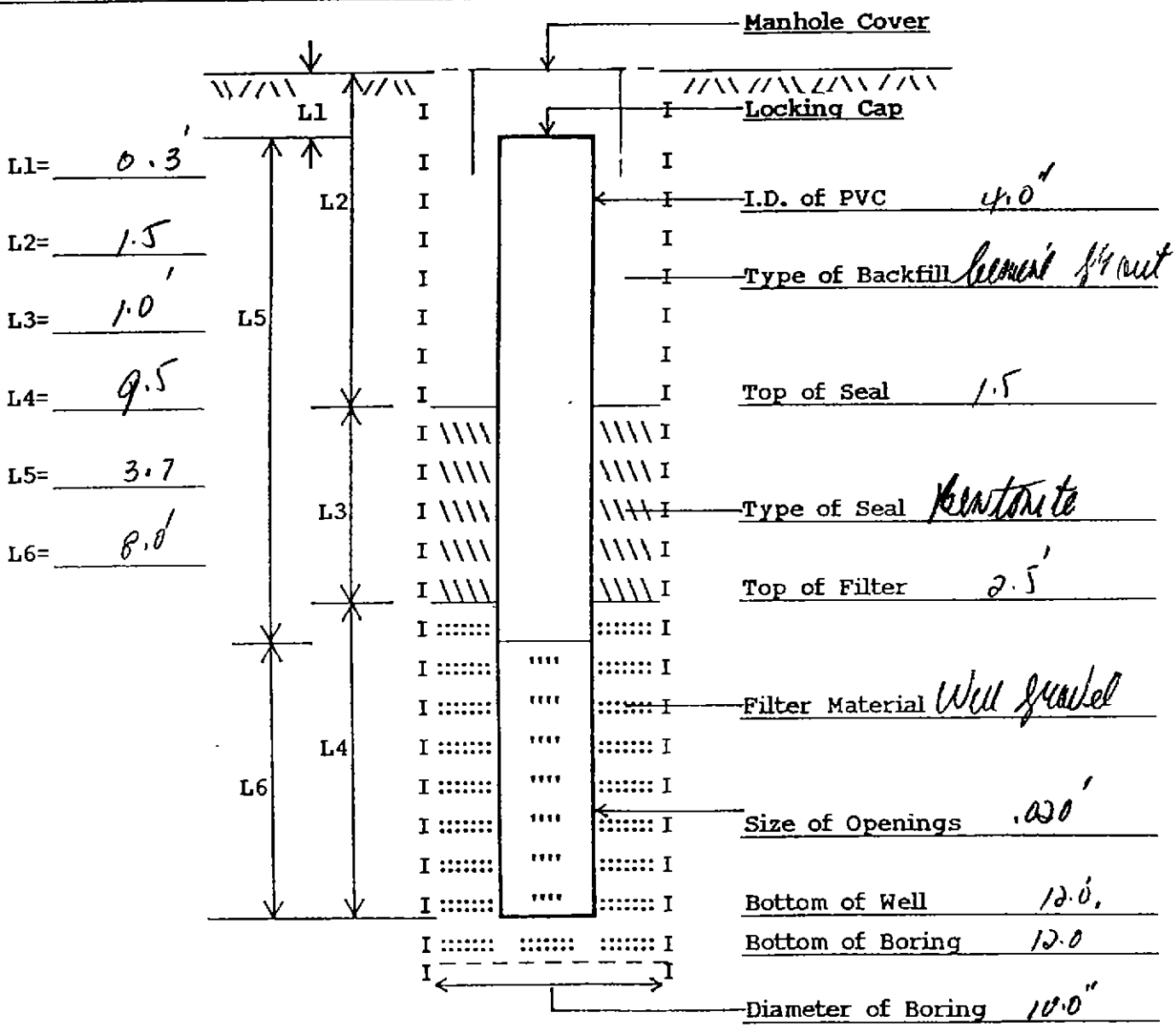
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Sheet 2 of 4

Project: NJ Marine Terminal Bldg # 187			Contract No.: 426-94-00
Location: As laid out by consultant			Contractor: Craig
Driller: G McAvoy		Inspector: R. M. Lukens	
Well No.: MW E 46-2	Type of Well: Monitor A'		Date: 2/10/94

Well Development

Date: 2-14-94	Water Level Before: 5.5'	Water Level After:
Note: Water level readings from top of PVC	Taken	min. After Development



Remarks:

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Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

Phase II — Tank E46

PROJECT: NJ Turnpike Terminal Bldg #187	NAME OF CONTRACTOR: Boring	BORING NO.: MW E46-3	SHEET 1 OF 4
LOCATION: No Land out by Consultant		CONTRACT NO.: 436-94-001	SURFACE ELEV.:
			DATE: 2/10/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	10" Augers	Monitor A

HAMMER	HAMMER
140 # FALL 30	— # FALL —

DRILLER: G McGarry
INSPECTOR: R. Liberti

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/10/94	12:45	5.5'	while Hand Augering

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				Asphalt 0.0'–0.6'
Hand Augers		N Augers	17"	1	Brown Fill Some Brick, Sand & Gravel, Some Cinders, Little Silt, Little Gravel
		Hand Augers	24"	2	Brown Fill Some Silt 4.0'
	5	Hand Augers	24"	3	Fill Some Silt, Little F Sand 6.0'
10' 1.5 Augers		5 4 4 4	16"	4	Fill Grey Silt and F. Sand.
		3 4 4 3	18"	5	Fill Same 10.0'
	10	3 3 2 3	10"	6	Red Peat (two attempts to recover sample) 12.0'
	15				Bottom of Boring
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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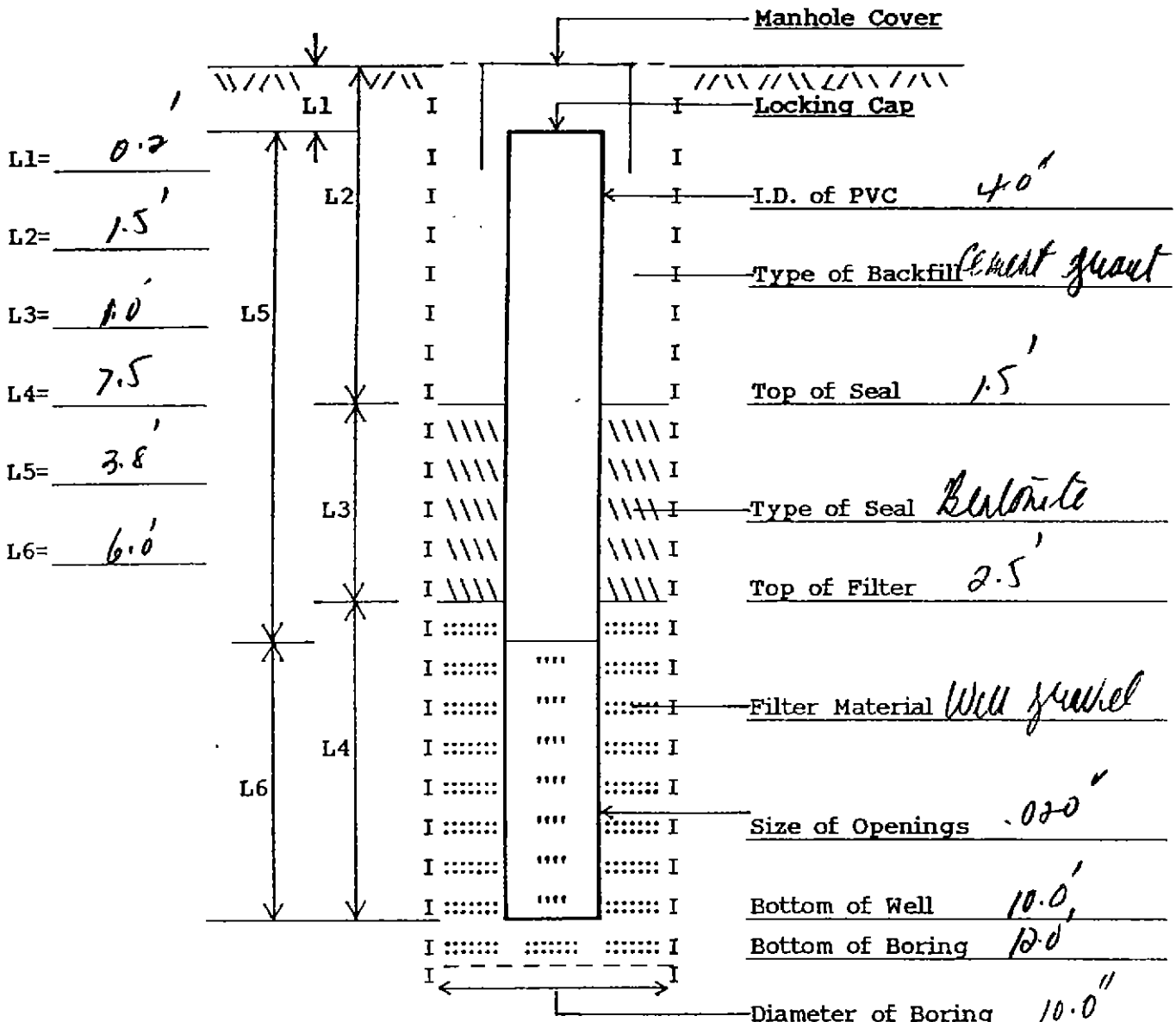
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Sheet 2 of 4

Project: NJ. Arrivee Terminal Bldg* 187	Contract No.: 426-94-001
Location: NO Land out by Consultant	Contractor: Berg
Driller:	Inspector: R. M. Liberti
Well No.: MW 46-3	Type of Well: Monitor A
	Date: 2/10/94

Well Development

Date: 2-14-94	Water Level Before: 5.5'	Water Level After:
Note: Water level readings from top of PVC	Taken	min. After Development



Remarks: 10.0' to 12.0' back filled with well gravel

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BORING REPORT

SHEET 1 OF 4

PROJECT: NJ Marine Chemical Bldg # 183	NAME OF CONTRACTOR: Lang	BORING NO.: MW C13-1	SURFACE ELEV.
LOCATION: Nr River drawing		CONTRACT NO.: 450-94-001	DATE: 4/15/94

SPOON	CASING SIZE	HOLE TYPE
3 O.D. 2 3/8 I.D.	10 Augers	Monitor A

HAMMER	HAMMER
140 # FALL 30	— # FALL —

DRILLER: C. Le. Manuel

INSPECTOR: R. McLeod

GROUND WATER LEVEL

Date	Time	Depth	Remarks
4/15/94	10:00 hr	9.0'	Water in sample # 4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Rolling bit / Mud Auger / 10" H.S. Augers	0				0.0' Asphalt / Gravel Refuse Base Course 0.2 → 1.0'
		Hand Auger	24"	1	Fill br m-f sand, br silt, br gravel
			24"	2	Fill Same (OIL ODOR)
	5	Hand Auger 7 28 31	15"	3	Fill Same "
		18 27 27 21	12"	*4	Fill br m-f sand, br silt, br gravel to red/br clayey silt (OIL ODOR)
	10	2 3 3 4	16"	5 B	Fill br m-f sand, br silt, br gravel " 10.5'
				B	Grey organic silty clay " 11.0'
					Bottom of Boring
	15				
					* DUPLICATE SAMPLE TAKEN
	20				
	21				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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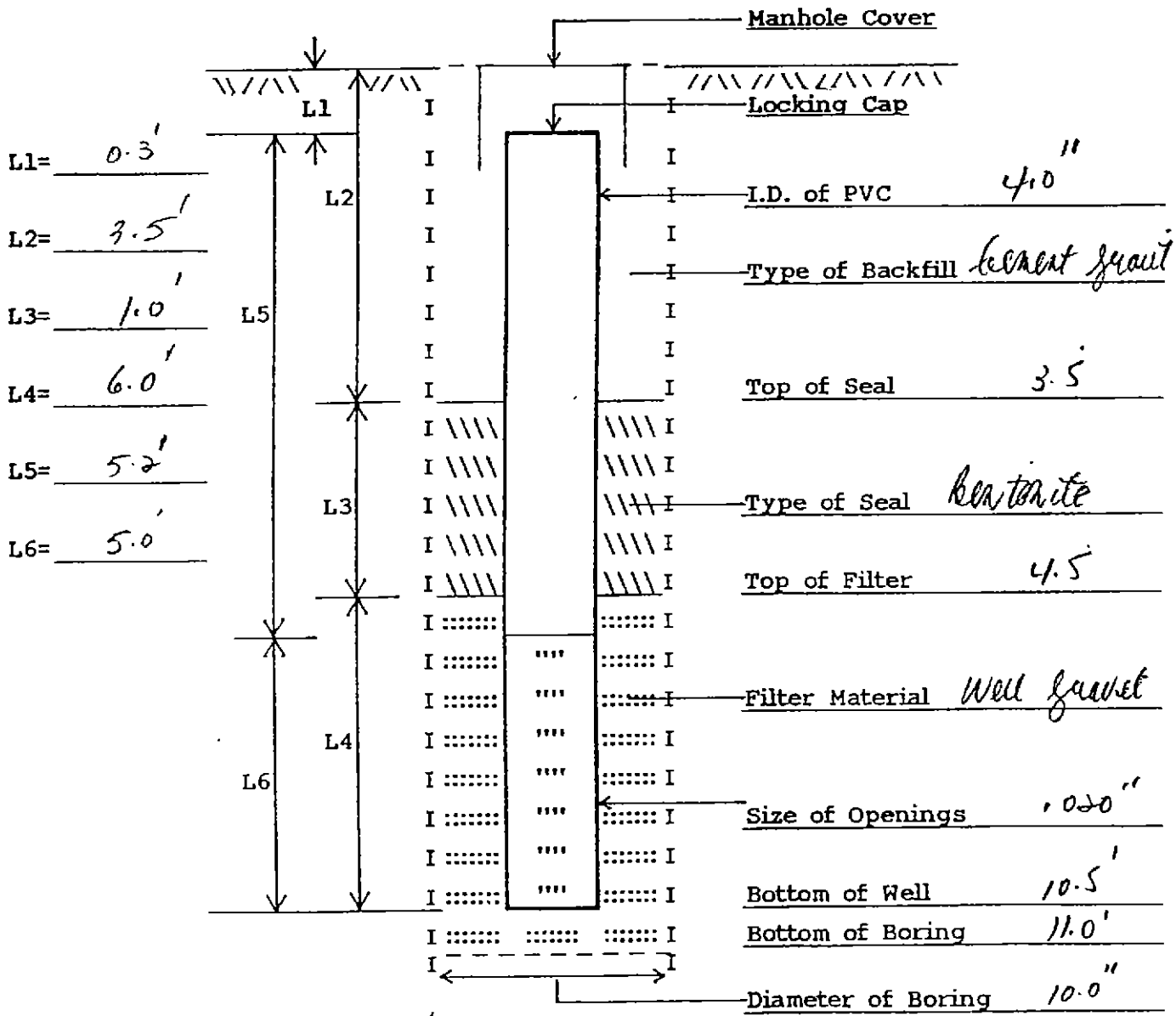
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Sheet 2 of 4

Project: NJ Marine Terminal bldg #83			Contract No.: 426-94-001
Location: Rt 440 Avenue C			Contractor: Berg
Driller: C Le Moine		Inspector: K. M. Liberti	
Well No.: MW C 13-1	Type of Well: Monitor		Date: 4/15/94

Well Development

Date: 4/18/94	Water Level Before: 5.5	Water Level After: 7.0
Note: Water level readings from top of PVC	Taken 20 min. After Development	



L1= 0.3'
L2= 3.5'
L3= 1.0'
L4= 6.0'
L5= 5.2'
L6= 5.0'

Remarks: 10.5' to 11.0' back filled with Well Gravel

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BORING REPORT

SHEET 1 OF 4

PROJECT N.S. Marine Terminal Bldg #183	NAME OF CONTRACTOR Craig	BORING NO. MW C12-1	SURFACE ELEV.
LOCATION Ho Ave Roadway		CONTRACT NO. 436-94-001	DATE 4/15/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	10" Auger	Mixter A
HAMMER 140 # FALL 30 "	HAMMER — # FALL — "	
DRILLER C. LeMaire		
INSPECTOR R. M. Libert		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
4/15/94	2.0'	9.0	

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. [2] NO.	[3] SAMPLE DESCRIPTION AND REMARKS LINE LOCATES CHANGE OF PROFILE
Keller Bit	0				Asphalt 0.0
					Dense graded Aggregate Base Course 0.3
Hand Auger		Hand Auger	24"	1	Fill Br m-F Sand, tr Silt, tr Gravel 1.0
					Fill Same (Product in sample)
	5	Hand Auger	24"	2	5.0
		4 7	20"	3	Fill Br m-F Sand and Red Br clayey Silt (Product in sample)
10" Augers		3 6			
		5 6 11 12	18	4	Fill Same (Product in sample)
	10	4 3 2 2	19"	5A	Fill Br m-F Sand, tr Silt, tr Red Br clayey Silt (Product in sample) 10.5'
				5B	Auger Refusal, Silt, Clay 11.0'
					Bottom of Boring
	15				
	20				
	21				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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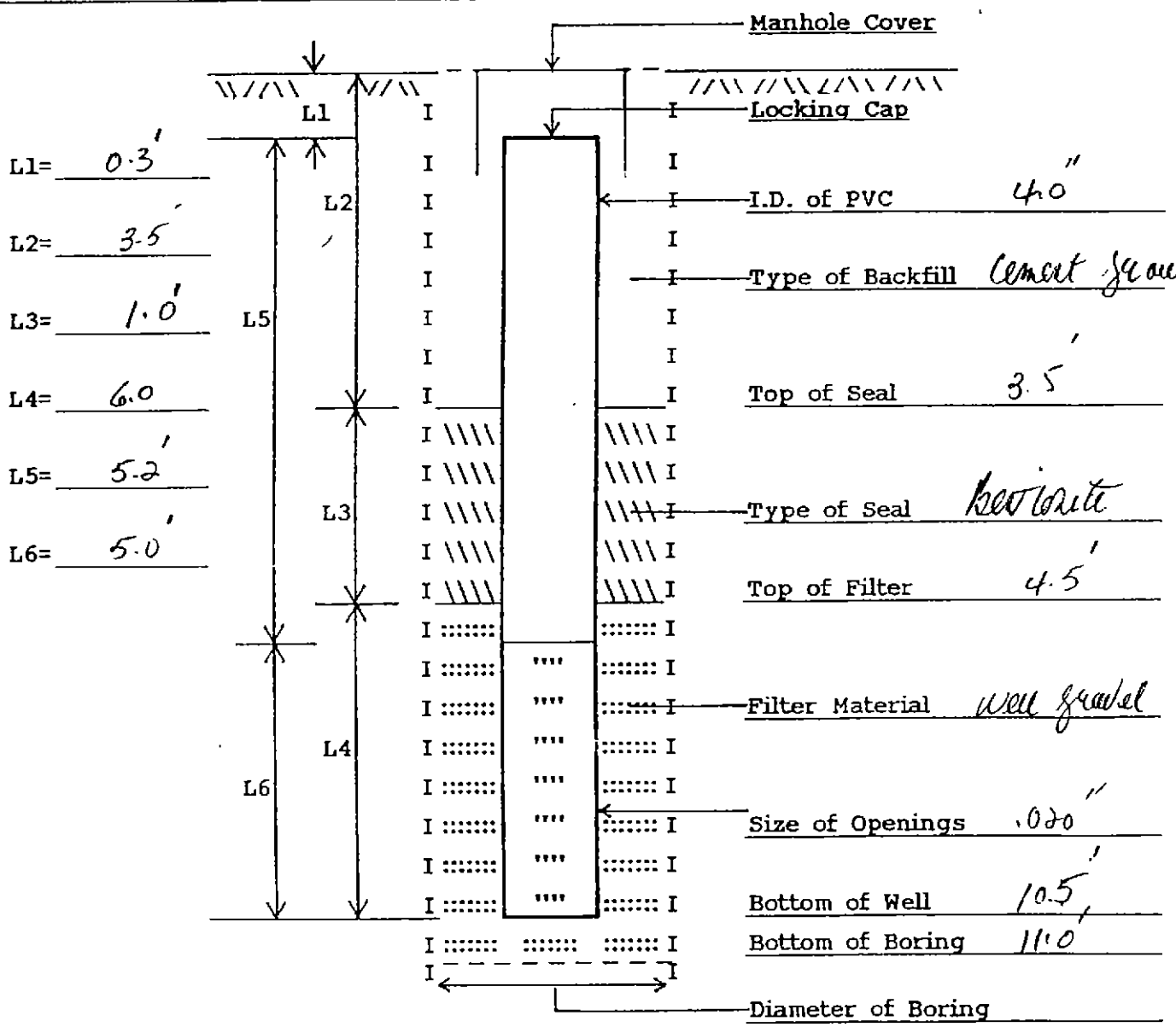
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ Marine Terminals			Contract No.: 426.94.001
Location: As per drawing			Contractor: Weeks
Driller: C. Le Mure		Inspector:	R.M. Liboll
Well No.: MW C-12-1	Type of Well: Monitor 'A'		Date: 4/15/94

