CONTAMINATION EVALUATION AT THE U.S. COAST GUARD STATION (FORMER ENGINEERS SCHOOL) FORT TOTTEN

FINAL ENGINEERING REPORT

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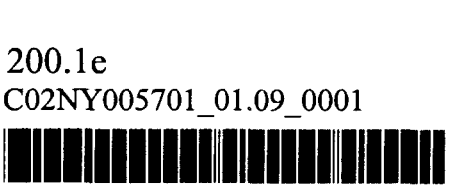

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1.0 EXECUTIVE SUMMARY

A preliminary contamination evaluation has been conducted at the U.S. Coast Guard Station property at Fort Totten, Queens, NY. This evaluation was performed under the Department of Defense (DOD) Defense Environmental Restoration Program (DERP) to confirm or deny the presence of environmental contamination onsite. The methods by which this evaluation was performed are outlined in this report.

Contamination was found to exist on this site. The contaminants detected consist of lead and chromium in groundwater, mercury in soils and marine sediments, petroleum hydrocarbons in marine sediments, and pesticides (DDD, DDT, and DDE) in buildings #619 and #624. Lastly, there does not appear to be any buried ordnance and drums onsite, nor does there appear to be a sealed room in building #619.

DERP CONFIRMATION STUDY
AT
ENGINEERING SCHOOL, FORT TOTTEN

DERA PROJECT #C02NY005700

1.1 Summary of Findings

Groundwater, soil, sediment and building surface contamination has been encountered at concentrations which may require regulatory review for this location. The contamination is reasonably suspected to have resulted from activities which took place during the period of DOD control and therefore should be referred to the appropriate office or agency for determination of a future course of action.

2.0 GENERAL

2.1 Introduction

The Department of Defense (DOD) conducts maintenance and manufacturing operations at defense installations. To assess possible environmental contamination resulting from these activities at former DOD sites, the Defense Appropriation Act was adopted in 1984 and the Defense Environmental Restoration Program (DERP) was begun. Responsibility for the management of DERP was given to the Secretary of Defense to assure a consistent approach.

The Huntsville Division of the Army Corps of Engineers is responsible for the inventory phase of the investigation of former DOD sites. This phase entails the collection and chemical analysis of groundwater, surface water, sediments, and soil samples to assess possible environmental contamination. Results of these studies will be employed to compare, evaluate, and rank individual DOD sites.

This report describes the inventory phase investigation performed at the U.S. Coast Guard Station (previous DOD property) at the Fort Totten Engineers School in Queens, New York. Project objectives and background information are presented in Section 2. Details of the sampling program are described in Section 3. Results of an electromagnetic survey are included in Section 4. Bunker penetration in building #619 is described in Section 5. Summary of analytical results is presented in

Section 6. Conclusions and recommendations are discussed in Section 7. Well logs and field data are included in Appendix A, monitoring well completion diagrams in Appendix B, well surveying data in Appendix C, chemical analytical data in Appendix D, quality control sample results in Appendix E, and New Jersey soil cleanup approaches are presented in Appendix F.

2.2 Project Objectives

The objectives of this investigation were to provide a preliminary determination of the presence or absence of chemical contamination which may have resulted from former DOD activities at this site and to determine the potential of contamination to local groundwater. To accomplish this objective, the following work was conducted:

1. Site visit for collection of background information and establishment of preliminary monitoring well and sampling locations.
2. Installation of five groundwater, monitoring wells.
3. Collection and analysis of groundwater, soil, sediment samples, and wipe tests.
4. Performance of an electro-magnetic survey.
5. Coring into bunker #619 to determine its contents.
6. Evaluation of physical and analytical data to determine the absence or presence of contamination.

2.3 Site Location and Physiography

The U.S. Coast Guard Station at Fort Totten is located with the U.S. Army Engineers School on the Fort Totten military

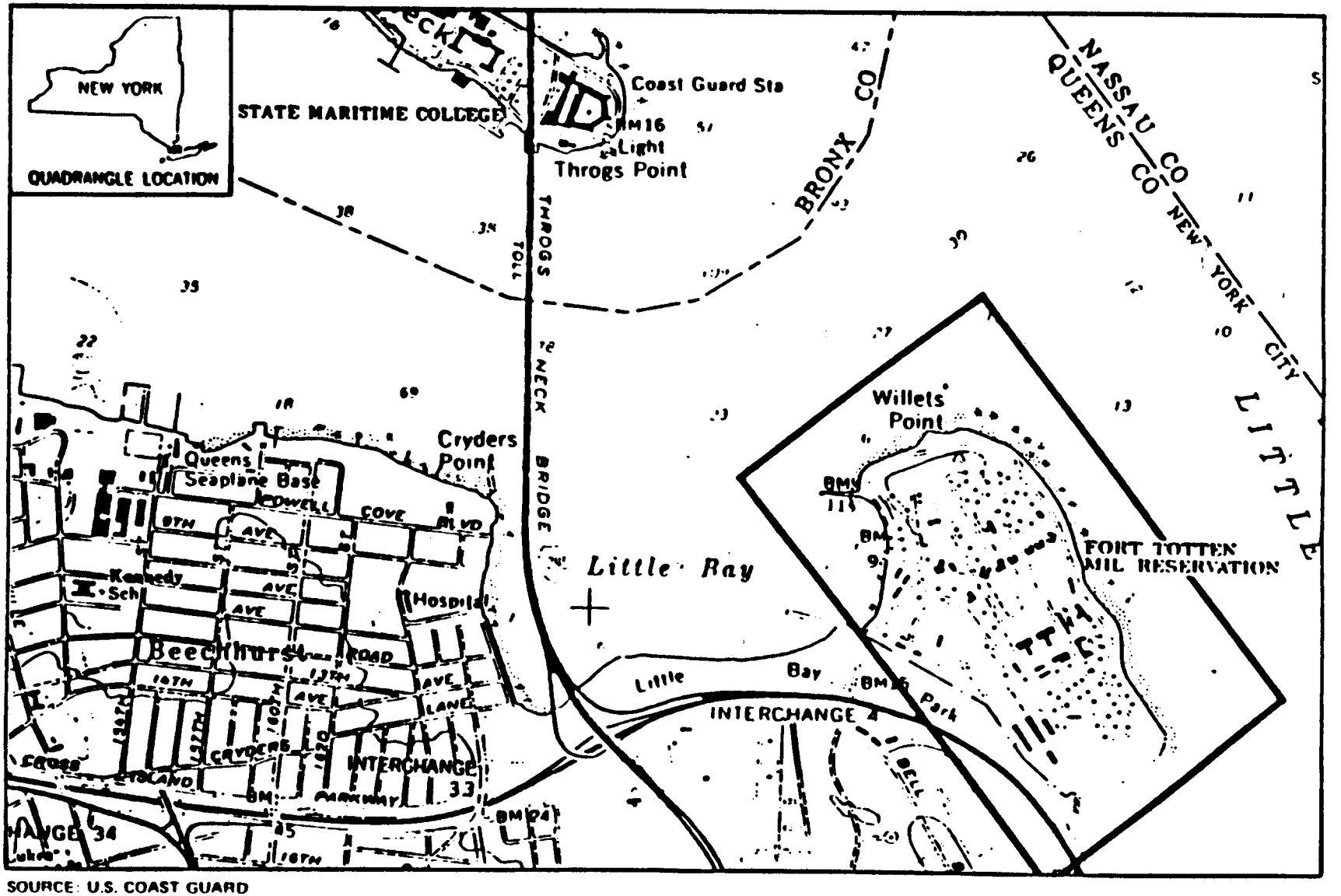
installation. Fort Totten is approximately 20 miles east of New York City at the mouth of the East River in Queens, New York (north shore of Long Island) as shown in Figure 2.1. Access to Fort Totten is via the Cross Island Parkway to Bell Boulevard.

Fort Totten is a 147 acre site and has been owned and operated by the DOD since 1857 (at that time called Willets Point). From 1857 to 1944, Fort Totten was used by the U.S. Army for national defense and engineer training purposes. From 1944 to present, Fort Totten has been operated by various U.S. Army commands which includes a training center for U.S. Army reserves and engineers. Today Fort Totten still functions as a training center. However, the land which composes Fort Totten is now owned by several federal agencies along with the DOD.