Well Development

Date: 4/18/94	Water Level Before: 6.5	Water Level After: 7.5
Note: Water level readings from top of PVC	Taken 15	min. After Development



Remarks: 10.5 - 11.0 Backfilled with well gravel

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BORING REPORT

SHEET 1 OF 4

PROJECT: NJ Traverse Seemens bldg 183	NAME OF CONTRACTOR: Craig	BORING NO.: MW E 141-1	SURFACE ELEV.
LOCATION: No Ref drawing		CONTRACT NO.: 426-94-001	DATE: 4/11/94

SPOON: 2" O.D. 1 3/8" I.D.	CASING SIZE: 10" Augers	HOLE TYPE: Auger
HAMMER: 140 # FALL 30"	HAMMER: — # FALL —	
DRILLER: C. Le Mone		
INSPECTOR: R. McLeod		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
4/15/94	1155	9.0	NOTE- Perched water below Asphalt - unlined continue to run into hole.
			water level assumed at 9.0 (BH MW C 13-1)

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D[1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS LINE LOCATES CHANGE OF PROFILE
Rolled Auger	0				Asphalt 0.0'
					Base Graded aggregate base Gravel 0.3'
		Hand Auger	24"	1	FILL Re-NF sand to dirt, to gravel (OIL ODOR) 1.0'
					FILL Same (OIL ODOR)
	5	Hand Auger	24"	2	
		3 4			FILL Same (OIL ODOR)
		6 4	16	3	
10' H.S. Augers		2 5			FILL Same
		3 2	14"	4	
		2 2		5A	FILL Same
	10	2 3	13"	5B	Grey organic silty clay, in part 10.0'
					Bottom of Boring 10'
	15				NOTE Perched water found on casing & Asphalt pavement. Water retained from drilling & augers.
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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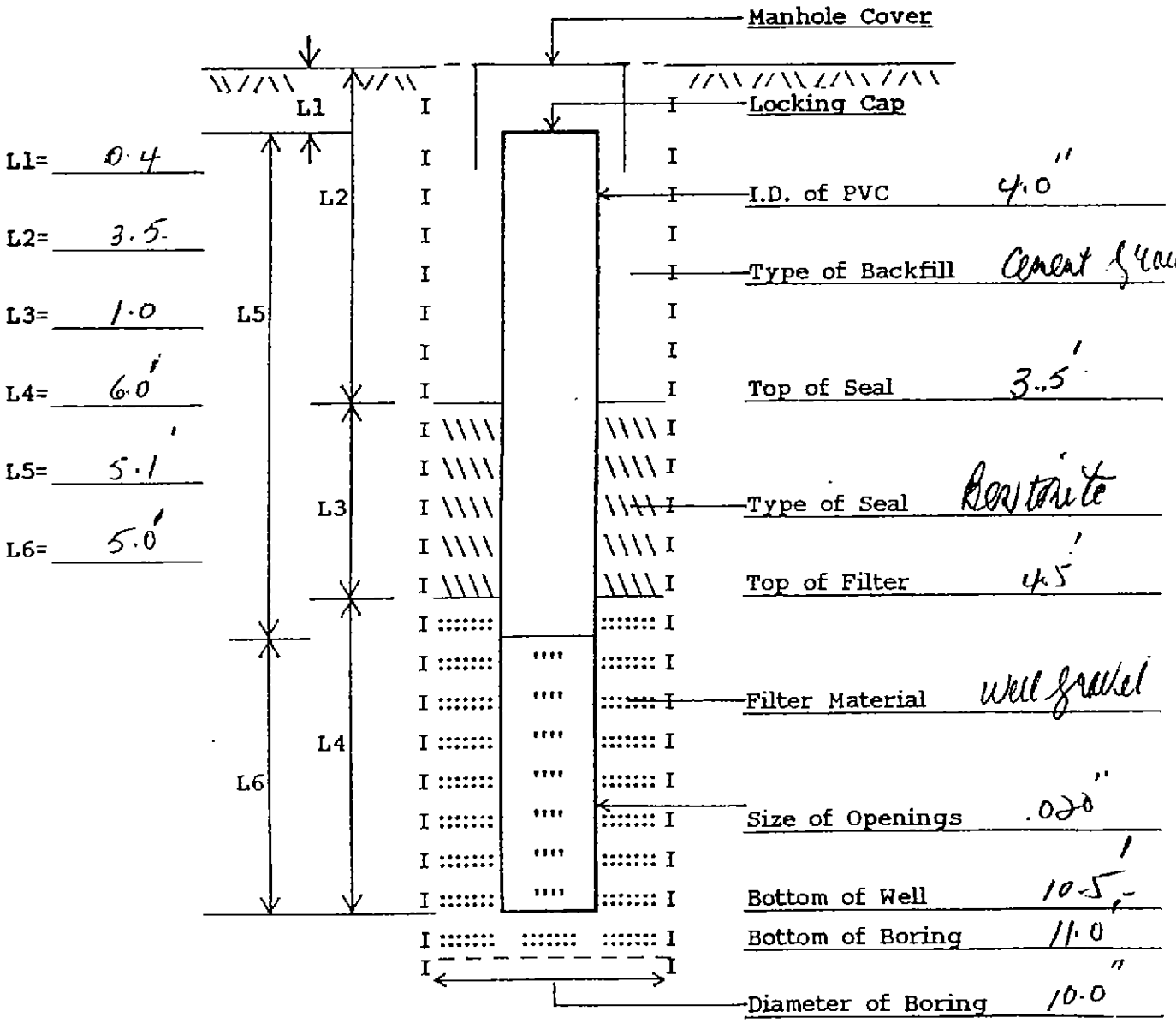
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: NJ Marine Services Bldg # 183		Contract No.: 46-94-001	
Location: Port Reading		Contractor: J Brady	
Driller: C Le Blanc	Inspector: R M Libutti		
Well No.: MW E 14-1	Type of Well: Monitor A	Date: 4/15/94	

Well Development

Date: 4/18/94	Water Level Before: 5'5	Water Level After: 7.5'
Note: Water level readings from top of PVC	Taken 15 min. After Development	



Remarks: 10.5' to 11.0' Back filled with well gravel

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Materials Engineering Division

BORING REPORT

SHEET 1 OF 3

PROJECT: Tort Rework Remedial Project	NAME OF CONTRACTOR: Dunn	BORING NO.: MW-E34-4	SURFACE ELEV.
LOCATION: As Laid out by Weeks Representative		CONTRACT NO.: 426 95-015	DATE: 6/29/95
SPOON: 3 O.D. 2 3/8 I.D.	CASING SIZE: 10" Auger	HOLE TYPE: Mon A	
HAMMER: 140 # FALL 30	HAMMER: — # FALL —		
DRILLER: T. Ward,			
INSPECTOR: R. Ackerd			

GROUND WATER LEVEL

Date	Time	Depth	Remarks
6/29/95	11.45	6.0'	in sample # 3.

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
	0				Asphalt 0.0'
					Crushed Rock Light Sand 0.3
					Fill 1.0
		Hand Auger	24"	1	Fill Lt Br m-f Sand, tr Silt
		Hand Auger	24"	2	Fill Same
	5	Hand Auger	24"	3	Fill Lt Br m-f Sand, tr Silt, tr Red Br clayey Silt
10" Auger		5 10 10 11	20"	4	Fill Lt Br m-f Sand, tr Silt, with 4" layers of Red Br clayey Silt
	10	6 8 8 6	19"	5	Fill Same
		10 10 13 13	21"	6	Fill Same 13.0
	15				Bottom of Boring
					Note Samples checked with PID and discarded.
	20				

NOTES: 1 — Length recovered; 0" — Loss of Sample.
2 — U = undisturbed.
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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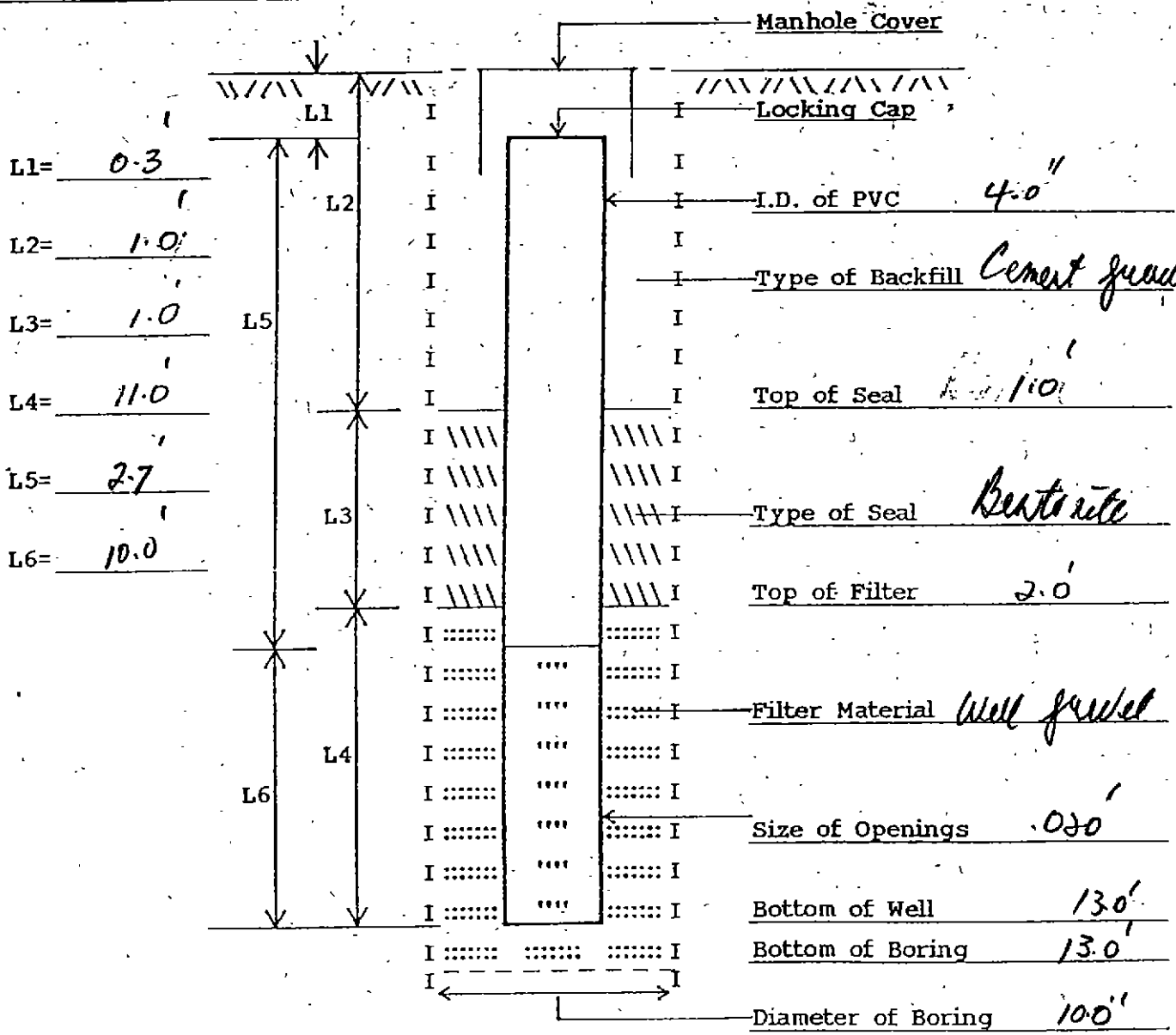
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Sheet 2 of 3

Project: Long Isl. Sawmill Remedial Program			Contract No.: 426 95-015
Location: Ms Land Out			Contractor: Brady
Driller: T Ward		Inspector:	
Well No.: MW-E34-4	Type of Well: Monitor "A"		Date: 6/29/95

Well Development

Date: 6/30/95	Water Level Before: 6.0	Water Level After: 7.5
Note: Water level readings from top of PVC	Taken 30 min. After Development	



Remarks:

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Construction Division
Materials Engineering Section

BORING REPORT

Sent E01

SHEET 1 OF 4

PROJECT: NJ Channel Deepening Project	NAME OF CONTRACTOR: Geraghty	BORING NO.: MW E01-1	SURFACE ELEV.
LOCATION: To be laid out by Consultant		CONTRACT NO.: 426-94-001	DATE: 2/2/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	4" Rotary	Monitor well

HAMMER	HAMMER
140 # FALL 30 "	— # FALL — "

DRILLER: G. Joe Reagy

INSPECTOR: R. M Schell

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/2/94	3:20	7.5	Water in sample # 4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Hand Auger	0	Hand Auger	24"	1	Fill Br m-f Sand, tr Silt, tr Gravel
		Hand Auger	24"	2	Fill Same
	5	Hand Auger	24	3	Fill Same
4 1/4" H.S. Augers		5 5 6 6	16"	4	Fill Same Duplicate Sample
	10	6 7 9 11	20"	5	Fill Same 10.0
		7 7 7 6	19"	6	Fill green/br f Sand tr Silt
		9 10 11 11	14"	7	Fill Grey f Sand, tr Silt 14.0
	15				Bottom of Boring
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

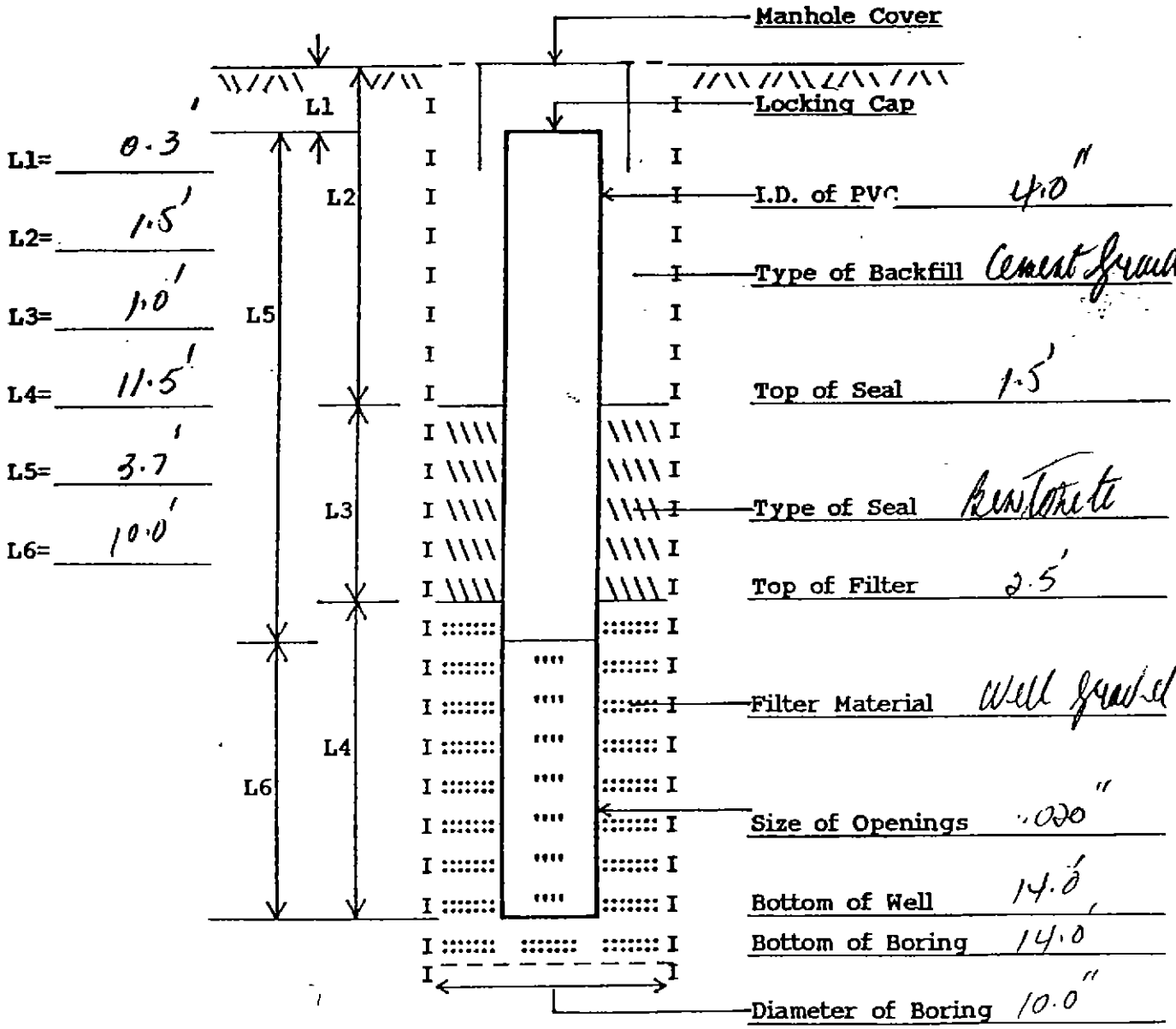
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Sheet 2 of 4

Project: N.J. Turnpike Lowmiel Triangle Property		Contract No.: 406-94-001	
Location: To be laid out by consultant		Contractor: Cravy	
Driller: G. McCleary	Inspector:	R. M. Rikell	
Well No.: MW E01-1	Type of Well: Monitor "A"	Date: 2/2/94	

Well Development

Date: 2/3/94	Water Level Before: 7.8	Water Level After: 9.0'
Note: Water level readings from top of PVC	Taken 15	min. After Development