The U.S. Army still owns and operates the largest tract of land on Fort Totten (92.4 acres). The General Services Administration now owns and operates 45 acres, and the Department of Transportation (DOT) owns 9.6 acres which is operated by the U.S. Coast Guard.

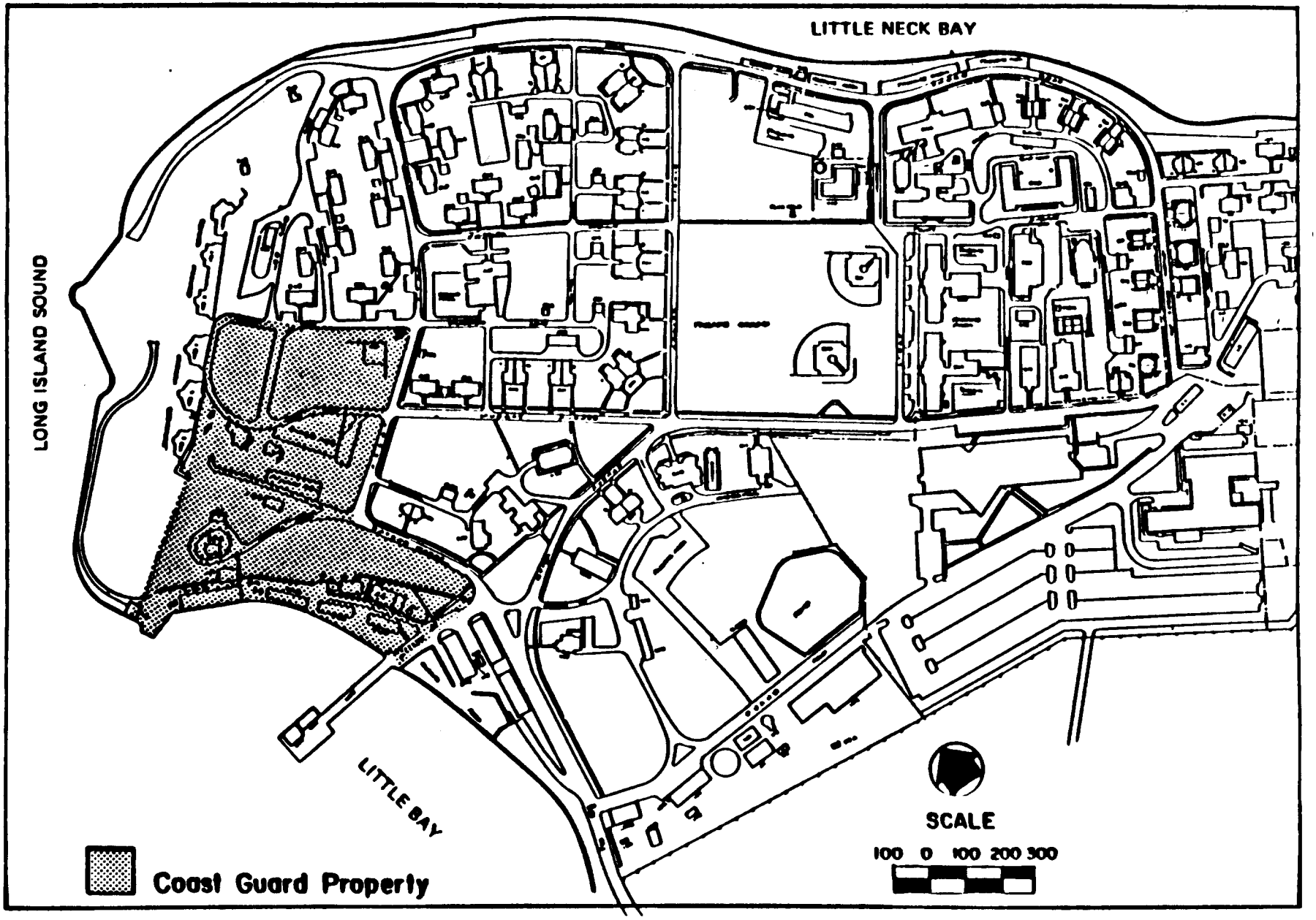
The U.S. Coast Guard operated property at Fort Totten (which is the target of this investigation) occupies the north-west portion of the peninsula and is bounded by U.S. Army property on the north, east and west as shown in Figure 2.2. Access to this property is gained via Willets Street which branches off of Totten Avenue.

This site contains fifteen buildings and a pier. Grassy lawns surround the station buildings in the southern half of the



SOURCE: U.S. COAST GUARD

FIGURE 2.1 MAP OF GENERAL VICINITY OF FORT TOTTEN



SOURCE U.S. COAST GUARD

FIGURE 2.2 BASE MAP OF FORT TOTTEN, COAST GUARD PROPERTY

site and northernmost areas. The northwestern area is heavily overgrown and wooded. Most of the station buildings are grouped along an axis boarding the waterfront on the western boundary. These buildings consist of a station barracks and administration gallery, workshops, storage spaces, and several vacant buildings. A single structure which houses married Coast Guard personnel is situated in the western section of this site and a large frame building (sublet to a civilian organization) is positioned in the center. Lastly, three small out-buildings are located in the north-eastern section of this site. The site elevation ranges from 10 to 60 feet above mean sea level.

2.4 Ownership and Prior Use

Fort Totten has been used for military purposes since the French and Indian War. However, the land on which Fort Totten is built first came into public record in 1640, when it belonged to a farmer named Thomas. From 1829 to 1857, the land passed through the hands of many owners until purchased by the U.S. Government in 1857.

In 1857, Congress appropriated the funds to build a fortification on Willets Point (Fort Totten) and in 1862 construction of the fort was initiated. This fortification was part of what was then known as the "Third System" of seacoast fortifications which began during a period of peace in 1817. The Fort Totten fortification complex was built and designed to protect New York City from naval forces of the confederate states during the Civil War. At that time, the fortification was built

at sea level from massive granite stones which were brought in by barge from quarries in New York and Pennsylvania. Above the stone fort on top of the hill, powder and munition magazines were built. In 1864, construction of this fort was discontinued and the partially completed stone fort can still be seen today on the northern tip of Fort Totten facing Long Island Sound.

During the Civil War, Fort Totten was used as a training post for troops enroute to the front even though its gun batteries never fired in anger.

In 1864, a hospital was built on Fort Totten which treated sick and wounded patients until closed in 1865. During this time, the first permanent garrison for the fort was established. This garrison consisted of 350 men and officers which represented most of the Engineer Corps of the United States Army at the time. In 1868, the War Department established Fort Totten as an Engineering School and in 1869 another general hospital was established on the property. During this period, Fort Totten was the only military engineer depot in the United States and became the arsenal for all mining, sapping tools, school for submarine mining, arsenal for pontoon material, and a depot for all material pertaining to the system of torpedo defenses. Submarine mine defense systems, seacoast searchlights and seacoast mortar batteries were also developed at Fort Totten during this time.

During the Spanish American War, a second set of fortifications was constructed on the hill in back of the first

set of fortifications. The second fortification sat 80 feet above sea level and again was designed to defend against naval attack penetrating into Long Island Sound. At the same time, a skirmish line of torpedoes was laid from Fort Totten across the channel to Fort Schuyler which was located on Throggs Point. These torpedoes were designed to detonate by means of electric batteries located at each end of the line. In addition, two groups of submarine mines (22 per group) were positioned as anti-ship weapons to assist in the defense of New York City. These improved defenses were once again never used since an attack on New York never occurred.

On July 23, 1898, President McKinley ordered that the fort at Willets Point be named Fort Totten as it is called today. The fort was named in honor of Brigadier General Joseph G. Totten, Corps of Engineers, United States Army who designed and planned many of the improvements of the United States coastal defenses.

In 1903, the Engineering School moved to Washington D.C. and later to Fort Belvoir, Virginia where they remain today. At this time, the Coast Artillery took over Fort Totten.

During World War I, additional guns were added to the fortifications at Fort Totten and troops enroute to the front in Europe were concentrated here.