Remarks: Permit No. 2635641

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Construction Division
Materials Engineering Section

BORING REPORT

TANK E01 — SHEET 1 OF 4

PROJECT: NJ Marine Terminal Sweeny Property	NAME OF CONTRACTOR: Lively	BORING NO.: MW E01-2	SURFACE ELEV.:
LOCATION: As laid out by Leonard Test		CONTRACT NO.: 4367-94-001	DATE: 2/2/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.		Hollow Stem Auger

HAMMER	HAMMER
140 # FALL 30	— # FALL —

DRILLER: G Inc Rigging

INSPECTOR: R. M. Lekuit

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/2/94	11.00	8.5'	Water in sample @ 4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-COV'D [1]	SAMP. NO. [2]	[3] SAMPLE DESCRIPTION AND REMARKS — LINE LOCATES CHANGE OF PROFILE
Hand Auger	0				0.0' ASPHALT 0.3' Dense graded aggregate base course 1.0'
		Hand Auger	24"	1	FILL Br Silt, tr m-f Sand, tr Gravel
		Hand Auger	24"	2	FILL Same
	5	3 4 4 5	16"	3	FILL Br m-f Sand, tr Silt, 7.0'
N.J. Augers		7 7 8 8	11	4	FILL Grey/br m-f Sand, tr Silt, tr Gravel 9.0'
	10	5 7 8 5	12	5	FILL Br m-f Sand, tr Silt, tr Gravel, 12" layer Red/br Clayey Silt 11.0'
10"		5 5 5 6	10"	6	FILL Grey F Sand, tr Silt, tr wood. 13.0'
		9 6 5 5	18"	7	FILL Red/br m-f Sand, and Grey m-f Sand tr Silt, with plastic bag at top 15.0'
	15				Bottom of Boring
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

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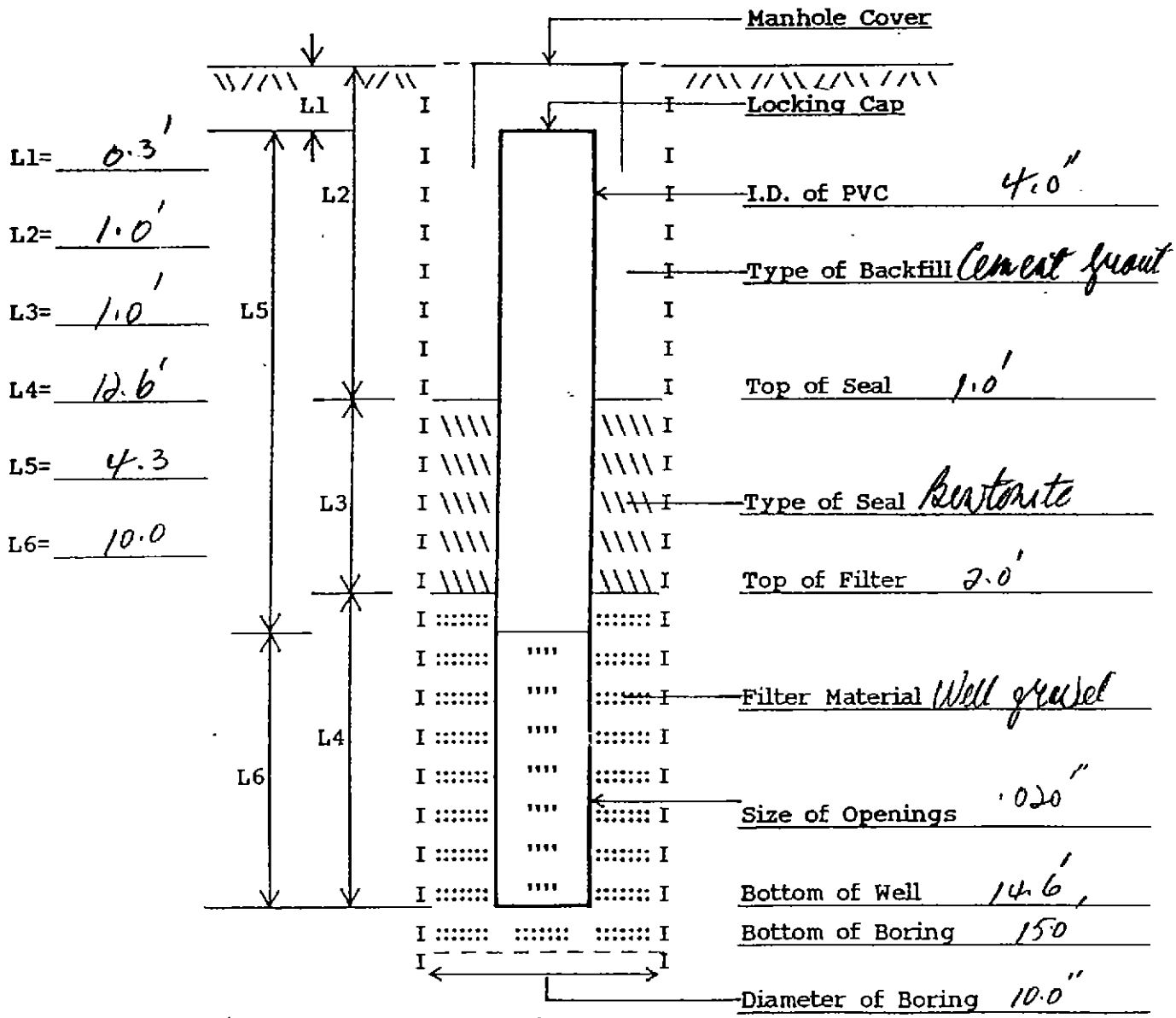
ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

Project: N.J. Marine Terminals - Triangle Property			Contract No.: 96-GW-001
Location: As laid out by consultant			Contractor: Craig
Driller: G Mc Neary		Inspector: R.M. Lebert	
Well No.: MW E01-2	Type of Well: Monitor A		Date: 2/2/94

Well Development

Date: 2/3/94	Water Level Before: 7.8	Water Level After: 7.8
Note: Water level readings from top of PVC	Taken 20 min. After Development	



Remarks: 14.6' to 15.0' back filled with well gravel.

Permit No. 2635642

PA 547
6-90

THE PORT AUTHORITY OF NY & NJ

Engineering Department
Construction Division
Materials Engineering Section

BORING REPORT

TANK E01 | SHEET 1 OF 4

PROJECT: N.J. Marine Terminal - Triangle Property	NAME OF CONTRACTOR: Lewis	BORING NO.: MW E01-3	SURFACE ELEV.:
LOCATION: As laid out by Consultant		CONTRACT NO.: 426-94-001	DATE: 2/1/94

SPOON	CASING SIZE	HOLE TYPE
3 "O.D. 2 3/8 "I.D.	Augers	Monitor "A"
HAMMER: 140 # FALL 30	HAMMER: — # FALL —	
DRILLER: G. McAvery		
INSPECTOR: R. M. Libert		

GROUND WATER LEVEL

Date	Time	Depth	Remarks
2/1/94	2:30 P	7.5	Water in sample #4

CASING BLOWS/FT.	DEPTH	SPOON BLOWS/6"	RE-[1] COV'D	SAMP.[2] NO.	[3]SAMPLE DESCRIPTION AND REMARKS LINE LOCATES CHANGE OF PROFILE
	0				Some spalled Asphalt and Concrete 0.0' 0.3' 1.5'
Hand Auger		Hand Auger	18"	1	Fill m-F Brown Sand and Silt, little gravel
		Hand Auger	24"	2	Fill Br Silt, tr m-F Sand, tr gravel 4.0'
	5	Hand Auger	24"	3	Misc Fill Br Silt, tr m-F Sand, tr brick, tr wood tr glass
		2 2 2 3	16"	4	Misc Fill Same 8.0'
4¼ Augers		8 9 6 5	11 10"	5	Fill Br m-F Sand, tr Silt 10.0'
	10	6 7 18 6	11"	6	Misc Fill grey Silt, tr m-F Br Sand, tr wood tr brick, tr cinder, tr Ash, tr glass 12.0'
10"		7 7 6 5	8"	7	Fill grey F Sand, tr Silt 14.0'
	15				
					Bottom of Boring
	20				
	25				

NOTES: 1 — Length recovered; 0" — Loss of Sample, T — Trap used
2 — U = undisturbed; A = auger; OER = open end rod; V = vane
3 — Log depth of change in color of wash water, loss of water, artesian water, sand heave in casing, etc.

ENGINEERING DEPARTMENT
MATERIALS ENGINEERING DIVISION
WELL INSTALLATION REPORT

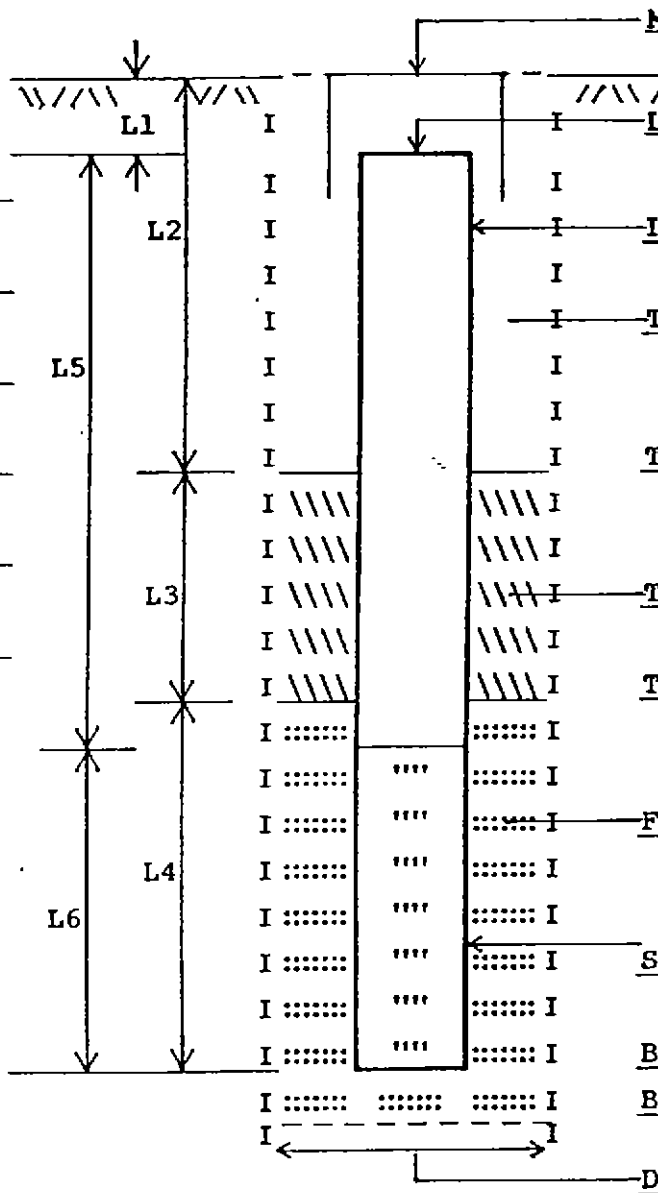
Sheet 2 of 4

Project: N.J. Marine Terminal - Triangle Property			Contract No.: 426-94-001
Location: As laid out by consultant			Contractor: Berg
Driller: G. McAneny		Inspector:	R. Hebert
Well No.: MWE01-3	Type of Well: "Monitor A"		Date: 2/1/94

Well Development

Date: 3/1/94	Water Level Before: 8.4	Water Level After: 8.4
Note: Water level readings from top of PVC	Taken 15	min. After Development

L1= 0.3'
L2= 1.5'
L3= 1.0'
L4= 11.5'
L5= 3.7'
L6= 10.0'



Manhole Cover
Locking Cap
I.D. of PVC 4.0"
Type of Backfill Cement grout
Top of Seal 1.5'
Type of Seal Bentonite
Top of Filter 2.5'
Filter Material Well graded
Size of Openings .020"
Bottom of Well 14.0'
Bottom of Boring 14.0
Diameter of Boring 10.0"

Remarks: Permit No. 2634643

Appendix D

APPENDIX D

ECOLOGICAL COMMUNITIES POTENTIALLY AFFECTED BY THE CLASS II-B GROUNDWATER RECLASSIFICATION

vegetated areas within the ditch. These species have adapted well to urban environments, and would remain unaffected by the proposed groundwater reclassification.

Reptiles and Amphibians

Some reptiles and amphibians may utilize the ditch, particularly towards its upper end where freshwater conditions are predominant. Since the direction of groundwater flow is toward the southern, brackish portion of the ditch, these species should remain largely unaffected by the proposed groundwater reclassification, regardless of existing groundwater quality.

Newark Bay

Potential ecological receptors associated with Newark Bay include wetland and mudflat habitats along the shores of the bay north and south of the Elizabeth and Newark Channels, marine benthic and open water habitats both within the channels and in the bay itself, and the species assemblages associated with these habitats that may be directly affected by degradation of surface water and sediment. The communities that are present within these habitats are well documented. A summary of these communities is presented below, based upon an extensive literature base of studies conducted within the area. Surveys of aquatic biota within Newark Bay have been conducted for Port Authority by Lawler, Matusky and Skelly (LMS) (1995) and others reviewed by LMS (e.g., Will and Houston 1988). These studies have characterized species assemblages within both shallow- and deep-water habitats, including fish, invertebrates, and other marine life. Additional studies include a literature review for the Port Authority prepared by Malcolm Pirnie (1995), a literature review of studies conducted in the nearby Arthur Kill prepared by IT Corporation (1991), and studies of regional dioxin effects on marine life such as the risk assessment conducted for the Port Authority by EA Engineering (1991). In addition, a letter sent by the National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service to LMS dated July 26, 1995 lists endangered/threatened species that have been documented in the New York Harbor region, which would be used in evaluating effects to surface water receptors (Attachment D-1).

The primary ecological communities of concern are associated with open water areas of Newark Bay located immediately adjacent to Ports Newark and Elizabeth. These open water areas provide habitat for a variety of fish and wildlife species that utilize the vicinity of the site. Studies of existing biota were recently summarized in the Draft Environmental Impact Statement (EIS) for Newark Bay Confined Disposal Facility, prepared by the U.S. Army Corps of Engineers (USACE) New York District in 1997, upon which the discussion below is largely based.

It should be noted that the fish species noted within each study varied highly with the sampling method used. For example, prior studies (Will and Houston, 1989) of fish distribution in Newark Bay found that 91% of the fish caught in seine nets were Atlantic menhaden, with striped bass and Atlantic tomcod comprising most of the remaining individuals. However, Atlantic tomcod, bay anchovy, and winter flounder collectively accounted for 88% of the trawl catch. Since the trawling studies underestimated the numbers of fish inhabiting shallow areas, other studies were considered in developing a species list for the vicinity of the proposed reclassification area. These included studies conducted at local power plants and other facilities where impingement and entrapment of smaller species occur that may be missed using conventional collection techniques.

Studies conducted in Newark Bay within the immediate vicinity of the proposed reclassification area (Hecht, 1995) found marked differences in species composition between shallow water versus dredged channel areas. Striped bass and blue crabs were found to be abundant in the flat, shallow areas in spring and early summer surveys, although summer and winter flounder as well as other species were recorded in smaller numbers. While fish were nearly absent from these shoal areas in the winter, the deeper dredged channel areas were used year-round. The winter fish community in the channel areas was dominated by striped bass and white perch. Will and Houston (1989) noted that most species were more common in the deeper channel areas, but that bay anchovy was more common in the shallows, and blueback herring was limited exclusively to the shallows. Will and Houston (1989) also suggested that the bay is an important nursery ground for some species. This point is supported by studies in Newark Bay finding a large number of smaller-sized individuals of the dominant species (USACE 1996). Within the area of Newark Bay immediately adjacent to the proposed reclassification area, the deeper water areas consist of the two channels at Ports Newark and Elizabeth, which are approximately 31-33 feet deep, while shallow water areas less than 2 feet deep exist immediately east of the shoreline areas outside of the channels.

None of the species previously recorded from Newark Bay are listed as federally endangered or threatened. While the short-nosed sturgeon is listed as endangered, it has not been found in Newark Bay.

Newark Bay Wildlife

A comprehensive review of wildlife species known to use or potentially use Newark Bay has been compiled for the USACE Draft EIS for the Newark Bay Confined Disposal Facility. Over 227 species of mammals, birds, reptiles, and amphibians have been identified in the Newark Bay area (Attachment D-4). However, proposed reclassification of the aquifer below Ports Newark and Elizabeth would potentially impact primarily aquatic species associated with Newark Bay. This is because nearly all of the terrestrial habitat within the proposed reclassification area has been developed, and the freshwater wetland areas have been largely filled. The Peripheral Ditch provides some limited habitat for wetland wildlife such as ducks, shorebirds, wading birds, and

affected are those using the area on an occasional or seasonal basis, such as wintering sea ducks or migratory waterfowl.

Marine Mammals

Both the harbor seal and harbor porpoise have been reported as uncommon visitors to Newark Bay (USACE 1997). Otherwise, the possibility of marine mammals entering the bay is remote.

Marine Turtles

Three species of marine turtles are known to inhabit the New York/New Jersey Harbor Estuary: the loggerhead sea turtle, Kemp's ridley sea turtle, and the green turtle. All of these species use the area on a seasonal basis (May to November), and none nest as far north as Newark Bay (USACE 1997). Marine turtles primarily feed on estuarine invertebrates such as blue crabs and molluscs, but are considered uncommon visitors to Newark Bay.

10. Killam Associates, Inc. April 1995. Environmental Document Report, North Avenue East Improvements Project. City of Elizabeth, NJ.

11. Lawler, Matusky and Skelly, June 15, 1995. Memorandum to Jack Hecht and Susan Metzger, "Newark Bay, Port Authority NY/NJ Information and Results of April/May 1995 Surveys".

12. Malcolm Pirnie, Inc. November 1995. Literature Review and Environmental Practicability Analysis for Construction of a Containment Island in the NY/NJ Harbor Region.

13. Memorandum from John Bullard to E. Knoesel and R. Pruno. September 18, 1995 Re: Newark Bay Combined Disposal Facility (CDF) Additional Metals Testing.

14. Memorandum from John Bullard to E. Knoesel, R. Pruno and M. Masters. October 23, 1995. Re: Port Newark Reach - Dioxin.

15. Memorandum from Joseph DiSorbo to Thomas Wakeman. June 15, 1995. Re: Newark Bay Confined Disposal Facility (sediment toxicity testing results).

16. National Oceanic and Atmospheric Administration. 1995. Magnitude and Extent of Sediment Toxicity in the Hudson-Raritan Estuary.

17. New York City Department of Environmental Protection. 1993. New York Harbor Water Quality Survey (and Appendices).

18. Ney, R.E. 1995. Fate and Transport of Organic Chemicals in the Environment. Government Institutes, Inc. Rockville, MD. 299 pp.

19. Port Authority of New York and New Jersey, April 1995. Environmental Baseline Investigation, Berths 30 and 32, Upland. Port Newark, NJ.

20. Science Applications International Corporation (SAIC), 1993. Toxic Assessment of New York/New Jersey Harbor Ambient Waters. Final Report. Submitted to Office of Water Enforcement and Compliance, US Environmental Protection Agency.