In 1922, the 62nd Coastal Artillery Regiment was stationed at Fort Totten. The 62nd Coastal Artillery Regiment was equipped with anti-aircraft artillery and later became the mother unit for the entire United States Anti-Aircraft defense system.

Between 1937-1942, many improvements were made at Fort Totten. This included remodeling of buildings, new roads and filling in marshland areas. These improvements made Fort Totten one of the most attractive army establishments in the United States at the time.

During World War II, Fort Totten became the headquarters for the Anti-Aircraft Artillery Command of the Eastern Defense Command. It was then charged with the defense against air attack for the entire east coast and in 1941, the first radar system used on the east coast was installed here.

The Army Anti-Aircraft command was deactivated in 1944 and Fort Totten then became the base for the North Atlantic Wing of the Air Transport Command. Aircraft under this command operated from LaGuardia Air Field. In 1945, Fort Totten became the headquarters for the entire Atlantic Division of the Air Transport Command and functioned under the Army Air Corps. until 1947 when Fort Totten was designated as an Army Medical Center. At that time, the old hospital was reconditioned, refurnished and named the Fort Totten General Hospital until closed in 1949. When the hospital closed, Fort Totten became the headquarters of the New York-New Jersey subarea of the army, and functioned as a training facility for the Organized Reserve Corps. and the National Guard in the New York-New Jersey area.

Since 1967, Fort Totten has been a sub-installation of Fort Hamilton, Brooklyn, New York and is still used today as an engineering training school for the army. However, the land

composing Fort Totten has been sub-divided for use by other U.S. Government agencies. The majority of Fort Totten (92.4 acres) is still owned and used by the U.S. Army. The remaining tracts of land are now in the possession of the U.S. Coast Guard (9.6 acres) and U.S. General Services Administration (45 acres).

The land (9.6 acres) which makes up the U.S. Coast Guard Station at Fort Totten is now being investigated under the Defense Environmental Restoration Program to determine if any environmental contamination exists on this property from past DOD activities.

At present, the U.S. Coast Guard operated property at Fort Totten is used as a small boat station for search and rescue activities, and tending aids to navigation.

3.0 SITE INVESTIGATION

3.1 Introduction

This site investigation was conducted to determine whether contamination exists at the U.S. Coast Guard Station at Fort Totten and whether this contamination appears to be related to past DOD activities at this site. A contamination evaluation, based on environmental samples collected at this site, has been performed in an effort to assess levels of any constituents found on site. The following subsections describe the methods employed to make this determination. Specific items discussed include drilling operations, geology, well construction and development procedures, and the sampling program.

M&E conducted a preliminary site visit prior to beginning any field activities. The preliminary site visit was conducted in order to collect existing information regarding the history of Fort Totten and to determine prospective sampling locations on the Coast Guard property at Fort Totten. The site visit was conducted on October 28, 1986. Well locations and sample locations were selected based on local geohydrology, known areas of past DOD industrial activities, and visual observations. Monitoring well/groundwater and soil sample locations are illustrated in Figure 3.1.

Surface soil samples were taken near suspected areas of hazardous materials handling operations. Groundwater monitoring wells were positioned near suspected areas of contaminant infiltration and migration to provide samples representative of groundwater beneath the site and groundwater flowing off the site. The wells were also positioned to gain a more accurate understanding of the groundwater flow direction beneath the site.

3.2 Monitoring Well Installation

Five shallow groundwater monitoring wells were installed at the U.S. Coast Guard Station in Fort Totten. All wells were installed and completed as outlined in the approved well Installation Plan of December 1986. The following sections briefly discuss the drilling procedures, geotechnical information, well installation, well development and testing for hydraulic conductivities.

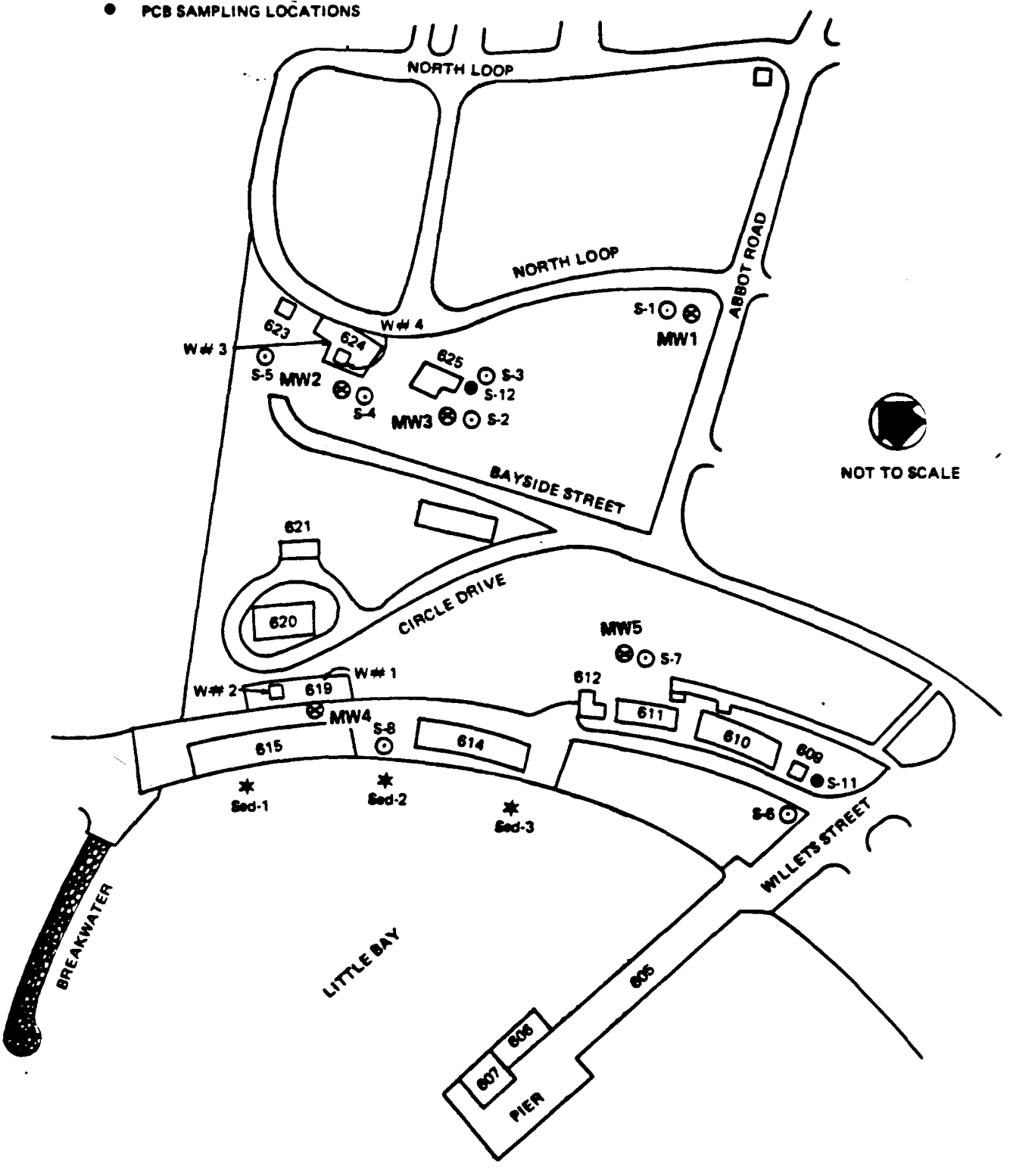


FIGURE 3.1 SAMPLING LOCATIONS MAP

3.2.1. Boring Operation

Drilling at the Fort Totten site began June 2, 1987. A mobile CME 75 drill rig was used for the drilling program. The method employed 6 1/2 inch hollow stem augers which yielded an approximate hole diameter of 11 inches through the unconsolidated deposits.

The hollow stem auger method involved advancing 5 foot flights of hollow stem augers into the ground. As the augers were rotated into the overburden the wings on the augers carried the drill cuttings to the land surface. As cuttings arrived at the surface they were shoveled into a 55 gallon drum.