21. Squibb, K.S., J.M. O'Connor, and T.J. Kneip. 1991. New York/New Jersey Harbor Estuary Program. Module 3.1: Toxics Characterization Report. Prepared by Institute of Environmental Medicine, New York University Medical Center, for US EPA Region II, New York City. 188 pp.

ATTACHMENT D-1
TABLE 3.08-2

Benthic Fauna Identified In Newark Bay

1993-1994

CNIDARIA
- *Anthozoa*

RHYNCHOCOELA
- *Rhynchocoela*

POLYCHAETA
- *Lepidonotus squamatus*
- *Lepidonotus sublevis*
- *Hypereteone heteropoda*
- *Hypereteone foliosa*
- *Paranaitis speciosa*
- *Eumida sanguinea*
- *Podarkeopsis levifuscina*
- *Microphthalmus sczelkowii*
- *Proceraea cornuta*
- *Streptosyllis pettiboneae*
- Nereididae
- *Neanthes succinea*
- *Nephtys incisa*
- *Glycera spp.*
- *Glycera americana*
- *Leitoscoloplos* sp.
- *Leitoscoloplos robustus* *
- *Polydora spp.*
- *Polydora cornuta* *
- *Spio setosa*
- *Pygospio elegans*
- *Streblospio benedicti* *
- *Marenzelleria viridis*
- *Tharyx sp. A* *
- *Heteromastus filiformis*
- *Mediomastus ambiseta* *
- *Sabellaria vulgaris* *
- *Pectinaria gouldii*
- Ampharetidae
- *Asabellides oculata*
- *Sabellidae*
- *Polychaete fragments*

OLIGOCHAETA
- Oligochaeta *

MOLLUSCA
- Gastropoda
- *Epitonium sp.*
- *Odostomia* sp. *
- *Rictaxis punctostriatus*
- *Cylichnella bidentata*
- *Doradella obscura*
- *Mytilus edulis*
- *Mulinia lateralis* *
- *Ensis directus*
- *Macoma balthica*
- *Tellina agilis*
- *Mya arenaria* *
- *Barnea truncata*
- Bivalve siphons

CRUSTACEA
- *Balanus improvisus*
- *Neomysis americana*
- *Leucon americanus* *
- *Oxyurostylis smithi*
- *Cyathura polita*
- *Sphaeroma quadridentata*
- *Edotea triloba*
- *Ampelisca* spp.
- *Ampelisca abdita*
- *Microdeutopus* spp.
- *Microdeutopus gryllotalpa*
- *Corophium* spp.
- *Corophium acutum*
- *Unciola serrata*
- *Elasmopus laevis*
- *Melita nitida*
- *Monoculodes* sp. I
- *Parapleustes aestuarius*
- *Paracaprella tenuis*
- *Crangon septemspinosa*
- *Cancer irroratus*
- Xanthidae
- *Rhithropanopeus harrisii*

INSECTA
- Chironomidae

ECHINODERMATA
- Asteroidea
- Echinoidea

ASCIDIACEA
- Molgula manhattensis

*Dominant taxon

ATTACHMENT D-3

Table 3.06-8 (Page 1 of 14)

Fish Species Collected in Newark Bay and Adjacent Waters[a]

Family Genus Species	Common Name	A 1972-73	B 1972-73	C 1972	D 1984-85	E 1987-88	F 1987-88	G 1987-88	H 1988
Carcharhinidae	**Requiem sharks**								
Mustelus canis	Smooth dogfish					X			
Rajidae	**Skates**								
Raja erinacea	Little skate								
Acipenseridae	**Sturgeons**								
Acipenser oxyrhynchus	Atlantic sturgeon		X						
Anguillidae	**Freshwater Eels**								
Anguilla rostrata	American eel	X	X		X	X	X	X	X
Ophichthidae	**Snake eels**								
Myrophis punctatus	Speckled worm eel								
Congridae	**Conger Eels**								
Conger oceanicus	Conger eel					X			
Clupeidae	**Herrings**								
Alosa aestivalis	Blueback herring	X	X			X	X	X	
Alosa pseudoharengus	Alewife	X	X		X	X	X	X	X
Alosa sapidissima	American shad	X	X		X	X	X	X	X
Alosa mediocris	Hickory shad					X	X	X	
Brevoortia tyrannus	Atlantic menhaden			X		X	X		
Clupea harengus	Atlantic herring					X	X		
Dorosoma cepedianum	Gizzard shad					X	X	X	
Engraulidae	**Anchovies**								
Anchoa mitchilli	Bay anchovy	X	X	X	X	X	X	X	X
Anchoa hepsetus	Striped anchovy					X		X	
Cyprinidae	**Carps & Minnows**								
Carassius auratus	Goldfish	X				X	X		
Notropis amoenus	Comely shiner								
Cyprinus carpio	Carp					X			

ATTACHMENT D-3 (CONTINUED)

Fish Species Collected in Newark Bay and Adjacent Waters[a]

Family Genus Species	Common Name	A 1972-73	B 1972-73	C 1972	D 1984-85	E 1987-88	F 1987-88	G 1987-88	H 1988
Belonidae	**Needlefishes**								
Strongylura marina	Atlantic needlefish		X						
Cyprinodontidae	**Killifishes**								
Fundulus heteroclitus	Mummichog	X	X	X	X			X	X
Fundulus majalis	Striped killifish					X	X	X	X
Fundulus diaphanus	Banded killifish								
Atherinidae	**Silversides**								
Menidia peninsulae	Tidewater silverside	X	X	X		X	X		
Menidia menidia	Atlantic silverside								
Membras martinica	Rough silverside								
Gasterosteidae	**Sticklebacks**								
Gasterosteus aculeatus	Threespine stickleback	X	X			X	X		
Apeltes quadracus	Fourspine stickleback								
Syngnathidae	**Pipefishes**								
Hippocampus erectus	Lined seahorse	X	X					X	
Syngnathus fuscus	Northern pipefish	X	X	X	X	X	X	X	X
Triglidae	**Searobins**								
Prionotus carolinus	Northern searobin	X	X			X	X	X	
Prionotus evolans	Striped searobin		X		X	X	X	X	X
Cottidae	**Sculpins**								
Myoxocephalus aenaeus	Grubby	X			X	X	X	X	
Myoxocephalus octodecemspinosus	Longhorn sculpin					X	X		
Percichthyidae	**Temperate Basses**								
Morone americana	White perch	X	X			X	X		
Morone saxatilis	Striped bass	X	X	X	X	X	X		
Serranidae	**Sea Basses**								
Centropristis striata	Black sea bass		X			X	X		

Fish Species Collected in Newark Bay and Adjacent Waters[a]

ATTACHMENT D-3 (CONTINUED)

Family Genus Species	Common Name	A 1972-73	B 1972-73	C 1972	D 1984-85	E 1987-88	F 1987-88	G 1987-88	H 1988
Sciaenidae (Continued)	**Drums (Continued)**								
Menticirrhus saxatilis	Northern kingfish								
Bairdiella chrysoura	Silver perch								
Micropogon undulatus	Atlantic croaker						X		
Chaetodontidae	**Butterflyfishes**								
Chaetodon ocellatus	Spotfin butterflyfish								
Mugilidae	**Mullets**								
Mugil cephalus	Striped mullet					X	X		
Mugil curema	White mullet					X	X		
Sphyraenidae	**Barracudas**								
Sphyraena borealis	Northern sennet								
Labridae	**Wrasses**								
Tautoga onitis	Tautog		X			X	X		
Tautogolabrus adspersus	Cunner	X				X	X		
Pholidae	**Gunnels**								
Pholis gunnellus	Rock gunnel					X			
Uranoscopidae	**Stargazers**								
Astroscopus guttatus	Northern stargazer								
Blenniidae	**Combtooth Blennies**								
Hypsoblennius hentz	Feather blenny								
Ammodytidae	**Sand Lances**								
Ammodytes americanus	American sand lance					X			
Gobiidae	**Gobies**								
Gobiosoma bosci	Naked goby	X	X	X		X			
Gobiosoma ginsburghi	Seaboard goby	X		X		X			
Scombridae	**Mackerels**								
Scomberomorus maculatus	Spanish mackerel								

ATTACHMENT D-3 (CONTINUED)

Fish Species Collected in Newark Bay and Adjacent Waters[a]

Family Genus Species	Common Name	I 1988-89	J 1988-89	K 1988-89	L 1991-92	M 1993-94	N 1994	O 1995-96
Carcharhinidae	**Requiem sharks**							
Mustelus canis	Smooth dogfish							
Rajidae	**Skates**							
Raja erinacea	Little skate				X	X		
Acipenseridae	**Sturgeons**							
Acipenser oxyrhyncus	Atlantic sturgeon					X		
Anguillidae	**Freshwater Eels**							
Anguilla rostrata	American eel	X	X	X	X	X	X	
Ophichthidae	**Snake eels**							
Myrophis punctatus	Speckled worm eel				X			
Congridae	**Conger Eels**							
Conger oceanicus	Conger eel	X			X	X		
Clupeidae	**Herrings**							
Alosa aestivalis	Blueback herring	X	X	X	X	X		X
Alosa pseudoharengus	Alewife	X	X	X	X	X	X	X
Alosa sapidissima	American shad	X	X	X	X	X	X	X
Alosa mediocris	Hickory shad				X		X	
Brevoortia tyrannus	Atlantic menhaden	X	X	X	X	X		
Clupea harengus	Atlantic herring	X	X	X		X		X
Dorosoma cepedianum	Gizzard shad	X	X	X	X	X		X
Engraulidae	**Anchovies**							
Anchoa mitchilli	Bay anchovy	X	X	X	X	X	X	X
Anchoa hepsetus	Striped anchovy	X	X	X				X
Cyprinidae	**Carps & Minnows**							
Carassius auratus	Goldfish							
Notropis amoenus	Comely shiner	X	X					
Cyprinus carpio	Carp							

Fish Species Collected in Newark Bay and Adjacent Waters[a]

ATTACHMENT D-3 (CONTINUED)

Family Genus Species	Common Name	I 1988-89	J 1988-89	K 1988-89	L 1991-92	M 1993-94	N 1994	O 1995-96
Belonidae	**Needlefishes**							
Strongylura marina	Atlantic needlefish	X	X		X			
Cyprinodontidae	**Killifishes**							
Fundulus heteroclitus	Mummichog				X		X	
Fundulus majalis	Striped killifish	X	X	X	X	X	X	
Fundulus diaphanus	Banded killifish				X			
Atherinidae	**Silversides**							
Menidia peninsulae	Tidewater silverside				X			
Menidia menidia	Atlantic silverside	X	X	X		X		X
Membras martinica	Rough silverside	X						
Gasterosteidae	**Sticklebacks**							
Gasterosteus aculeatus	Threespine stickleback	X	X	X	X	X		
Apeltes quadracus	Fourspine stickleback	X			X			
Syngnathidae	**Pipefishes**							
Hippocampus erectus	Lined seahorse				X	X		
Syngnathus fuscus	Northern pipefish	X	X	X	X		X	X
Triglidae	**Searobins**							
Prionotus carolinus	Northern searobin	X	X	X	X			
Prionotus evolans	Striped searobin	X	X	X	X			
Cottidae	**Sculpins**							
Myoxocephalus aeneus	Grubby	X	X	X	X		X	X
Myoxocephalus octodecemspinosus	Longhorn sculpin							
Percichthyidae	**Temperate Basses**							
Morone americana	White perch	X	X	X	X	X	X	X
Morone saxatilis	Striped bass	X	X	X	X	X	X	X
Serranidae	**Sea Basses**							
Centropristis striata	Black sea bass	X	X	X	X			

Fish Species Collected in Newark Bay and Adjacent Waters[a]

ATTACHMENT D-3 (CONTINUED)

Family Genus Species	Common Name	I 1988-89	J 1988-89	K 1988-89	L 1991-92	M 1993-94	N 1994	O 1995-96
Sciaenidae (Continued)	**Drums (Continued)**							
Menticirrhus saxatilis	Northern kingfish	X	X	X	X	X		X
Bairdiella chrysoura	Silver perch		X		X	X		
Micropogon undulatus	Atlantic croaker							X
Chaetodontidae	**Butterflyfishes**							
Chaetodon ocellatus	Spotfin butterflyfish	X	X	X	X			
Mugilidae	**Mullets**							
Mugil cephalus	Striped mullet	X		X	X			
Mugil curema	White mullet	X	X					
Sphyraenidae	**Barracudas**							
Sphyraena borealis	Northern sennet	X	X					
Labridae	**Wrasses**							
Tautoga onitis	Tautog	X	X	X	X	X	X	
Tautogolabrus adspersus	Cunner	X	X	X	X	X	X	X
Pholidae	**Gunnels**							
Pholis gunnellus	Rock gunnel	X	X		X	X	[b]	
Uranoscopidae	**Stargazers**							
Astroscopus guttatus	Northern stargazer	X			X			
Blennidae	**Combtooth Blennies**							
Hypsoblennius hentz	Feather blenny	X	X		X			
Ammodytidae	**Sand Launces**							
Ammodytes americanus	American sand launce	X			X		X	
Gobiidae	**Gobies**							
Gobiosoma bosci	Naked goby				X			
Gobiosoma ginsburghi	Seaboard goby				X			
Scombridae	**Mackerels**							
Scomberomorus maculatus	Spanish mackerel	X	X	X	X			

Table 3.06-8 (Page 13 of 14)

Fish Species Collected in Newark Bay and Adjacent Waters[a]

ATTACHMENT D-3 (CONTINUED)

ITEM No.	STUDY LOCATION	REFERENCE
A	Linden Generating Station	Ichthyological Associates (IA). 1979. Demonstration for Section 316(b) of the Federal Water Pollution Control Act Amendments of 1972, PL92-500, Linden Generating Station. Report to: Public Service Electric & Gas Company, New Jersey.
B	Sewaren Generating Station	Ichthyological Associates (IA). 1979. Demonstration for Section 316(b) of the Federal Water Pollution Control Act Amendments of 1972, PL92-500, Sewaren Generating Station. Report to: Public Service Electric & Gas Company, New Jersey.
C	Arthur Kill Generating Station	Lawler, Matusky & Skelly Engineers (LMS). 1975. Arthur Kill Generating Station Study, Section 316(a) Demonstration. Prepared for Consolidated Edison Company of New York, Inc.
D	Newark Bay and Kill Van Kull	U.S. Army Corps of Engineers (USACE). 1987b. Feasibility Report, Navigation Study on Improvements to Existing Navigation Channel. Technical Appendices.
E	Hackensack River	EA Engineering, Science and Technology (EA). 1988. Hudson Generating Station Units 1 and 2. Supplemental 316(b) Report. Prepared for Public Service Electric & Gas Company.
F	Hudson Generating Station	EA Engineering, Science and Technology (EA). 1988. Hudson Generating Station Units 1 and 2. Supplemental 316(b) Report. Prepared for Public Service Electric & Gas Company.
G	Newark Bay	Will, R., and L.J. Houston. 1992. Fish Distribution Survey of Newark Bay, May 1987-April 1988. *In*: Estuarine Research in the 1980s (Edited by C. Lavett Smith). The Hudson River Environmental Society, Seventh Annual Symposium on Hudson River Ecology.
H	Arthur Kill and Old Place Creek	Louis Berger & Associates, Inc. (LBA). 1992. Staten Island Bridges Program Environmental Report. Submittal to the Port Authority of New York/New Jersey.
I	Arthur Kill	EA Engineering, Science and Technology. 1989. Sewaren Generating Station, Units 1 through 4 Supplemental 316(b) Report. Report to Public Service Electric & Gas Company.
J	Sewaren Generating Station	EA Engineering, Science and Technology. 1989. Sewaren Generating Station, Units 1 through 4 Supplemental 316(b) Report. Report to Public Service Electric & Gas Company.
K	Linden Generating Station	EA Engineering, Science and Technology. 1989. Linden Generating Station Supplemental 316(b) Report. Report to Public Service Electric & Gas Company.

ATTACHMENT D-4

Table 3.07-1 (Page 1 of 6)

Wildlife Species Likely to Use the Newark Bay Area as Identified During Studies in the NY/NJ Harbor Area

		Upland, Marine and Adjacent Shoreline Sites					Marine and Adjacent Shoreline Sites Hudson River Waterfront LMS Unpublished			Marine and Open Water Sites Pany/NJ Newark Bay
Common Name	Scientific Name	USCG 1998	Harbor Herons Report (1990) Individuals	Andrle and Carroll (1988) Breeding Birds	Aquila and Alderson (1994) Overwintering Birds	Liberty State Park TI (1976)	LMS (1984 a)	LMS (1984 b)	LMS (1984 c)	LMS (1996b)
Mammals										
Virginia opossum	*Didelphis virginiana*	x	x							
Eastern mole	*Scalopus aquaticus*		x							
Unidentified bat	*Unidentified bat*	x	x							
Red bat	*Lasiurus borealis*		x							
Hoary bat	*Lasiurus cinereus*		x							
Little brown bat	*Myotis lucifugus*		x							
Eastern cottontail	*Sylvilagus floridanus*	x	x							
Grey squirrel	*Sciurus carolinensis*	x	x							
White-footed mouse	*Peromyscus leucopus*	x								
Meadow vole	*Microtus pennsylvanicus*	x	x							
Muskrat	*Ondatra zibethica*	x	x							
Norway rat	*Rattus norvegicus*	x	x							
House mouse	*Mus musculus*	x								
Raccoon	*Procyon lotor*	x	x							
White-tailed deer	*Odocoileus virginianus*	x								
Number of species		11	12	Not Applicable	Not Applicable					
Birds										
Common loon	*Gavia immer*				x	x				
Red-throated loon	*Gavia stellata*				x	x				
Pied-billed grebe	*Podilymbus podiceps*	x	x	x	x	x				x
Horned grebe	*Podiceps auritus*				x	x				
Great cormorant	*Phalacrocorax carbo*				x					x
Double-crested cormorant	*Phalacrocorax auritus*	x	x		x	x	x	x	x	x
Great blue heron	*Ardea herodias*	x	x		x	x	x		x	
Green heron	*Butorides virescens*	x	x	x		x	x		x	
Little blue heron	*Egretta caerulea*		x	x						
Cattle egret	*Bulbucus ibis*		x	x						
Great egret	*Ardea alba*	x	x	x						
Snowy egret	*Egretta thula*	x	x	x		x	x			
Black-crowned night heron	*Nycticorax nycticorax*	x	x	x	x	x	x		x	
Yellow-crowned night heron	*Nycticorax violacea*	x	x							
Least bittern	*Ixobrychus exilis*		x	x						
American bittern	*Botaurus lentiginosus*		x	x						
Glossy ibis	*Plegadis falcinellus*	x	x	x		x				
Louisiana heron	*Hydranassa tricolor*		x							
White-faced ibis	*Plegadis chihi*		x							
Brant goose	*Branta bernicle*		x		x	x	x			x
Snow goose	*Chen caerulescens*					x				
Canada goose	*Branta canadensis*	x	x	x	x	x	x		x	x
Mallard	*Anas platyrhynchos*	x	x	x	x	x	x	x	x	x
Black duck	*Anas rubripes*	x	x	x	x	x	x	x	x	x
Gadwall	*Anas strepera*	x	x	x	x	x	x	x	x	x
Northern pintail	*Anas acuta*		x			x				