Two foot split spoon samples were continuously collected to a depth of 10 feet or to the top of the rock surface, whichever was encountered first.

The drill rig was steam cleaned according to the procedures and protocol outlined in the approved Well Installation Plan. All tools, flights of augers and accessories used for boring each hole were steam cleaned prior to commencing work on site and in between work on each of the boreholes. Split spoons were cleaned with live steam and a natural bristle brush.

3.2.2. Geologic Data

The unconsolidated deposits encountered during the drilling of the five holes (Figure 3.2) were similar in each of the holes. Generally, a thin surface layer of brown silty sand with

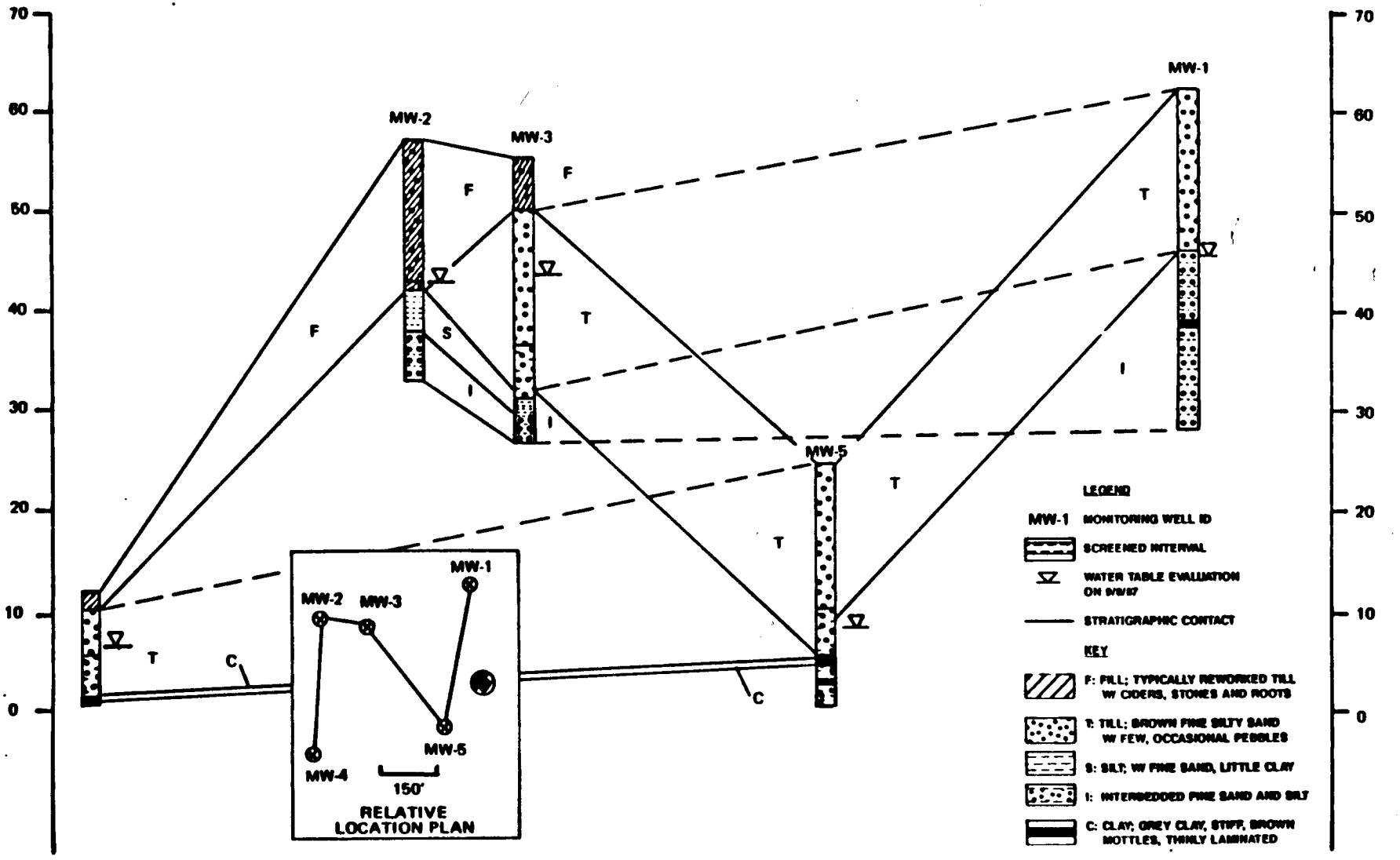


FIGURE 3-2. STRATIGRAPHIC CROSS-SECTIONS, FORT TOTTEN, NY

occasional stones and organic matter overlay deposits of glacial till of Pleistocene age. The layer of unconsolidated deposits ranged from twelve to 33 feet thick. Most split spoons revealed samples composed of brown fine sands and silts with occasional pebbles and less commonly stones. Cinders were also encountered during drilling in samples taken from wells MW-2, MW-3, and MW-4. Laboratory tests performed on soil samples (water content, after boring limits, sieve analysis) in accordance with ASTM methods, confirmed field observations. Soils were chiefly made up of (SM) silty sands, poorly graded sand-silt mixtures and (ML) organic silts and very fine sands with slight plasticity. In accordance with task #6 (Scope of Work paragraph 3.4.1) bedrock, which was not encountered upon refusal, was not cored and therefore not analyzed in this report.

3.2.3. Monitoring Well Construction

Five monitoring wells were constructed on the U.S. Coast Guard property at the Fort Totten site in accordance with the well installation plan. All monitoring wells were constructed with approximately 10 feet of screen set below the water table. MW1, MW2, MW3, MW4, and MW5 extend to depths of 33 feet, 25 feet, 30 feet, 12 feet, and 25 feet respectively.

Each monitoring well was constructed with 2-inch, threaded flush joint, No. 10 (0.010 inch slot) PVC manufactured well screen; 2-inch PVC (schedule 80), threaded, flush joint, solid riser pipe, No. 1 silica sand, bentonite pellets, grout mixture,

steel protective coverings with locking cover (or for MW4, one road box cover) and concrete pads with steel protective posts. Well construction plans for each monitoring well are presented in Appendix B, and well survey data in Appendix C.

Drill holes were reamed and washed out with onsite potable water in cases where obstructions existed at depth. Monitoring wells were constructed by placing PVC screen and riser down the hole. Sand was slowly added to the hole and periodically checked to assure that no bridging occurred and that a proper interval of sand pack filled the annular space between the PVC screen and the borehole well. A minimum 2 foot bentonite seal was placed atop the sand pack and the remainder of the hole was filled with a grout mixture comprised of portland cement and bentonite powder. A 3 foot square concrete pad was constructed on the ground surface and a steal protective surface was emplaced on all wells with the exception of MW4 which was constructed flush with the land surface through the emplacement of a road box. Three guard posts were placed around each steel protective casing. Table 3.1 summarized the Characteristics of each well.

TABLE 3.1
FINISHED WELL SPECIFICATIONS
U.S. COAST GUARD STATION, FORT TOTTEN, QUEENS, NEW YORK

Well No.	Depth (ft)	Screen Length (ft)	Sand pack (ft)	Bentonite (ft)	Grout Layer (ft)
MW-1	33	10	13	2	18
MW-2	25	10	10	2	10
MW-3	30	10	13	2	15
MW-4	12	10	7	1	2
MW-5	25	10	8	2	11

3.2.4. Well Development

All grout seals in the monitoring wells were allowed to cure a minimum of 48 hours prior to development. Monitoring wells were developed using teflon bailers. After a well was bailed dry, the well was allowed to recharge and bailed dry again. The purpose of the well development is to assure the removal of fine particles from the well, to assure a good hydraulic connection between the well screen, filter pack and formation, and to remove any contamination inadvertently introduced during the drilling process. Well development information is summarized in Table 3.2.