ATTACHMENT D-4 (CONTINUED)

Table 3.07-1 (Page 3 of 6)

Wildlife Species Likely to Use the Newark Bay Area as Identified During Studies in the NY/NJ Harbor Area

Common Name	Scientific Name	Upland, Marine and Adjacent Shoreline Sites					Marine and Adjacent Shoreline Sites Hudson River Waterfront LMS Unpublished			Marine and Open Water Sites Perry/NJ Newark Bay
		USCG (1995)	Harbor Herons Report (1990) Individuals	Andrle and Carroll (1988) Breeding Birds	Aquila and Alderson (1994) Overwintering Birds	Liberty State Park TI (1976)	LMS (1984 a)	LMS (1984 b)	LMS (1984 c)	LMS (1996b)
Birds										
Purple sandpiper	*Calidris maritima*				x	x				
Greater yellowlegs	*Tringa melanoleuca*	x	x			x				
Lesser yellowlegs	*Tringa flavipes*	x	x							
Pectoral sandpiper	*Calidris melanotos*	x	x							
Least sandpiper	*Calidris minutilla*	x				x	x		x	
Dunlin	*Calidris alpina*				x	x				
Short-billed dowitcher	*Limnodromus griseus*									
Stilt sandpiper	*Micropalama himantopus*									
Semipalmated sandpiper	*Calidris pusilla*	x	x			x				
Black-bellied plover	*Pluvialis squatarola*		x							
Red knot	*Calidris canutus*		x							
Sanderling	*Calidris alba*		x		x					
Dowitcher sp	*Limnodromus sp*		x							
Wilson's phalarope	*Steganopus tricolor*		x							
Great black-backed gull	*Larus marinus*	x	x	x		x	x	x	x	x
Herring gull	*Larus argentatus*	x	x	x	x	x	x	x	x	x
Ring-billed gull	*Larus delawarensis*	x	x		x	x	x	x	x	x
Laughing gull	*Larus atricilla*	x	x	x		x	x	x	x	x
Bonaparte's gull	*Larus philadelphia*		x		x	x	x		x	
Common tern	*Sterna hirundo*		x			x			x	
Roseate tern	*Sterna dougallii*		x							
Least tern	*Sterna antillarum*		x			x			x	
Arctic tern	*Sterna paradisaea*								x	
Black skimmer	*Rynchops niger*		x			x				
Rock dove	*Columba livia*	x	x	x	x	x	x	x	x	x
Mourning dove	*Zenaida macroura*	x	x	x	x	x	x	x	x	
Yellow-billed cuckoo	*Coccyzus americanus*	x		x						
Common barn-owl	*Tyto alba*	x	x	x						
Screech-owl	*Otus asio*		x		x					
Great horned owl	*Bubo virginianus*		x		x					
Snowy owl	*Nyctea scandiaca*		x							
Short-eared owl	*Asio flammeus*		x		x	x				
Ruby-throated hummingbird	*Archilochus colubris*		x							
Chimney swift	*Chaetura pelagica*	x		x		x				
Belted kingfisher	*Ceryle alcyon*	x	x		x	x	x		x	
Northern flicker	*Colaptes auratus luteus*	x	x	x	x	x				
Red-bellied woodpecker	*Melanerpes carolinus*				x					
Yellow-bellied sapsucker	*Sphyrapicus varius varius*				x					
Hairy woodpecker	*Dendrocopus villosus*	x	x	x	x					
Downy woodpecker	*Dendrocopus pubescens*	x		x	x					
Eastern kingbird	*Tyrannus tyrannus*	x	x	x						
Flycatcher sp	*Empidonax sp*	x	x							
Great crested flycatcher	*Myiarchus crinitus*	x	x							
Eastern phoebe	*Sayornis phoebe*	x				x				
Eastern wood-pewee	*Contopus virens*	x	x	x						

ATTACHMENT D-4 (CONTINUED)

Table 3.07-1 (Page 5 of 6)

Wildlife Species Likely to Use the Newark Bay Area as Identified During Studies in the NY/NJ Harbor Area

		Upland, Marine and Adjacent Shoreline Sites					Marine and Adjacent Shoreline Sites			Marine and
							Hudson River Waterfront			Open Water Sites
				Andrle and Carroll	Aquila and Alderson		LMS Unpublished			Pany/NJ Newark Bay
Common Name	Scientific Name	USCG (1995)	Harbor Herons Report (1990) Individuals	(1988) Breeding Birds	(1994) Overwintering Birds	Liberty State Park TI (1979)	LMS (1984 a)	LMS (1984 b)	LMS (1984 c)	LMS (1998b)
Birds										
Blackpoll warbler	*Dendroica striata*	x								
Pine warbler	*Dendroica pinus*	x								
Prairie warbler	*Dendroica discolor*									
Palm warbler	*Dendroica palmarum*	x								
Ovenbird	*Seiurus aurocapillus*	x		x						
Common yellowthroat	*Geothlypis trichas*	x	x	x		x				
American redstart	*Setophaga ruticilla*	x	x							
Connecticut warbler	*Oporornis agilis*		x							
Blue-winged warbler	*Vermivora pinus*		x							
House sparrow	*Passer domesticus*	x	x	x		x	x	x		
Bobolink	*Dolichonyx oryzivorus*		x							
Eastern meadowlark	*Sturnella magna*	x								
Red-winged blackbird	*Agelaius phoeniceus*	x	x	x	x	x				
Orchard oriole	*Icterus spurius*									
Northern oriole	*Icterus galbula*	x	x			x				
Boat-tailed grackle	*Quiscalus major*									
Common grackle	*Quiscalus quiscula*	x	x	x		x	x	x	x	
Brown-headed cowbird	*Molothrus ater*	x		x	x	x				
Scarlet tanager	*Piranga olivacea*	x								
Boat-tailed grackle	*Quiscalus major*									
Northern cardinal	*Cardinalis cardinalis*	x	x	x	x					
Rose-breasted grosbeak	*Pheucticus ludovicianus*	x								
Indigo bunting	*Passerina cyanea*	x		x		x				
Purple finch	*Carpodacus purpureus*									
House finch	*Carpodacus mexicanus*	x		x	x	x				
Common redpoll	*Carduelis flammea*		x							
American goldfinch	*Spinus carduelis tristis*	x	x	x	x	x				
Rufous-sided towhee	*Pipilo erythrophthalmus*	x	x	x	x	x				
Savannah sparrow	*Passerculus sandwichensis*	x				x				
Dark-eyed junco	*Junco hyemalis*				x	x				
American tree sparrow	*Spizella arborea*	x	x		x	x				
Chipping sparrow	*Spizella passerina*									
Field sparrow	*Spizella pusilla*	x			x	x				
White-crowned sparrow	*Zonotrichia leucophrys*	x			x					
White-throated sparrow	*Zonotrichia albicollis*	x	x		x	x				
Seaside sparrow	*Ammodramus caudacutus*									
Sharp-tailed sparrow	*Ammospiza maritimus*		x							
Fox sparrow	*Passerella iliaca*				x					
Lincoln's sparrow	*Melospiza lincolnii*	x								
Swamp sparrow	*Melospiza georgiana*	x	x	x	x	x				
Song sparrow	*Melospiza melodia*	x	x	x	x	x				
Snow bunting	*Plectrophenax nivalis*				x	x				
House sparrow		x	x							
Number of species.		117	124	72	83	98	45	18	36	20

Table 3.07-2

Confirmed, Probable, and Possible Wildlife Species Using The Newark Bay Shoal Areas

Common Name	Scientific Name	Status	Season	Habitat
Mammals				
Eastern pipistrelle	*Pipistrellus subflavus*	Possible	Spring to fall	Aerial - over land and water
Big brown bat	*Eptesicus fuscus*	Possible	Spring to fall	Aerial - over land and water
Red bat	*Lasiurus borealis*	Possible	Spring to fall	Aerial - over land and water
Hoary bat	*Lasiurus cinereus*	Possible	Spring to fall	Aerial - over land and water
Evening bat	*Nycticeius humeralis*	possible	Spring to fall	Aerial - over land and water
Silver-haired bat	*Lasionycteris noctivagans*	Possible	Spring to fall	Aerial - over land and water
Small-footed bat	*Myotis leibii*	Possible	Spring to fall	Aerial - over land and water
Little brown bat	*Myotis lucifugus*	Possible	Spring to fall	Aerial - over land and water
Northern long eared bat	*Myotis septentrionalis*	Possible	Spring to fall	Aerial - over land and water
Muskrat	*Ondatra zibethica*	Possible	Spring to fall	Marsh - wetland, riverine, small bays and creeks
Harbor seal	*Phoca vitulina*	Possible	All year	Marine bays, channels and coastal waters
Birds				
Common loon	*Gavia immer*	Possible	Late fall - early spring	Open water
Red-throated loon	*Gavia stellata*	Possible	Late fall - early spring	Open water
Pied-billed grebe	*Podilymbus podiceps*	Possible	Late fall - early spring	Open water
Great cormorant	*Phalacrocorax carbo*	Probable	Winter	Open water
Double-crested cormorant	*Phalacrocorax auritus*	Confirmed	All year	Open water
Great blue heron	*Ardea herodias*	Probable	All year	Marshes - shallow water
Green heron	*Butorides virescens*	Possible	All year	Marshes - shallow water
Great egret	*Ardea albus*	Probable	Summer	Marshes - shallow water
Snowy egret	*Egretta thula*	Possible	Summer	Marshes - shallow water
Black-crowned night heron	*Nycticorax nycticorax*	Possible	Summer	Marshes - shallow water
Yellow-crowned night heron	*Nyctcorax violacea*	Possible	Summer	Marshes - shallow water
Glossy ibis	*Plegadis falcinellus*	Possible	Summer	Marshes - shallow water
Brant goose	*Branta bernicla*	Probable	Winter	Marshes - shallow water
Snow goose	*Chen caerulescens*	Possible	Winter	Marshes and adjacent open water
Canada goose	*Branta canadensis*	Confirmed	All year	Marshes and adjacent open water
Mallard	*Anas platyrhynchos*	Confirmed	All year	Marshes and adjacent open water
Black duck	*Anas rubripes*	Confirmed	All year	Marshes and adjacent open water
Gadwall	*Anas strepera*	Confirmed	All year	Marshes and adjacent open water
Northern pintail	*Anas acuta*	Possible	Fall and early winter	Open water
Ruddy duck	*Oxyura jamaicensis*	Probable	Fall and early winter	Open water
Canvasback	*Aythya valisineria*	Confirmed	Late fall - early winter	Open water
Lesser scaup	*Aythya affinis*	Probable	Late fall - early winter	Open water
Greater scaup	*Aythya marila*	Probable	Late fall - early winter	Open water
Common goldeneye	*Bucephala clangula*	Probable	Late fall - early winter	Open water
Green-winged teal	*Anas crecca*	Probable	Late fall - early spring	Marshes - open water
Blue-winged teal	*Anas discors*	Probable	All year	Marshes - open water
American wigeon	*Anas americana*	Confirmed	Late fall - early spring	Marshes - open water
Northern shoveler	*Anas clypeata*	Possible	Late fall - early spring	Marshes - open water
Redhead	*Aythe americana*	Possible	Late fall - early spring	Open water
Ring-necked duck	*Aythe collaris*	Possible	Late fall - early spring	Marshes - open water
Bufflehead	*Bucephala albeola*	Confirmed	Late fall - early spring	Open water
White-winged scoter	*Melanitta deglandi*	Possible	Late fall - early spring	Open water
Oldsquaw	*Clangula hyemalis*	Possible	Late fall - early spring	Open water
Hooded merganser	*Lophodytes mergus*	Probable	Late fall - early spring	Open water
Common merganser	*Mergus merganser*	Probable	Late fall - early spring	Open water
Red-breasted merganser	*Mergus serrator*	Confirmed	Late fall - early spring	Open water
Red-tailed hawk	*Buteo jamaicensis*	Possible	All year	Upland
Northern harrier	*Circus cyaneus*	Possible	All year	Marshes
Osprey	*Pandion haliaetus*	Possible	Summer	Over open water
Peregrine falcon	*Falco peregrinus*	Probable	All year	Over water and land
Merlin	*Falco columbarius*	Possible	Winter	Over water and land
American kestrel	*Falco sparverius*	Possible	All year	Over land
American coot	*Fulica americana*	Possible	Summer	Marshes, tidal creeks and open water
Great black-backed gull	*Larus marinus*	Confirmed	All year	Open water
Herring gull	*Larus argentatus*	Confirmed	All year	Open water
Ring-billed gull	*Larus delawarensis*	Confirmed	All year	Open water
Laughing gull	*Larus atricilla*	Confirmed	Summer	Open water
Common tern	*Sterna hirundo*	Probable	Summer	Open water
Roseate tern	*Sterna dougallii*	Possible	Summer	Open water
Least tern	*Sterna albifrons*	Probable	Summer	Open water
Black skimmer	*Rynchops niger*	Possible	Summer	Open water tidal creeks and rivers
Tree swallow	*Iridoprocne bicolor*	Probable	Summer	Over land and water
Barn swallow	*Hirundo rustica*	Probable	Summer	Over land and water
American crow	*Corvus brachyrhynchos*	Confirmed	All year	Along shores and mudflats
Reptiles				
Loggerhead	*Caretta caretta*	Possible	Summer	Coastal waters
Kemp's ridley	*Lepidochelys kempi*	Possible	Summer	Coastal waters
Green sea turtle	*Chelonia mydas*	Possible	Summer	Coastal waters

Appendix E

APPENDIX E

BIOACCUMULATION POTENTIAL OF GROUNDWATER CONTAMINANTS OF POTENTIAL CONCERN

To evaluate the bioaccumulation potential of groundwater pollutants, a screening assessment was undertaken of contaminants exceeding New Jersey GWQSs in groundwater within the proposed reclassification area.

The contaminants of potential concern identified in the groundwater quality review (see Section 5.0) include VOCs and metals. As a conservative screening measure, contaminants detected in groundwater at concentrations exceeding NJDEP GWQSs were also compared to surface water quality criteria (NJDEP). Groundwater concentrations should not be compared directly to surface water quality standards or criteria, since dilution or, in the case of organics, volatilization occurs when groundwater enters the surface water body. However, such a comparison provides a "worst case" picture of which contaminants would potentially pose a risk to aquatic receptors. This comparison revealed that metals (particularly arsenic, copper, lead, and mercury) exist at concentrations that could impact surface waters should they reach surface waters at these undiluted, unattenuated concentrations. Of these, arsenic and lead were the most widely detected at levels that exceeded GWQSs in wells.

It should be noted that New Jersey State surface water quality criteria are largely based upon potential human health exposure, which should be minimal in the vicinity of the reclassification area (see Section 6.1.1 of this report). The criteria are often very conservative, being based upon the possibility of an increased cancer risk to 1 out of 1 million individuals. A more appropriate comparison is provided by ecologically-based criteria. If the groundwater concentrations were instead compared to EPA Ambient Water Quality Criteria for Protection of Aquatic Life as a conservative screening measure of potential ecological risk (Table 6-1), there would be far fewer exceedances of the criteria for the metals present in groundwater. Groundwater concentrations of arsenic, lead, cadmium, copper, mercury, nickel, selenium, and zinc exceed EPA marine acute water quality criteria in at least one of the wells measured within the reclassification area. However, the mean concentration of these analytes in the wells measured would exceed the EPA marine acute criterion for the following metals only: arsenic, copper, lead, and mercury.

A comparison with existing screening criteria suggests that few organic compounds are present in groundwater at levels that would pose a risk if they entered surface waters at an undiluted, unattenuated concentration. If very conservative NJDEP human health criteria for surface water are used, the primary organic compound of concern would be benzene, based upon the frequency of exceedances in groundwater wells sampled within the proposed reclassification area. However, a comparison of groundwater data from within the proposed reclassification area to the EPA marine acute water quality criterion reveals that while the maximum benzene concentration of 11,000 ug/L would exceed the EPA marine acute criterion of 5,500 ug/L, the average concentration in these wells of 5,100 ug/L is below the criterion indicative of acute ecological risks.

A sufficient literature base of information exists to determine the bioaccumulation potential of each contaminant found in groundwater wells at concentrations exceeding New Jersey GWQSs.

Generally, highly lipophilic compounds with a high octanol-water partitioning coefficient (K_{ow}), such as pesticides and PCBs, have a higher potential to bioaccumulate in aquatic ecosystems. Since they are poorly soluble in water, their threat to aquatic food chains comes largely from their presence in sediment, where they may be ingested by benthic invertebrates and passed upward through the food chain via ingestion of contaminated tissue. No PCBs were detected in the groundwater wells measured within the proposed reclassification area, and only one pesticide (alpha-BHC) was detected (in one well).

Table E-1 provides a list of K_{ow} values for contaminants detected in exceedance of New Jersey GWQSs. In general, compounds with K_{ow} values less than 500 are highly water-soluble and mobile, with little to no bioaccumulation potential, and are readily biodegraded (Ney, 1995). Most of the VOCs detected in groundwater at levels exceeding NJDEP GWQSs fall into this category. Compounds with K_{ow} values greater than 1,000 have low solubility, are largely immobile in soil, are readily bioaccumulated, and are not readily biodegradable. Compounds detected in groundwater at exceedance levels having K_{ow} values greater than 1,000 include PAHs such as acenaphthene, fluoranthene, fluorene, and pyrene. These compounds were each detected in less than 25% of the groundwater wells analyzed for these compounds within the proposed reclassification area, and none exceeded NJDEP GWQSs in more than two wells sampled. Of these, only fluoranthene and fluorene would exceed EPA acute ambient marine water quality criteria for protection of aquatic life (Table 6-1), should the groundwater from the two wells affected reach the bay at a totally undiluted, unattenuated concentration.

Other compounds detected in groundwater at concentrations exceeding NJDEP GWQSs were hexachlorobutadiene, hexachloroethane, and xylenes. The first two compounds were each detected within only one well. Xylenes, however, were detected in 80 of the 403 samples for which they were analyzed, with 40 (a little over 10%) exceeding the NJDEP GWQS of 40 ug/L. There are no New Jersey state or EPA marine water quality criteria or standards for xylenes. Concentrations of xylenes ranged from 0.12 to 100,000 ug/L.

The remaining compounds detected at levels exceeding NJDEP GWQSs have K_{ow} values between 500 and 1,000, implying that their solubility, mobility, and bioaccumulative and biodegradation characteristics are variable (Ney, 1995). These compounds, chlorobenzene, alpha-BHC, and 2,4-dichlorophenol, were each detected in two wells or less. In summary, xylene is the organic compound with the most significant bioaccumulation potential, based upon its frequency and magnitude of contamination in groundwater, and its K_{ow} value; however, it was detected at exceedance levels at less than 10% of the wells where it was analyzed for. Moreover, given its K_{ow} value (1,585), it is not considered to be highly mobile, and hence is less likely to reach surface water bodies such as Newark Bay.

Metals often adhere to organic or minute suspended sediment particles, and settle out of the water column where they may be available to consumers in the sediment. Transport of metals from groundwater into surface water may occur in the dissolved or suspended solids phases.