TABLE 3.2
WELL DEVELOPMENT CHARACTERISTICS
U.S. COAST GUARD STATION, FORT TOTTEN, QUEENS, NEW YORK

Well No.	Development Process	Approximate Volume Of Water Removed (gal)	Development Time (hrs)
MW-1	Bailer	30	4.0
MW-2	Bailer	45	4.5
MW-3	Bailer	45	4.0
MW-4	Bailer	25	4.0
MW-5	Bailer	100	4.0

The monitoring wells at the Fort Totten site were developed without incident. The depth and amount of recharge varied within each monitoring well. Therefore a variety of well volumes were required to develop each different well. The technique used to develop the wells removed silts from the screened section of the well and created a secure connection between the well screen, filter pack and fractured formation.

3.2.5. Water Levels

Water level measurements in each monitoring well were recorded after the completion of each well and prior to sampling. This information is presented in Table 3.3. Surveyed horizontal control positions and elevations of each monitoring well are present in Appendix C of this report.

TABLE 3.3
WATER LEVELS
U.S. COAST GUARD STATION, FORT TOTTEN, QUEENS, NEW YORK

Well No.	Land Surface **(NGVD)	*TOC (NGVD)	Water Level Below TOC (ft)	Water Elevation (NGVD)	Hydraulic Conductivity (ft/day)
MW-1	61.50	63.40	17.09	46.31	0.1
MW-2	58.90	61.06	16.99	44.07	0.3
MW-3	57.10	59.13	14.56	44.57	0.4
MW-4	12.15	11.87	5.54	6.28	0.5
MW-5	25.0	27.01	19.04	7.97	0.3

* Top of Casing
** NGVD = National Geodetic Vertical Datum

Water level elevations vary significantly with each location. Water elevations ranged between 46.31 feet and 6.28 feet above National Geodetic Vertical Datum (NGVD). Inferred groundwater gradients across the site, based on those elevations, indicate that groundwater flow is generally to the northwest downgradient toward Long Island Sound.

3.2.6. Hydraulic Conductivities

Slug and bail tests were conducted at all five monitoring well locations in accordance with the approved well installation plan. Slug and bail tests were conducted as follows: The initial water level was recorded. Both tests were initiated by inducing a sudden change in water level and measuring the response of the well. The change in water level was accomplished by introducing a known quantity of previously bailed well water (slugging the well) or removing (bailing the well) a known quantity of water with a bailer. Data were recorded using a water level tape. Data were analyzed using the Hvorslev method when the well screen remained submerged during testing. The modified Hvorslev method was used when data gathered from a well whose screen was not submerged throughout the test.

The hydraulic conductivity (K) values which are based specifically on slug test analysis are presented in Table 3.3. The rate at which the monitoring well responds depends upon the rate of recharge that occurs. This rate can vary by several orders of magnitude depending upon the characteristics of the formation in which each well is installed. Values for K (Table 3.3) range from 0.1 to 0.5 feet per day which is less than one order of magnitude of difference among the five wells. These values fall into the standard range of values given for glacial till deposits.

3.3 Sampling Program

The preliminary contamination evaluation conducted by Metcalf & Eddy included the sampling and analysis of the groundwater monitoring wells, soils, sediments, and wipe tests on the structures. The field sampling episode was conducted from July 18 - July 24, 1987. Sampling protocol and procedures were presented in project work plans submitted to the Army Corps of Engineers in April 1987.

The parameters chosen for analysis were outlined in the scope of work provided by the U.S. Army Corps of Engineers. The analyses selection reflect possible contamination expected resulting from past DOD activities, and includes the measurement of volatile compounds, petroleum hydrocarbons, selected metals, PCB, pesticides, pH, conductivity, and temperature.

3.3.1. Work Plans

After the site visit and prior to actual field work, work plans were developed to outline site investigation procedures. These work plans included:

- Site Specific Health & Safety Plan
- Site Specific Well Installation Plan
- Site Specific Sampling Analysis and Quality Assurance Project Plan (S&A/QAPP)

COE approval of these work plans was obtained prior to commencement of well construction, sampling, electro-magnetic survey, and coring into the bunker (Bldg. #619). The field team adhered to procedures described in the above work plans.

The specific work plans were submitted to the COE as separate documents and have not been presented within this report. However, a summary of field techniques employed during the investigation has been included in Section 3.3.3. The analytical methodology is provided in the SA/QAPP and is summarized in Section 3.4. The analytical results of the QC samples have been evaluated and compared against the goals stated in the S&A/QAPP. A quality assurance summary for the project is included in 3.5.

3.3.2. Sampling Locations

The individual sampling locations were selected to assess particular areas of the site. Each location is briefly described to indicate the selection rationale. Sampling locations that are described which could not be sampled during this program are indicated as such. Sampling locations are illustrated in Figure 3.1 and are described as follows:

Monitoring Well MW-1

Monitoring Well MW-1 was installed in the eastern portion of the site at the corner of Abbot Road and North Loop. This well position was selected as an upgradient "background" monitoring point to determine groundwater quality prior to movement through the U.S. Coast Guard Station at Fort Totten. This well position is located on the sites highest elevation with surrounding vegetation consisting of grass and trees. It should also be

noted that a battery of gun mounts "Battery King" was decommissioned and buried below the recreation field just upgradient of MW-1.

Monitoring Well MW-2

Monitoring Well MW-2 was installed downgradient of building #624. This well position was selected to intercept potential groundwater contaminants which may have been released in and around this building. Past DOD activities performed in this area include vehicle repair, and electrical equipment maintenance. In addition, there is some evidence that the area behind building #624 was used as a solid waste "trash" dump.

Monitoring Well MW-3

Monitoring Well MW-3 was installed downgradient of building #625. This well position was selected to intercept potential groundwater contaminants which may have been released in and around this building. Past DOD activities performed in this area include fuel storage in above ground tanks. Dark colored fuel stains were observed on surface soils near this building during the site visit.

Monitoring Well MW-4

Monitoring Well MW-4 was installed downgradient of building #619 "bunker". This well position was selected to intercept potential groundwater contaminants which may have been

released in and around this building. In addition, this well location would also intercept any contaminant migration from building #624 and #625. Past DOD activities in and around building #619 may have resulted in the release of solvents, oils, pesticides, and mercury.

Monitoring Well MW-5

Monitoring Well MW-5 was installed in the vicinity of buildings #610, #611, and #612. This well location was selected to detect potential groundwater contaminants which may have been released in and around these buildings. In addition, this well location would also intercept any contaminant migration from buildings #624 and #625. The past DOD activities that took place at this location were primarily administrative in nature with some light industrial maintenance. However, this area is contiguous to the waterfront area where torpedoes, mines, and search lights were developed and maintained.

Soil Sample S-1

Soil Sample S-1 was collected in the eastern corner of the U.S. Coast Guard Station at Fort Totten near MW-1. This location was selected as an upgradient location to serve as a background sample.

Soil Sample S-2

Soil Sample S-2 was collected near MW-3 down slope from bldg. #625. This location was selected because of dark colored fuel stains (possibly paraffins) on surface soils which were observed during the site visit.

Soil Sample S-3

Soil Sample S-3 was collected at the east corner of building 625 down slope of MW-2 in an area of past oil storage/use activities, and possible spills and leaks.

Soil Sample S-4

Soil Sample S-4 was collected near MW-2 located down slope of building #624. This location was selected due to past maintenance and repair activities which took place in this area.

Soil Sample S-5

Soil Sample S-5 was collected approximately 40 feet behind building #623. This sample location was selected due to suspected solid waste dumping "trash" in this area during past DOD activities.

Soil Sample S-6

Soil Sample S-6 was collected at the corner of Willets Street and the access road leading shoreside into the U.S. Coast Guard Station at Fort Totten. This location was selected to

detect potential contaminants down slope from buildings #609, #610, #611, and #612.

Soil Sample S-7

Soil Sample S-7 was collected near MW-5. This location was selected to detect contaminants down slope of buildings #624 and #625, and to detect contaminants in the area of buildings #610, #611, and #612.

Soil Sample S-8

Soil Sample S-8 was collected approximately 30 feet down slope of building #619 "bunker" and in between buildings #615 and #614. This location was selected to detect potential contamination which may have been released from and around these buildings. This is also the area where past DOD industrial activity was the greatest.

Soil Sample S-11

Soil Sample S-11 was collected near building #609. This location was selected for PCB analysis because an electrical transformer station is and has been located there for some years.

Soil Sample S-12

Soil Sample S-12 was collected on the east corner of building #625. This location for a PCB sample was selected because of past oil storage activities and accidental spills or leaks which caused staining on surrounding soils.

Wipe Test W#1

Wipe Test W#1 were taken in the left room facing the bay in building #619. This location was selected because of past DOD storage activities of DDT in this room.

Wipe Test W#2

Wipe Test W#2 was taken in the right room facing the bay in building #619. This location was selected because of past DOD storage activities of DDT in this room.

Wipe Test W#3

Wipe test W#3 was taken in the right room facing the bay in building #624. This location was selected because of potential past DOD storage activities of DDT in this room.

Wipe Test W#4

Wipe test W#4 was taken in the left room facing the bay in building #624. This location was selected because of potential past DOD storage activities of DDT in this room.

Sediment Samples (Sed-1, Sed-2, & Sed-3)

Three sediment samples were collected in the bay along the seawall at the U.S. Coast Guard Station. The three samples were taken at 100 foot intervals between the pier and the back of building #615. The samples were collected at a depth of 6 inches. These locations were selected to detect potential

contaminant
~~containment~~ run-off from shore which might have occurred during past DOD activities.

3.3.3. Sampling Methods

Detained sampling and analytical procedures are provided in the S&A/QAPP. Brief summaries of methodology are presented in the following section and include methods for groundwater, soil, and wipe tests.

3.3.3.1. Groundwater Sampling

At least 5 well casing volumes were removed from each monitoring well prior to groundwater sampling. This was necessary to assure that the samples collected were representative of the water quality in the aquifer. Table 3.4 presents well purging data. Sampling of the five monitoring wells involved the following steps:

- measurement of static water level
- purging out 5 well casing volumes
- allow groundwater to recover to static level
- collection of sample

A teflon bailer was employed for well purging and sample recovery.

TABLE 3.4
WELL PURGING DATA

	SWL (feet)	WELL VOLUME (gallons)	VOLUME PURGED (gallons)	WELL VOLUME PURGED
MW-1	14.70	2.40	12.00	5
MW-2	18.35	1.25	6.25	5
MW-3	16.09	2.45	12.30	5
MW-4	10.85	0.758	3.79	5
MW-5	19.75	0.905	4.60	5

SWL = Standing water level to top of casing

3.3.3.2. Soil Sampling

Soil samples were collected at 10 locations throughout the site. A hand-driven soil auger was employed to collect each soil sample from a depth of approximately 6 inches. Samples were scooped with a stainless steel spoon into a pyrex bowl and homogenized prior to aliquotting into sample containers. Volatile Organic compound samples were collected prior to homogenization to minimize loss of volatile components.

3.3.3.3. Wipe Tests

Wipe tests were collected at four locations by wiping a 2" x 2" hexane rinsed gauze pad over a 9" x 9" area on each floor area tested. The gauze pad was handled with forceps. The wipe test sample "gauze pad" was then returned to its container "VOA Vial" for analysis.

3.4 Analytical Methods

The analytical methods employed to analyze samples are presented in detail in the S&A/QAPP. Table 3.5 summarizes the specific analytical methods used.

3.5 Quality Assurance

As required by the Fort Totten S&A/QAPP a quality assurance summary report was to be prepared upon the conclusion of all sample collection, analysis and data reduction activities. The purpose of such a report is to "summarize and present all pertinent quality control data and discuss the influence of quality assurance issues on the overall data quality." This report consists of the discussion and results provided in this section.

As applied to field measurements and laboratory analyses performed during this project, Quality Assurance is the demonstration and documentation of data quality. These procedures include the recording of all quality control activities undertaken by the field team, and the assessment of analytical performance of the subcontract laboratory through the analysis of internal and external control and audit samples.

3.5.1. Field Sampling and Measurements

All field sampling was in compliance with the S&A/QAPP; all field samples and QC samples were collected as planned; all wells were surveyed before sampling, proper decontamination procedures were utilized, field analytical parameters of conductivity, pH,

TABLE 3.5
ANALYTICAL SUMMARY

Location	Sample Date	Sample No.	Parameters	EPA Method No.
MW-1	7/22/87	2332-301	Volatile Organics Extractable Organics Total Metals	8240 625 200 Series
MW-2 (triplicate)	7/22/87	2332-302, 2332-306, 2332-307*	Volatile Organics Extractable Organics Total Metals	8240 625 200 Series
MW-3	7/22/87	2332-303	Volatile Organics Extractable Organics Total Metals	8240 625 200 Series
MW-4	7/22/87	2332-304	Volatile Organics Extractable Organics Total Metals	8240 625 200 Series
MW-5	7/23/87	2332-305	Volatile Organics Extractable Organics Total Metals	8240 625 200 Series
Well Sample Blk	7/22/87	2332-308, 2332-309*	Volatile Organics Extractable Organics Total Metals	8240 625 200 Series
Well Travel Blk		2332-310, 2332-311*	Volatile Organics	8240
Well Travel Blk #2	7/23/87	2332-360, 2332-359*	Volatile Organics	8240
S-1	7/20/87	2332-320	Volatile Organics Extractable Organics Total Metals	8240 8270 7000 Series
S-2	7/20/87	2332-321	Volatile Organics Extractable Organics Total Metals	8240 8270 7000 Series
S-3	7/20/87	2332-322, 2332-328, 2332-329*	Volatile Organics Extractable Organics Total Metals	8240 8270 7000 Series
S-4	7/20/87	2332-323	Volatile Organics Extractable Organics Total Metals	8240 8270 7000 Series

TABLE 3.5 (Continued)
ANALYTICAL SUMMARY

Location	Sample Date	Sample No.	Parameters	EPA Method No.
S-5	7/20/87		Volatile Organics Extractable Organics Total Metals	8240 8270 7000 Series
S-6	7/20/87	2332-325	Volatile Organics Extractable Organics Total Metals	8240 8270 7000 Series
S-7	7/20/87	2332-326	Volatile Organics Extractable Organics Total Metals	8240 8270 7000 Series
S-8	7/20/87	2332-327	Volatile Organics Extractable Organics Total Metals	8240 8270 7000 Series
S-11	7/20/87	2332-330	PCBs	3540 & 8080
S-12 (triplicate)	7/20/87	2332-331, 2332-358, *2332-332	PCBS	3540 & 8080
Soil Sample Blank	7/20/87	2332-332, *2332-333	Volatile Organics Extractable Organics Total Metals	8240 8270 7000 Series
Soil Sample Blank #2	7/20/87	2332-337	PCBs	3540 & 8080
Soil Travel Blank #1	7/20/87	2332-335, *2332-336	Volatile Organics	8240
Sed-1 (triplicate	7/21/87	2332-341, 2332-344, *2332-345	Volatile Organics Total Metals Petroleum Hydrocarbons	8240 7000 Series 503 A,D Std Methods
Sed-2	7/21/87	2332-342	Volatile Organics Total Metals Petroleum Hydrocarbons	8240 7000 Series 503 A,D Std Methods
Sed-3	7/21/87	2332-343	Volatile Organics Total Metals Petroleum Hydrocarbons	8240 7000 Series 503 A,D Std Methods

TABLE 3.5 (Continued)
ANALYTICAL SUMMARY

Location	Sample Date	Sample No.	Parameters	EPA Method No.
Sediment Sample Blank	7/21/87	2332-346, *2332-347	Volatile Organics Total Metals Petroleum Hydrocarbons	8240 7000 Series 503 A,D Std Methods
Sediment Travel Blank	7/21/87	2332-348, *2332-349	Volatile Organics	8240
Wipe #1	7/21/87	2332-350 2332-354, *2332-355	DDT, DDE, DDD	608
Wipe #2	7/21/87	2332-351	DDT, DDE, DDD	608
Wipe #3	7/21/87	2332-352	DDT, DDE, DDD	608
Wipe #4	7/21/87	2332-353	DDT, DDE, DDD	608
Wipe Sample Blank	7/21/87	2332-356, 2332-357	DDT, DDE, DDD	608

* Note these samples were sent to MRDED-L for QA and have not been included in this report.

and temperature were recorded as required, and chain of custody procedures including sample labeling were adhered to.