However, ultimately, if metals were to reach the marine ecosystem, the greatest threat would likely to be posed by metals in the sediment, where concentrations are often an order of magnitude higher than those in the water column.

Metals of potential concern in groundwater are arsenic, cadmium, copper, lead, mercury, nickel, and zinc. All of these metals may bioaccumulate to some extent if they were to reach surface waters or sediment associated with the surface water body. The degree of bioaccumulation is determined by site-specific conditions determining the species of metal present and subsequent bioavailability. Factors affecting uptake include physical and chemical characteristics of the sediment and water (pH, salinity, total organic carbon, particle distribution of the sediment, degree of bioturbation of the sediment, form of the metal [dissolved or adhered to particles], and exposure route [ingestion, absorption, etc.]). For instance, the presence of selenium in the tissues of an organism may act to bind mercury, making it unavailable, while the presence of calcium in sediments may bind lead, making it unavailable.

The extent of uptake is also determined by the physiological and behavioral characteristics of the organism exposed, and the duration of exposure. Thus, bioconcentration factors (the concentration in the animal's tissue divided by the concentration in the sediment and/or water) vary not only between these metals, but for the organisms exposed, and are difficult to predict. However, in the present case, the bioaccumulation potential of these metals is a moot point, given that it is highly unlikely that they would ever reach surface waters (see Section 5.0).

WESTON

TABLE E-1

OCTANOL-WATER PARTITIONING COEFFICIENTS FOR ORGANIC CHEMICALS OF POTENTIAL CONCERN IN GROUNDWATER.
PETITION FOR GROUNDWATER RECLASSIFICATION
PORT AUTHORITY OF NY/NJ

SVOCs	K_{ow} Value
2,4-Dichlorophenol	562
2,4-Dimethylphenol	302
Acenaphthene	21,380
Fluoranthene	213,796
Fluorene	15,136
Hexachloroethane	2,187
Isophorone	6
Pyrene	63,400
Pesticides	
alpha-BHC (benzene hexachloride)	911 (for lindane, gamma isomer of BHC)
VOCs	
1,1,1-Trichloroethane	302
1,1,2,2-Tetrachloroethane	363
1,1-Dichloroethane	61.66
Acetone	0.95
Benzene	135
Bromomethane (methyl bromide)	12.59
Chlorobenzene	692
Chloroform	87
Chloromethane (methyl chloride)	8
Hexachlorobutadiene	5,495
Methylene Chloride	17.78
Styrene	NL
Toluene	490
Xylenes (Total)	1,585

NL - value not located

K_{ow} - octanol water partitioning coefficient

Appendix F

WESTON

APPENDIX F

SEDIMENT CONCENTRATION PLOTS OF THE NY/NJ HARBOR ESTUARY FROM THE BATTELLE (1992) AND NOAA (1995) STUDIES PETITION FOR GROUNDWATER RECLASSIFICATION PORT AUTHORITY OF NY/NJ

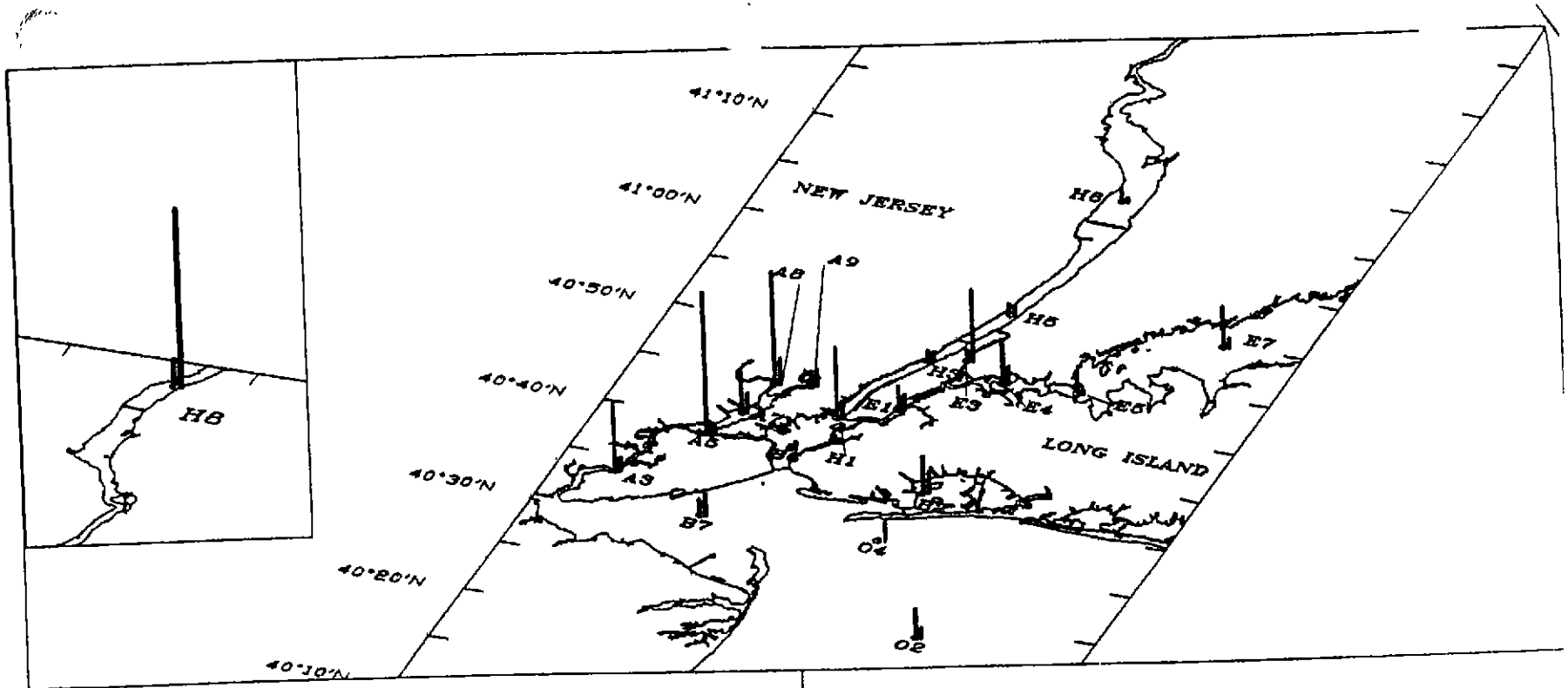
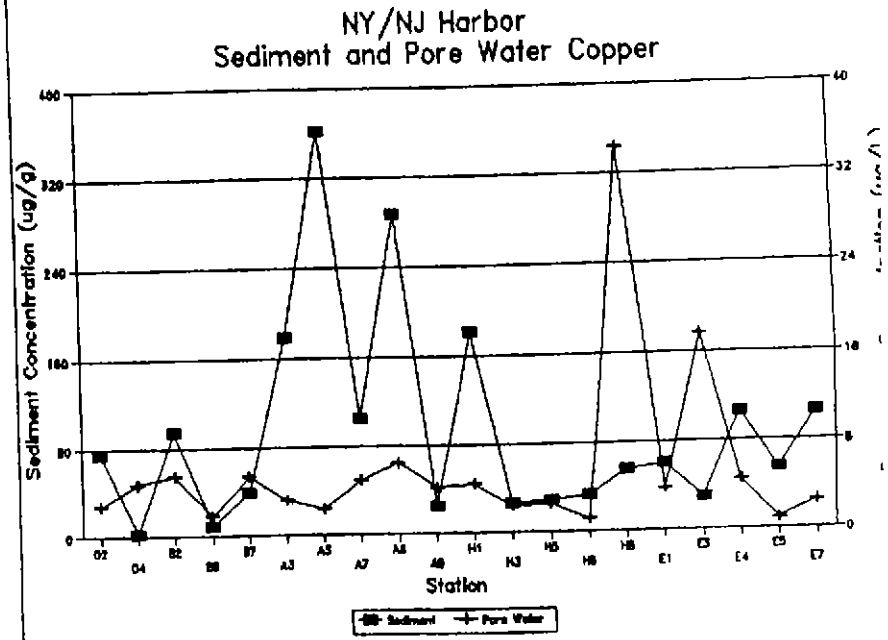


FIGURE 5A. COPPER RESULTS

| SEDIMENT COPPER

| PORE WATER COPPER



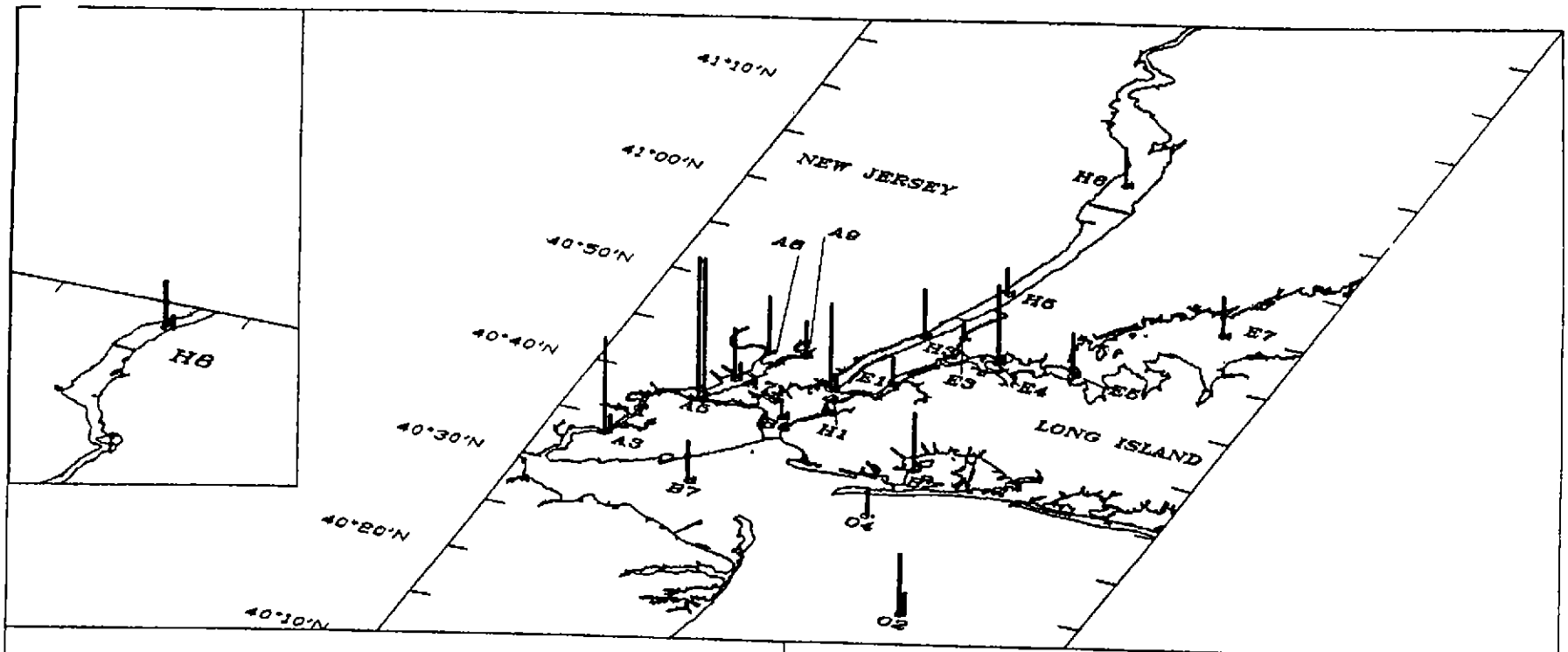
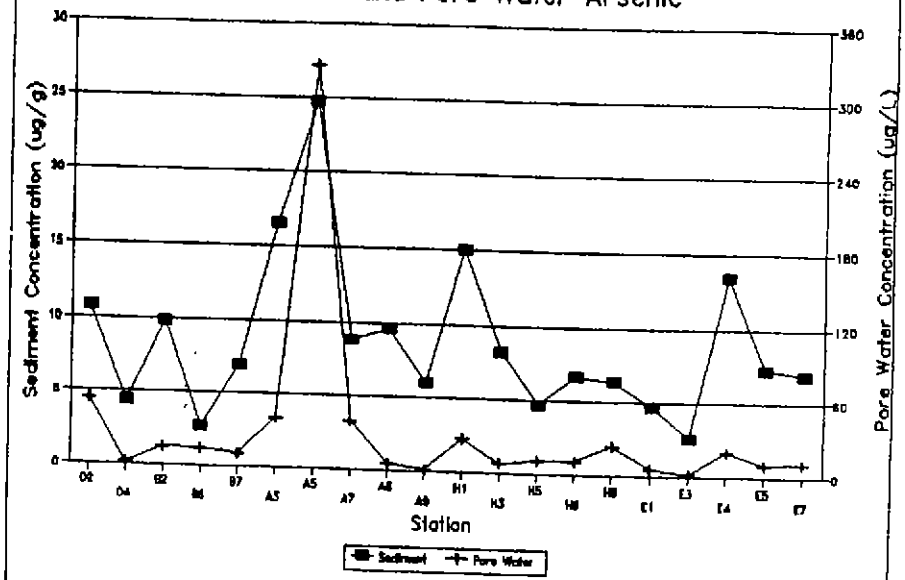


FIGURE 5D. ARSENIC RESULTS

- SEDIMENT ARSENIC
- PORE WATER ARSENIC



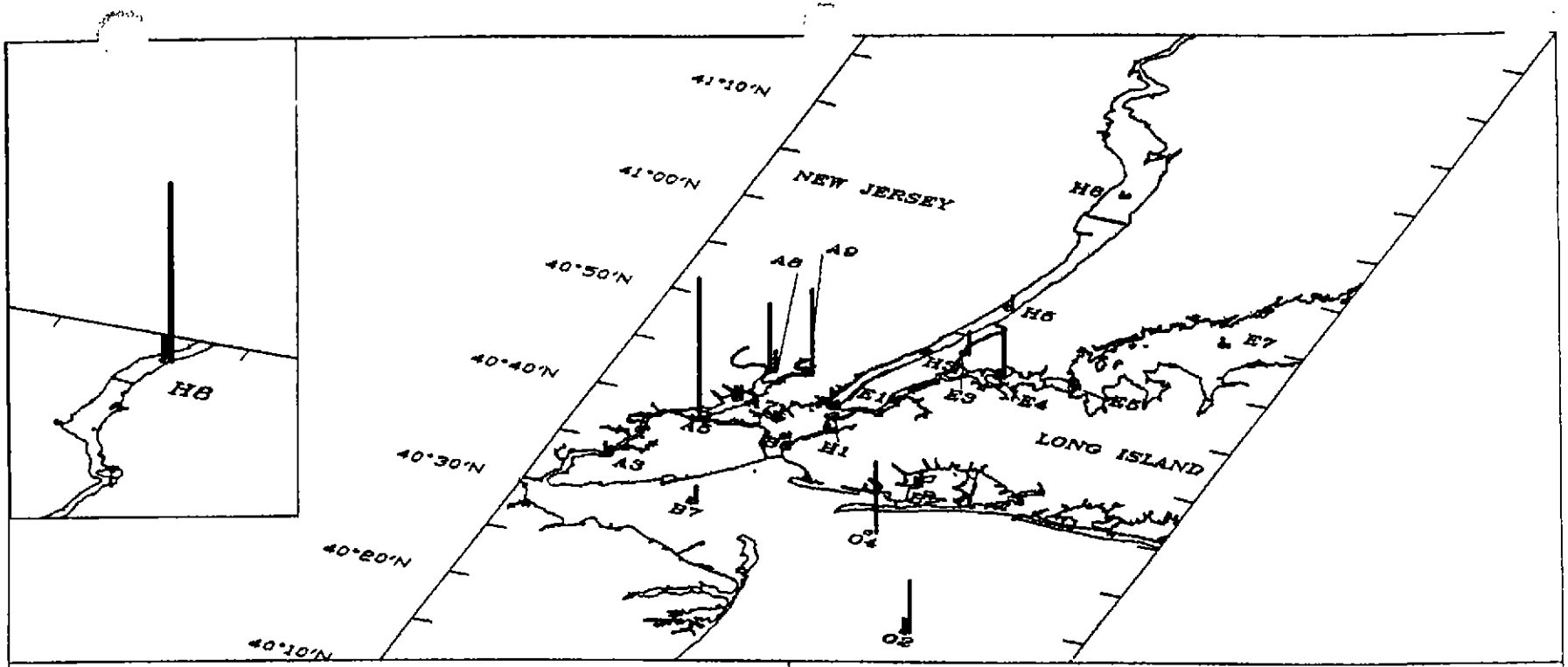
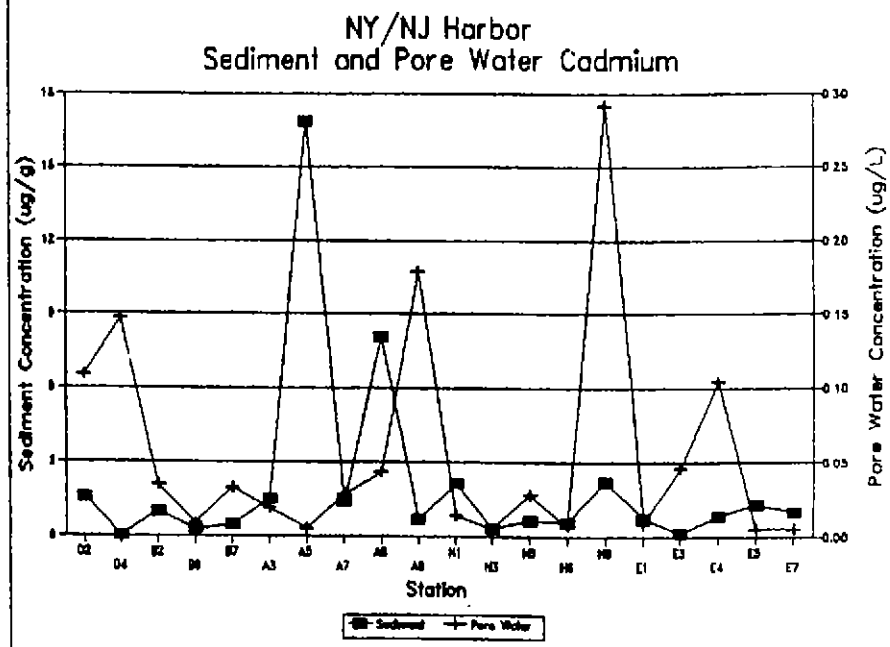