3.5.2. Metcalf & Eddy Laboratory Analysis, Systems and Performance Audit

An on-site laboratory systems audit would normally be performed by Metcalf & Eddy to assure that the subcontractor laboratory is capable of maintaining the necessary minimum levels of instrumentation and levels of experience of personnel, and that laboratory quality assurance/control procedures are in conformance with the requirements of the QAPP. However, since the Army Corps of Engineers, Missouri River Division Laboratory (MRD) decided to conduct a performance and system audit of Resource Analysts, Inc. (RAI) to validate their ability to perform work under this contract, Metcalf & Eddy did not schedule any additional audits. The independent performance audit conducted by the COE involved preparation and analysis of QA samples prepared by the Army COE Missouri River Division (MRD) Quality Assurance Laboratory. The purpose of those QA samples was to provide an independent determination of any problem areas in sample handling, analysis, and reporting by the subcontract laboratory. The program also provided data to document performance of the various measurement systems. Quality assurance samples were submitted as blind samples to RAI for comparison of results. The QA samples submitted had been selected by the MRD QA Laboratory to include analyses of duplicate standard pairs, low and high range standards, as well

as blanks. The QA samples were prepared in certified Organic free water, not actual site samples. The results of the MRD audit were not made available to M&E, only that MRD had approved RAI Laboratory to conduct the required analyses under this contract. The laboratory related quality control activities undertaken during the course of this project were designed to assure that measurement systems as well as activities specific to a given site evaluation were under control.

The ongoing laboratory related quality control activities consisted principally of the evaluation of data obtained from the following sample categories: (a) calibration standards, (b) working standards, (c) field samples, (d) laboratory duplicates, (e) laboratory spikes, (f) laboratory methods blanks, (g) trip blanks, (h) laboratory split samples. Procedures to be used to evaluate that data would include calculation of arithmetic means, standard deviations, relative percent differences for duplicate samples and comparison of differences between standards of spiked and experimentally determined values expressed as percent recovery. Identification and treatment of outliers was not appropriate as no marked deviations were noted in the data set. The information used to evaluate the laboratory quality control activities was to be obtained from the subcontract laboratory performing the analytical work. An assessment of the laboratory's compliance with stated objectives presented in the Fort Totten S&A/QAPP is summarized below.

Quality Assurance data are presented in tables F.1 through F.5 in Appendix E. The tables include results for field

duplicate analysis, laboratory sample spikes, laboratory replicates, laboratory sample spikes, surrogate Recoveries and laboratory control data.

All Field Duplicate Analysis with the exceptions of Chromium and Lead in MW-2, Silver and Cadmium in S-3, and Silver and Barium in Sed-3 were within QA objectives as presented in Table F.1. Laboratory Sample Spikes were within QA objectives with the exception of Selenium in MW-1, S-1, and S-7, Arsenic in S-7, and petroleum hydrocarbons in Sed-1 field duplicate, as presented in Table F.2. Laboratory replicates, as presented in Table F.3, were within QA objectives with the exception of Barium in MW-1. The Surrogate Standard Recoveries for volatile compounds as presented in Table F.4 were within the control range with the exception of D(4)-1-2-Dichloroethane in S-3, D8-Toluene in MW-2, MW-2 Field Duplicate, MW-3, MW-4, MW-5 Lab Replicate 2, Well Travel Blank, and Lab Controls D0027, and D0012. Surrogate Standard Recoveries for Extractable organics were within control ranges with the exception of 2-Fl-Phenol in S-3 Field Duplicate, S-5, Blank A014 S-8, and S-8 Lab Duplicate, Nitrobenzene and 2-Fl-Biphenyl in S-1, S-2, S-3, S-3 Field Duplicate, S-7, Blank A014, S-8, and S-8 Lab Duplicate, and Terphenyl-d14 in S-8 as described in Table F.5.

3.5.3 RAI Quality Assurance

Wells

Spike recovery was below control limits for selenium. Since both the calibration and verification and the laboratory control sample were well within control limits, this probably represents a matrix effect.

Silver recovery was low in the laboratory control sample, however, since spike recovery was well within control, the data was accepted for the series.

Silver, barium, cadmium and chromium for all samples and lead for "Well #4 2332-304", (our laboratory number 10465-12) were analyzed by method 7241 (Graphite Furnace Atomic Absorption Spectroscopy).

Surrogate recoveries for d_8-toluene were consistently low for these samples. Some fell just below acceptance levels. This would not have effected the detection of toluene however. No toluene was found in the samples. Methylene chloride was found in an instruments blank at 11 ug/L. It was not found in the samples. One of the laboratory replicates had higher than normal recovery for methylene chloride. This elevated level is likely due to lab contamination. Matrix spike recoveries were acceptable.

BIS-2-ethylhexyl phthalate was found in the blank for semivolatiles at a level equivalent to 100 ug/L. Some samples contained this compound at similar levels. These values should be considered suspect. Matrix spike recoveries for the

semivolatiles ranged from 38 to 134% recovery. While some values were outside project limits, they fell within EPA CLP acceptance criteria.

Soils

Spike recoveries were below control limits for arsenic in the soils samples and selenium in both the soil and water samples. Since both the calibration verification and the laboratory control sample were well within control limits, this probably represents a matrix effect.

Silver recovery was low in the laboratory control sample, however, since spike recoveries were well within control for both the soil samples and the water sample, the data was accepted for the series.

Silver, Barium, Cadmium, Chromium, and Lead were analyzed by Method 6010 (Inductively Coupled Argon Plasma Spectroscopy) ICP.
No problems were encountered for Volatile Organics.
No problems were encountered for Acid/Base Neutral Extractable Organic Compounds. No analytical problems were encountered for PCB's.

Sediments

Spike Recoveries were below contract limits for arsenic in the soil samples for the selenium in both the soil and water samples. Since both the calibration verification and the laboratory control sample were well within control limits, this probably represents a matrix effect.

Silver recovery was low in the laboratory control sample, however, since spike recoveries were well within control for both the soil samples and the water sample, the data was accepted for the series.

Silver, barium, cadmium, chromium, and lead were analyzed by method 6010 (Inductively Coupled Argon Plasma Spectoscopy). Lead was analyzed in the water sample "2332-346 FT Sed Sam Blk", (our laboratory number 10,430-13) by method 7421 (Graphite Furnace Atomic Absorption Spectroscopy).

Recoveries were low for the volatiles laboratory control sample. Methylene chloride was found in the water blank at 13 ppb but was not found in the samples. Toluene was found at 0.7 ug/g in the soil blank but was not found in the samples. The duplicate water matrix spikes showed higher than expected recoveries (113 to 171%). The detection of volatiles was not effected however, and no compounds were detected in the samples. Surrogate recoveries for all samples were acceptable except for BFB in 2332-346 FT Sed Blk which was 83% with an acceptance limit of 86%.

Matrix spike recovery for oil and grease was 156% and 60% for the two soils spiked. Inhomogeneity of the soils contributed to the error.

Wipes

Wipes were analyzed for pesticides by electron capture gas chromotograph and confirmed using Hall Detector. Interferences in the wipes may have been present and raised detected

quantities. These samples could not be subsampled for precision and occurance determination. Laboratory Control Sample results for pesticides were within CLP acceptance limits except for Endrin and DDT which showed 51 and 27% recovery. CLP criteria are 56 and 36% respectively. The calibration for DDT is updated with each calibration check sample to compensate for changing DDT breakdown characteristics. This is reflected in the reported concentration for DDT in the mid-range calibration QC data.

3.5.4 Summary

The above observations are minor in nature, thus the analytical sample data presented within this report is satisfactory and completely usable for the original purpose of this site characterization.

4.0 ELECTRO-MAGNETIC SURVEY

4.1 Introduction

An electro-magnetic (EM) survey was performed at the U.S. Coast Guard Station at Fort Totten on December 8-10, 1986. The purpose of this survey was to detect potential buried ordnance and drums, and to verify that groundwater monitoring wells could be installed safely without drilling into buried obstructions such as water lines, power lines, and communications lines.