FIGURE 5E. CADMIUM RESULTS

- SEDIMENT CADMIUM
- PORE WATER CADMIUM



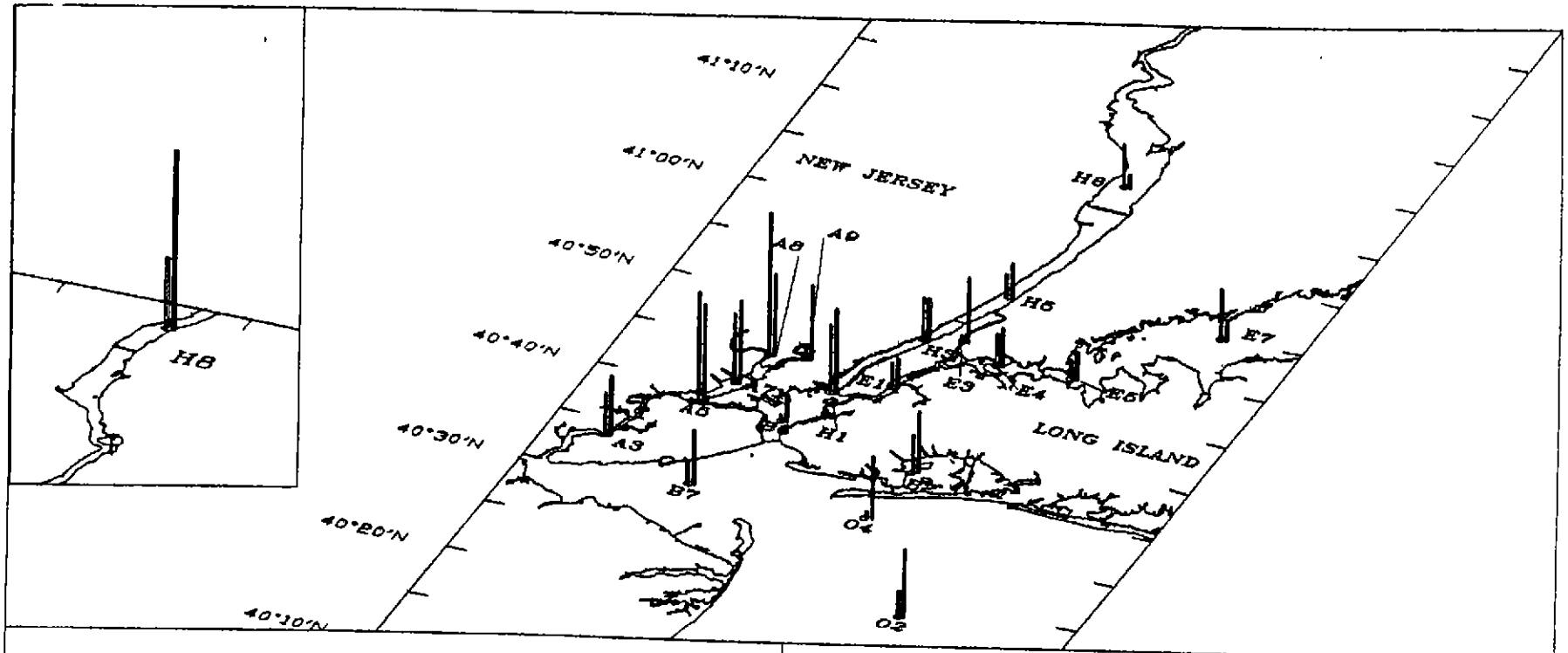
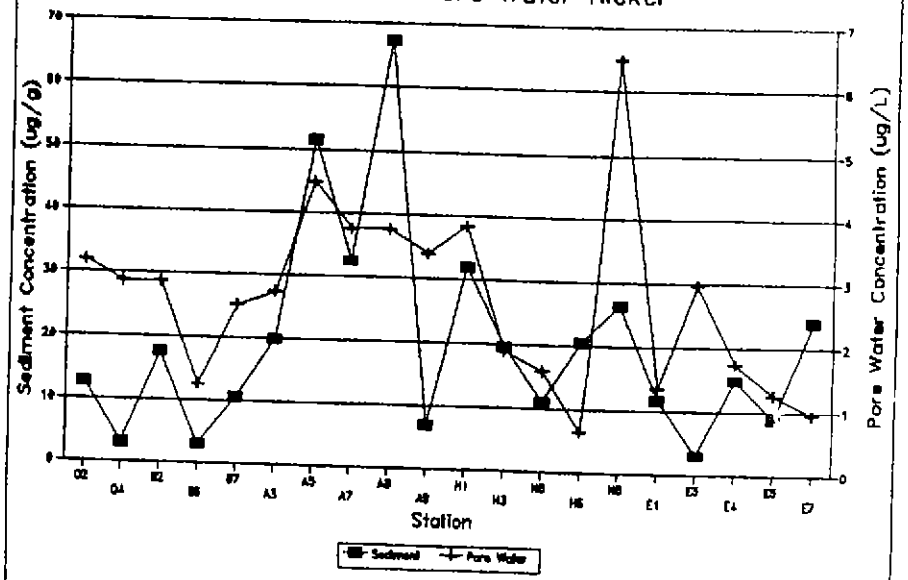


FIGURE 5F. NICKEL RESULTS

- SEDIMENT NICKEL
- PORE WATER NICKEL



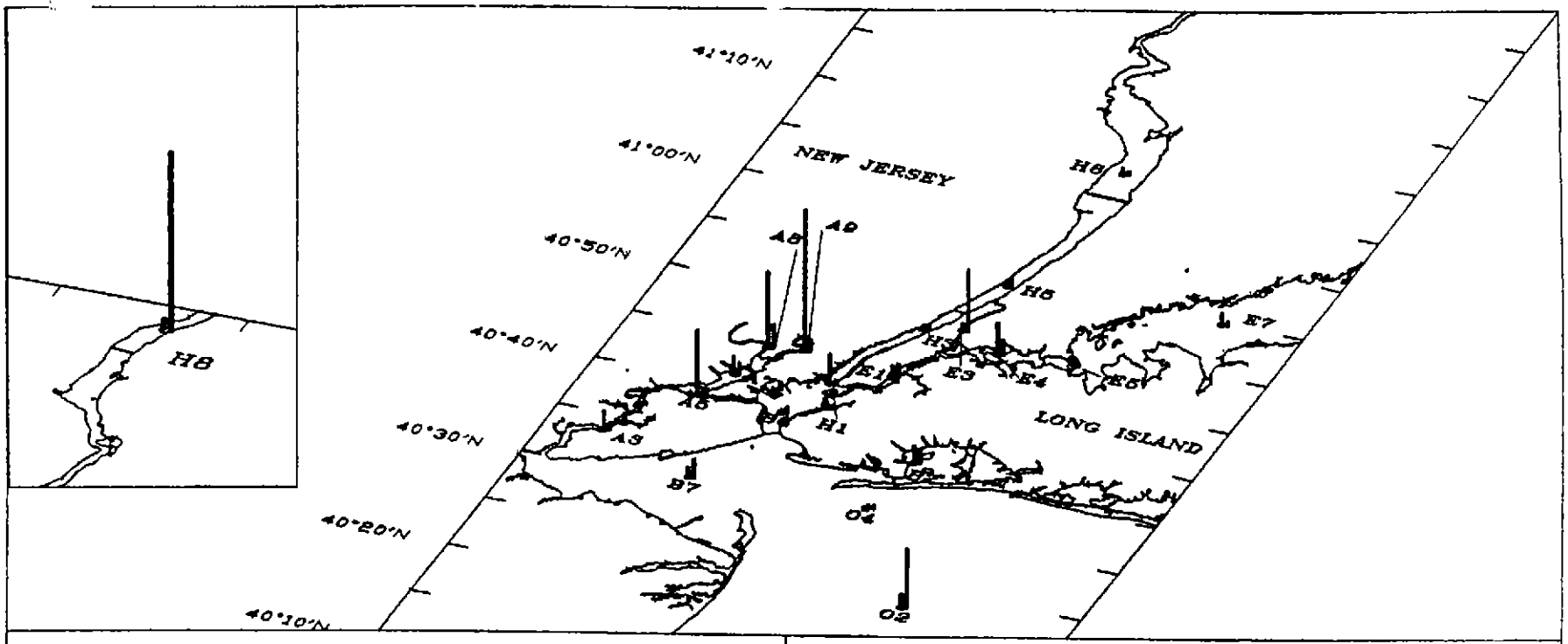
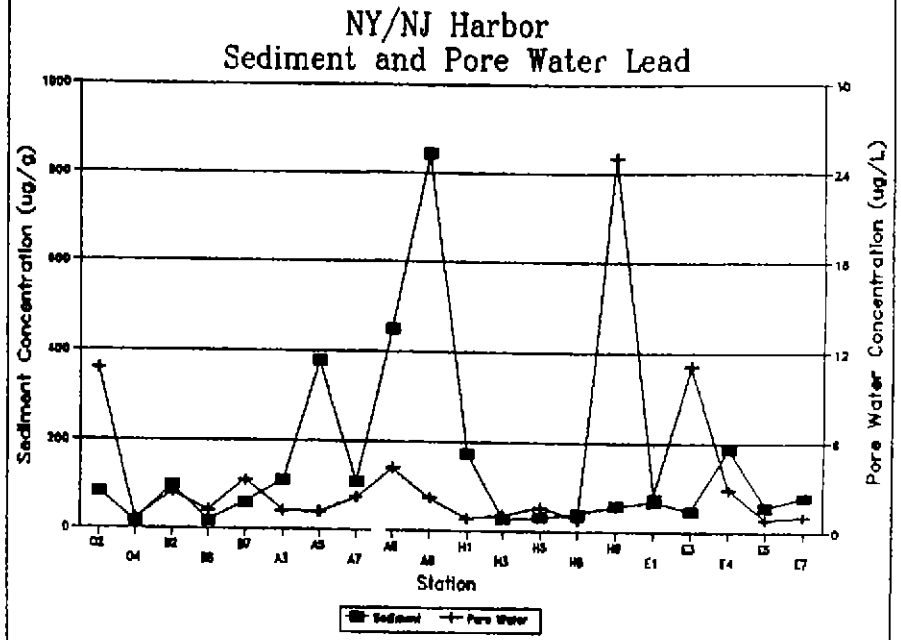
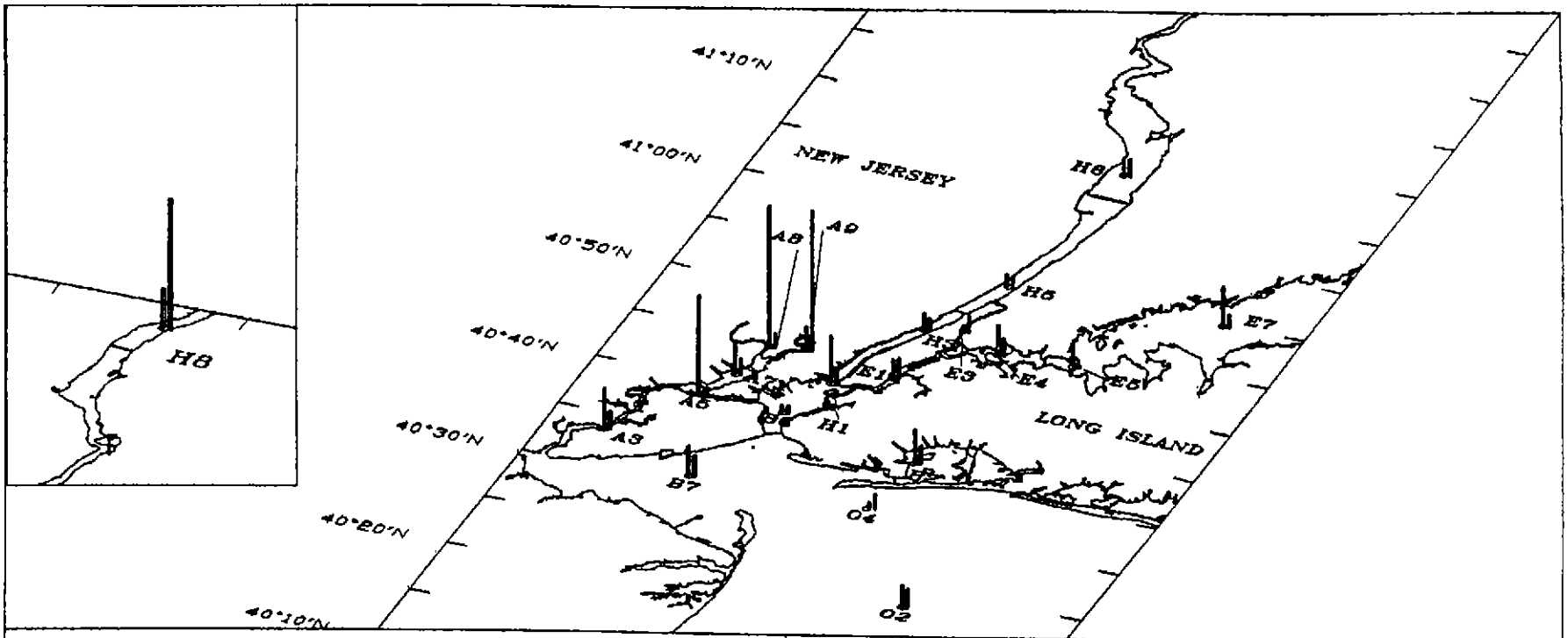


FIGURE 5G. LEAD RESULTS

| SEDIMENT LEAD

| PORE WATER LEAD





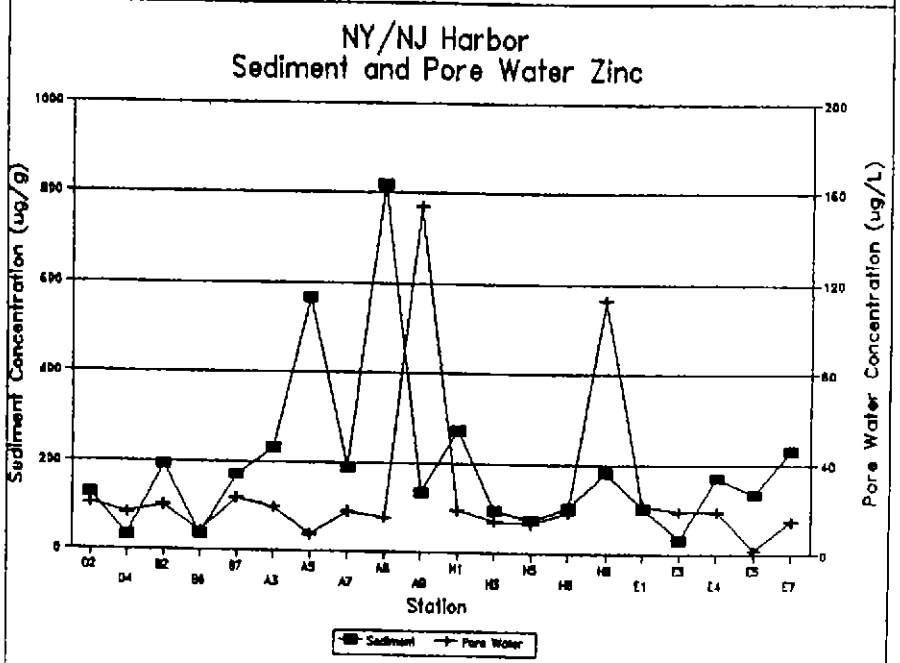


FIGURE 5H. ZINC RESULTS

| SEDIMENT ZINC

| PORE WATER ZINC

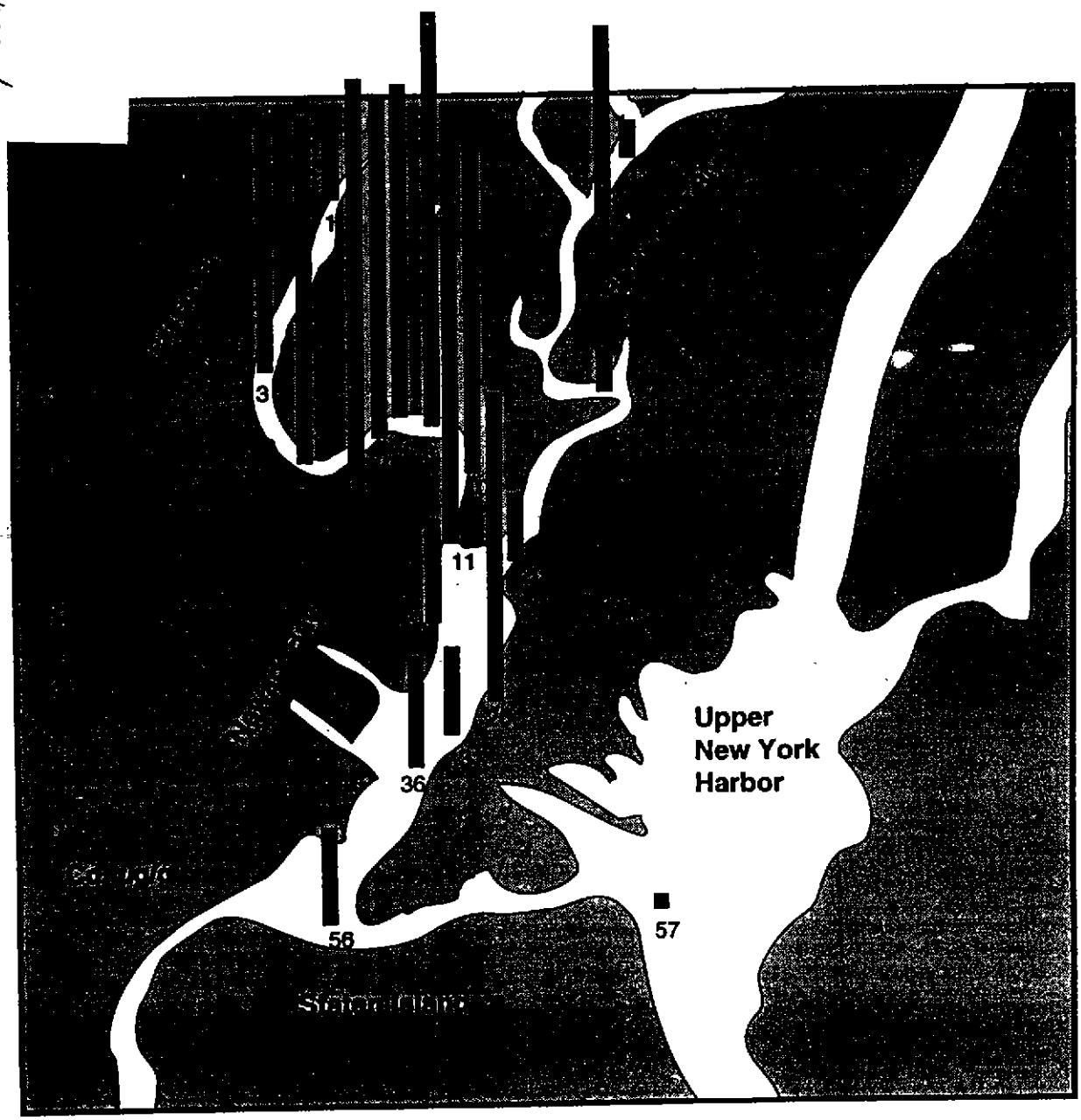


Figure 21. Concentrations of cadmium at selected stations in Newark Bay and vicinity.

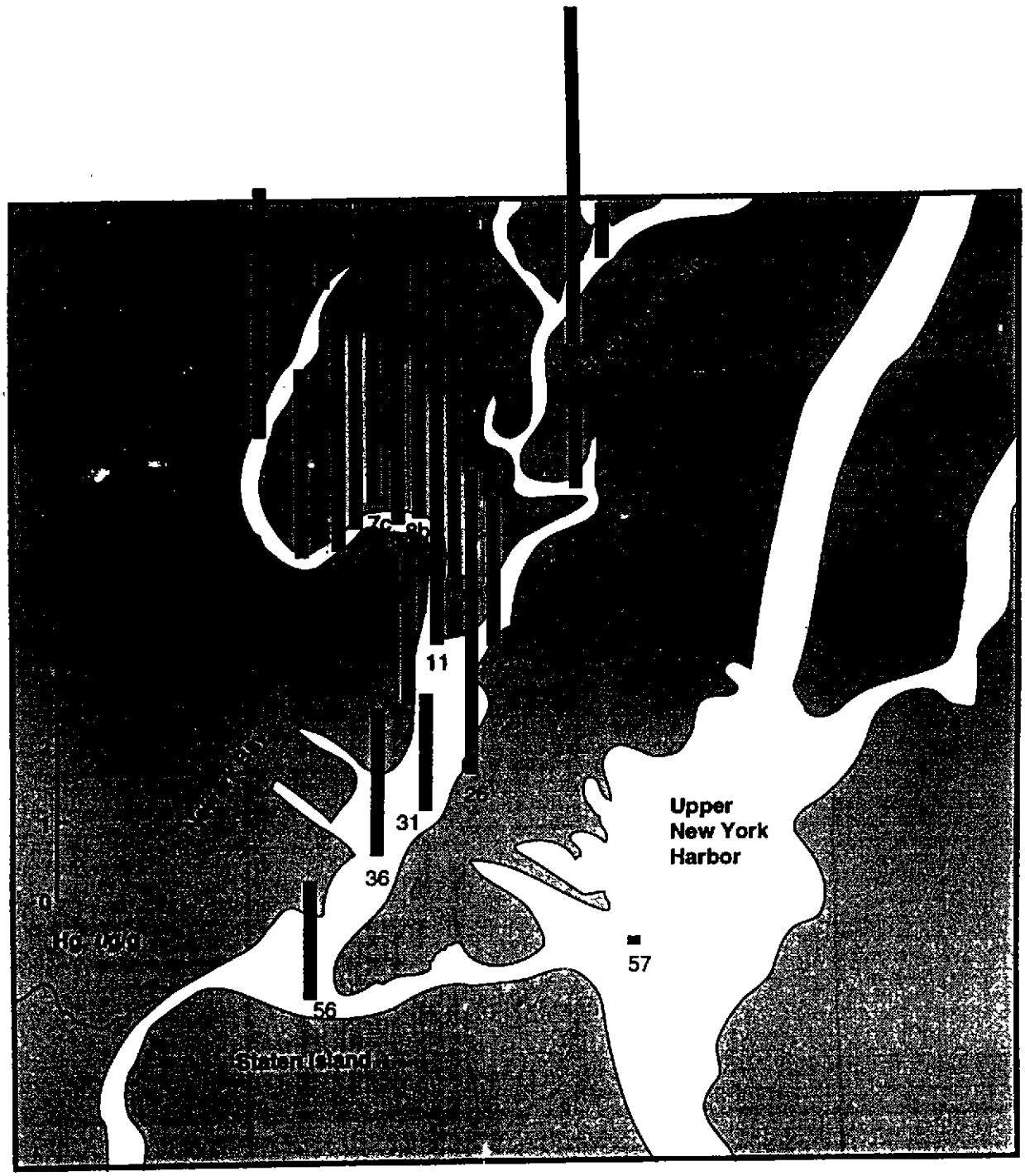


Figure 22. Concentrations of mercury at selected stations in Newark Bay and vicinity.

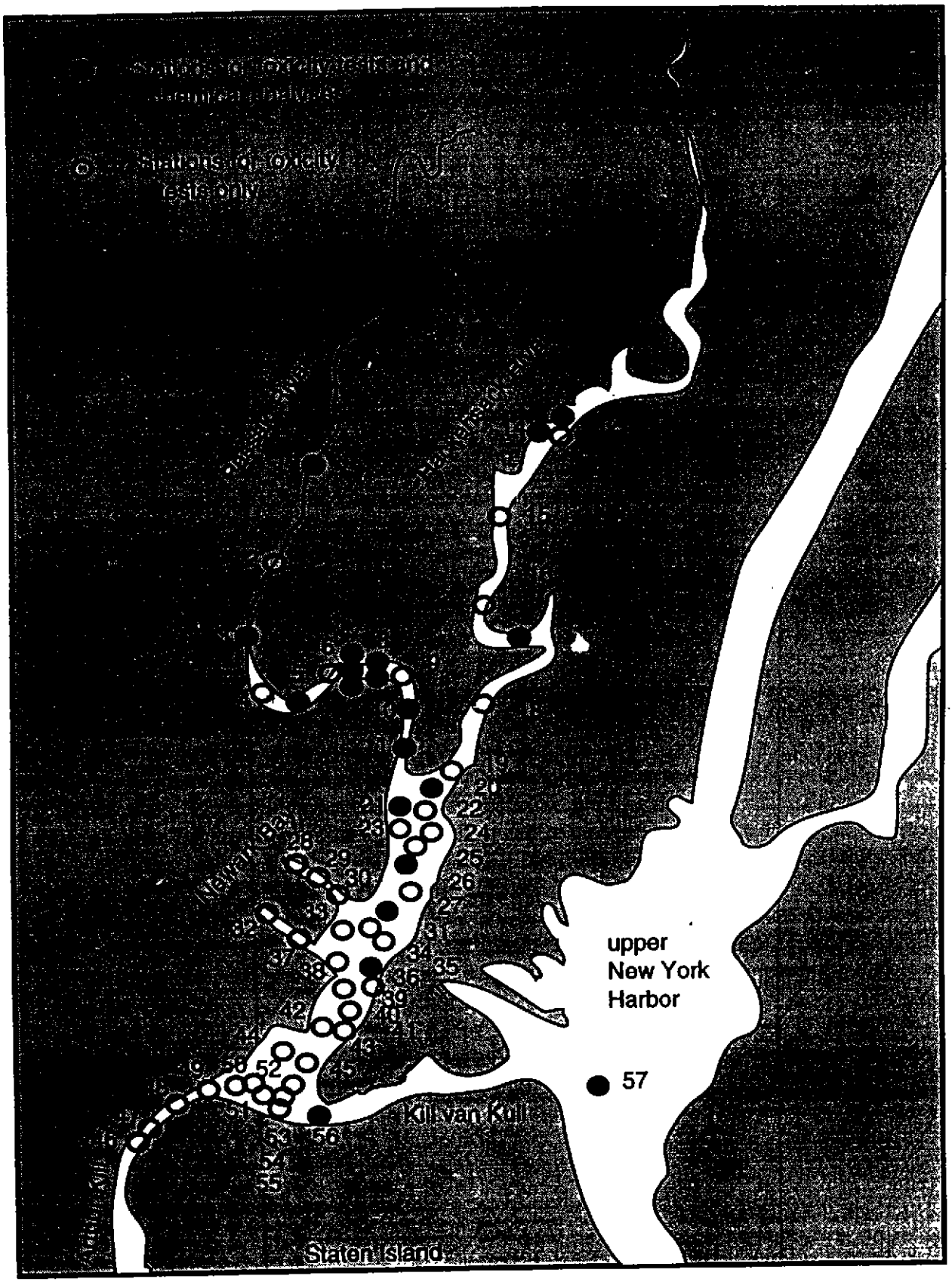


Figure 5. Stations sampled in the Passaic River, Hackensack River, Newark Bay, upper Arthur Kill, Kill van Kull, and upper New York Harbor during Phase 2.

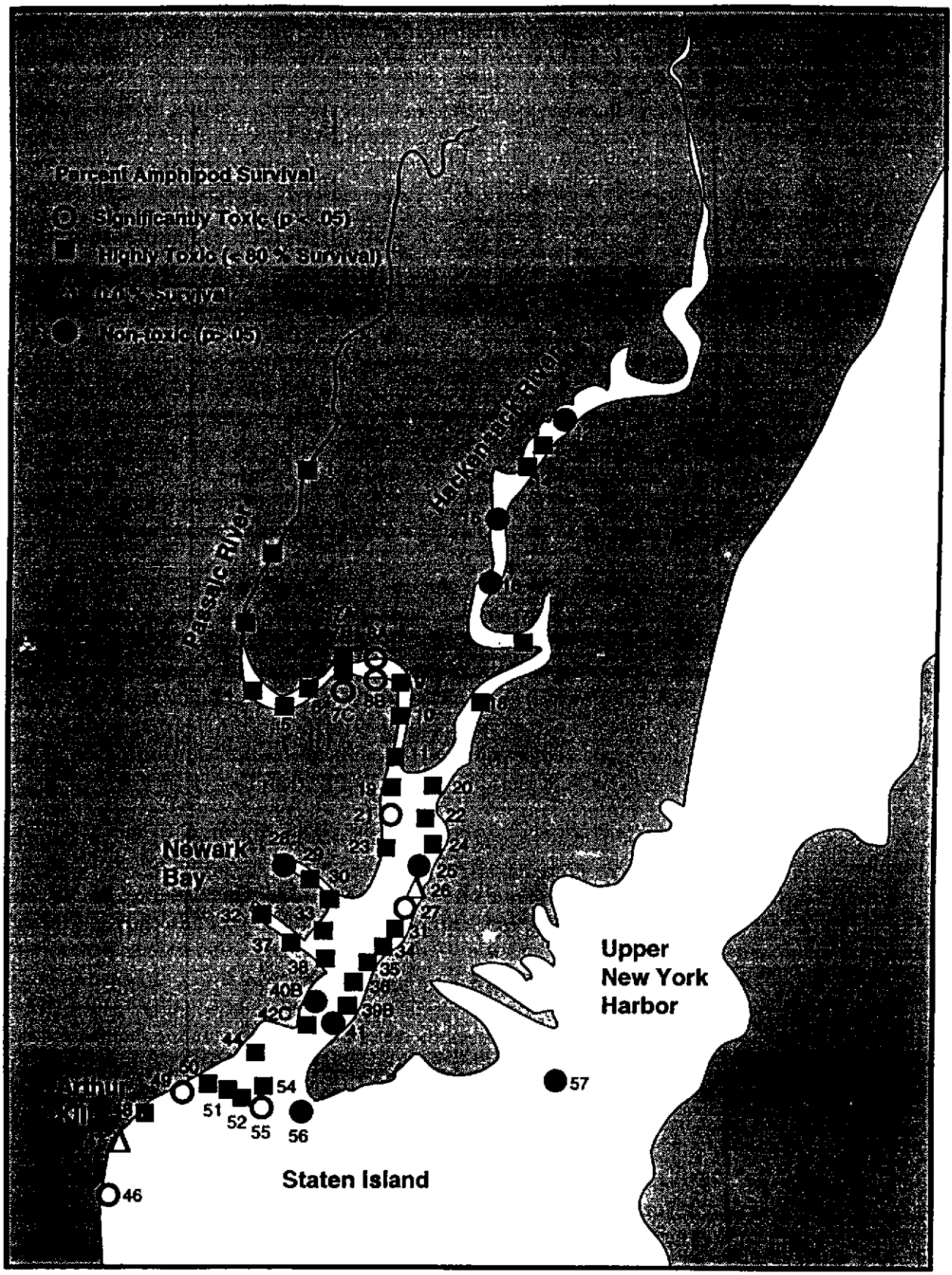


Figure 8. Distribution of stations in Newark Bay and vicinity that were toxic, highly toxic, and non-toxic in amphipod (A. *abdita*) survival tests.

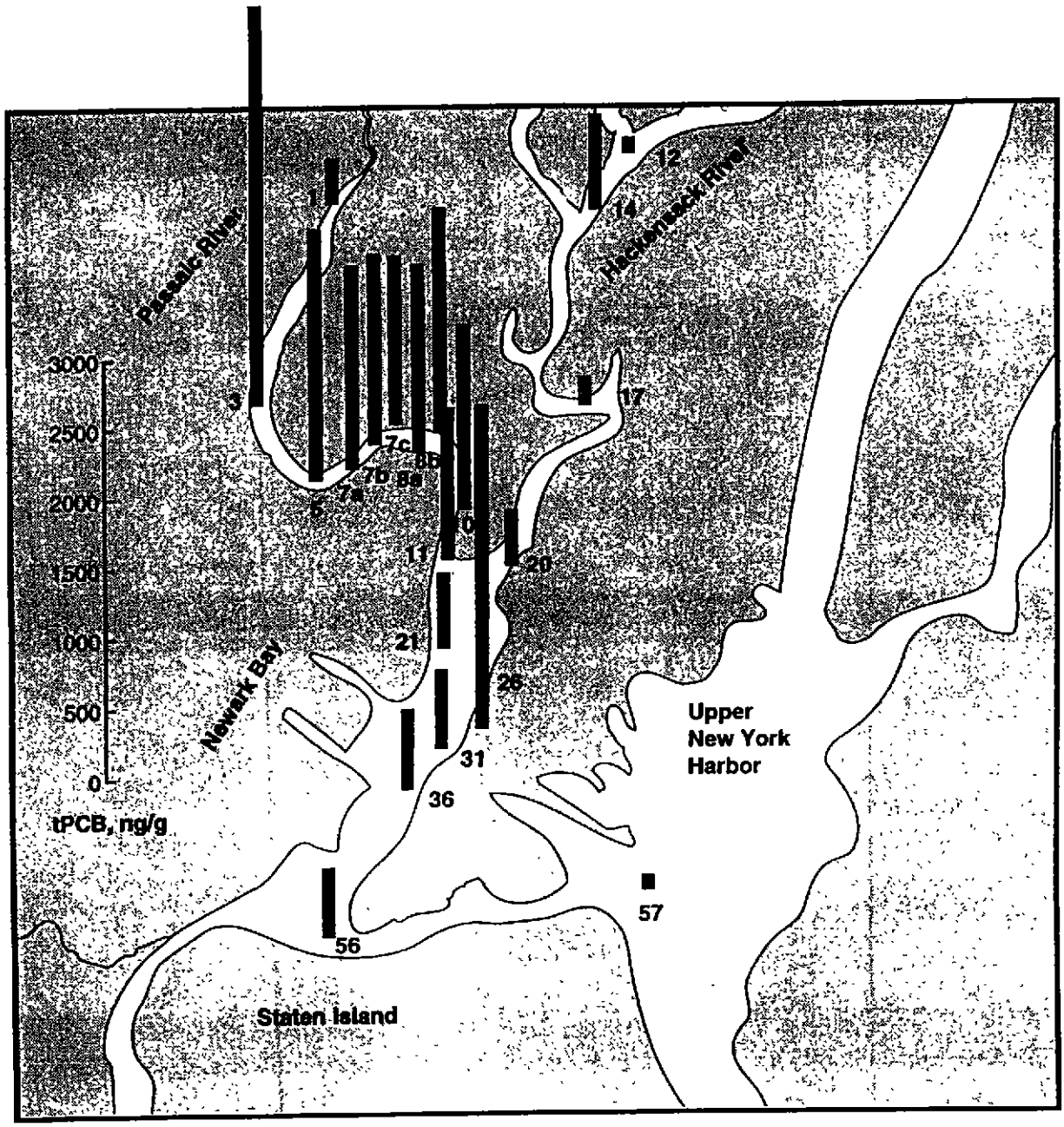


Figure 24. Concentrations of total PCBs at selected stations in Newark Bay and vicinity.

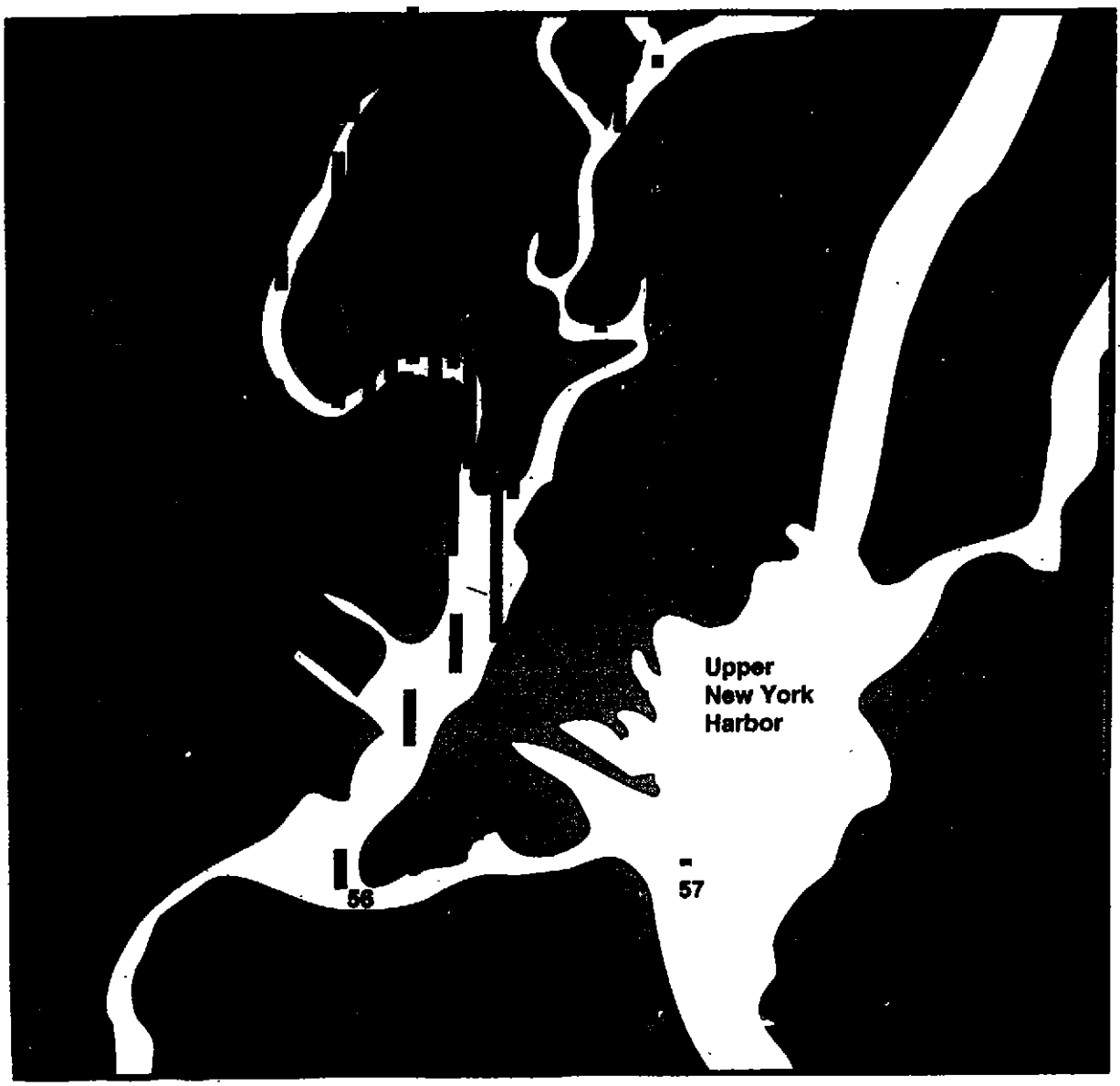


Figure 25. Concentrations of total 2,3,7,8-tcdd toxicity equivalency quotients (TEQ) at selected stations in Newark Bay and vicinity.