The instrument employed in this survey was a GEONICS EM-31. This instrument is direct "continuous" reading in millisiemens per meter (ms/m). It has an effective exploration depth of about 6 meters and is composed of a self-contained

dipole transmitter and dipole receiver which operates on a 9.8 kHz frequency. The EM-31 is powered by alkaline "C" cell batteries and has conductivity ranges from 3 to 1,000 ms/m.

4.2 Subsurface Conditions

Prior to performing the EM survey, research at the Post Engineers Office at Fort Totten was conducted. This research consisted of obtaining all known drawings of underground utilities which included communications lines, potable water lines, fire fighting water lines, electrical service lines, storm drainage lines, and sewer lines. During this research, some utility drawings were obtained. However, it was learned that many drawings of underground utilities at Fort Totten were destroyed during a fire. It was also learned that the U.S. Coast Guard Station property at Fort Totten is a maze of abandoned underground cables which served the old gun emplacements and overall communications for the site. During the EM survey, some of these cables could be seen in various states of decay penetrating above the ground surface. Drawings of these abandoned cable positions were not available.

4.3 Method

The U.S. Coast Guard property at Fort Totten was mapped as a grid system prior to performing the EM survey. The grid consisted of 12' x 12' squares which were measured off in horizontal and vertical lines with cloth tapes. The horizontal and vertical lines were then walked while carrying the EM-31

which was set on 500 mv at a maximum detection range of 30 mmho/m. All readings at or above 30 mmho/m during the survey were marked with a wooden stake. Consistent readings in straight lines were verified with utility location drawings or assumed to be abandoned undocumented utility lines. Single non-consistent EM hits were marked and later re-surveyed in an attempt to establish a pattern.

4.4 Results

As expected, the EM-31 detected all known utilities as well as undocumented abandoned utilities. Many abandoned utility lines detected were discussed with personnel of the U.S. Coast Guard Station. Their local knowledge of this area verified the existence of these abandoned lines. U.S. Coast Guard personnel recalled unearthing many of these lines during station improvements and maintenance.

The only major EM hit which could not be explained was in the northeast area of the recreation field as shown in Figure 4.1. This area covers a buried fortification "Battery King" which might account for the unexplained EM hits. It was later learned that Battery King still contains the metal ring gun mounts, although the guns themselves were removed during the battery's demobilization. It was also learned that a mini-railway system existed between Battery King and the underground bunker munitions storage facility on Fort Totten's northern tip. The railway was used to transport munitions to Battery King and may still exist in whole or in part. Metal pieces of this

railway would include axles, wheels, tracks, spikes, and rail car bodies.

4.5 Conclusion

The subsurface area below the U.S. Coast Guard Station at Fort Totten is a maze of utility lines and debris. This was ascertained from old and new site drawings, interviews with Coast Guard and Army personnel, visual observations, and EM survey results. Historically, ordnance has been unearthed along the waterfront of the U.S. Coast Guard Station and on U.S. Army property to the north. This was ascertained by interviews with U.S. Coast Guard and U.S. Army personnel. However, no buried ordnance or drums were found on the U.S. Coast Guard Station property by M&E or the present U.S. Coast Guard personnel at the station. In addition, the majority of the EM survey data resulted in continuous and consistent detections which are interpreted to as buried utilities. The exception to this is the northeast area of the recreation field as shown in Figure 4.1. This area contains magnetic anomolies which could be the remnants of a buried rail road system that serviced Battery King. It can not be concluded with certainty that buried ordnance or drums do not exist on this property without performing excavations. However, it is unlikely that buried ordnance and drums exist on the U.S. Coast Guard property. This is based on interviews with U.S. Coast Guard personnel presently assigned to Fort Totten, results from the existing EM survey data, drawings and past DOD activities that took place on this property.

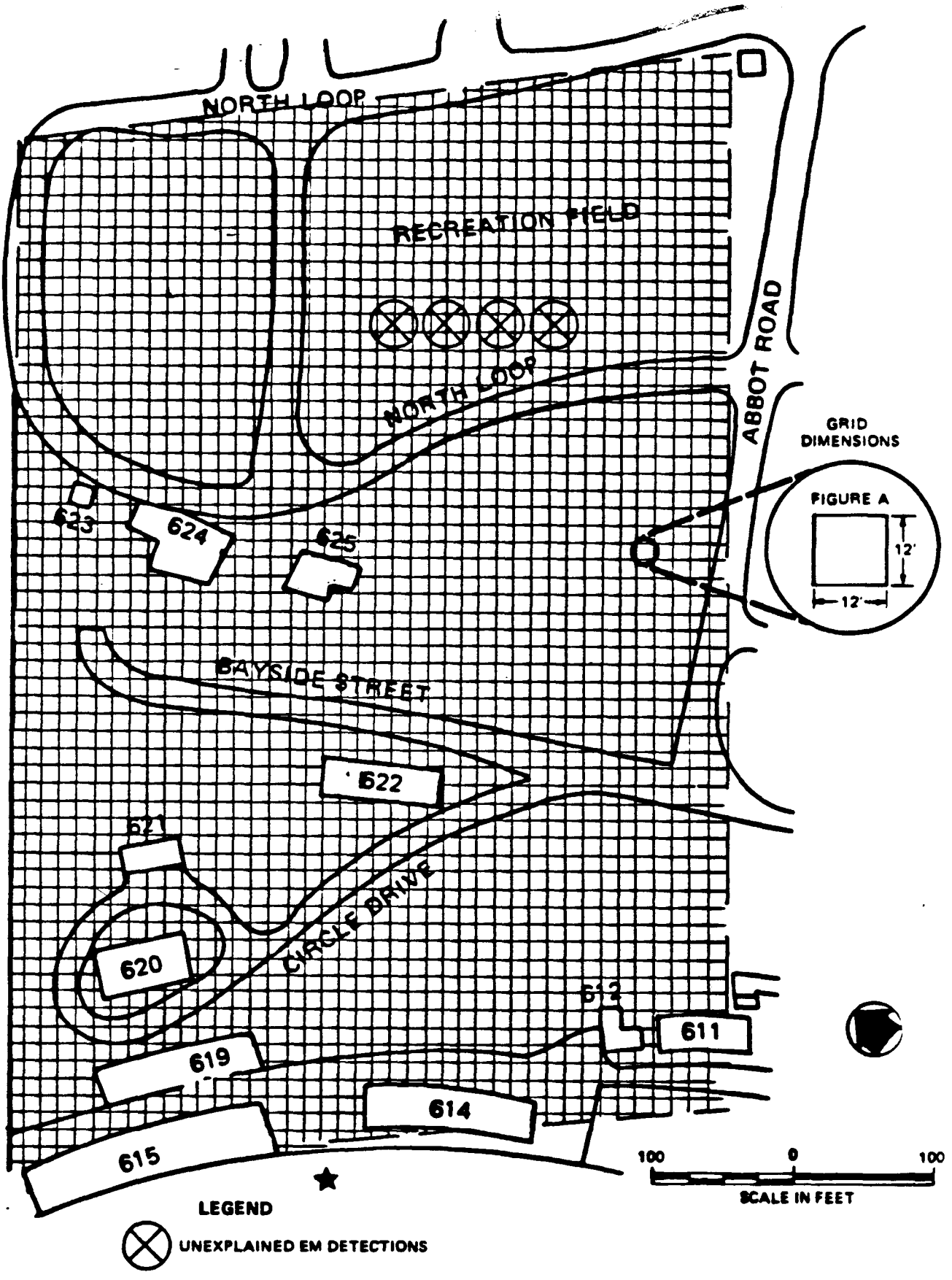


FIGURE 4.1 EM SURVEY GRID SPACING

5.0 BUNKER (BUILDING #619) PENETRATION

5.1 Introduction

The bunker (building #619) which stands at the east corner of the U.S. Coast Guard property at Fort Totten across from building #615 was thought to have a sealed room. This assumption was made due to the fact that approximately three-fourths of the structure has usable space and the remaining one-fourth (east corner) appears to be sealed with concrete aggregate. Concrete aggregate was also used to construct the entire bunker.

The bunker was constructed in the early 1900's. It was used first as a communications center and later as a storage area. DDT was once stored in this structure, but now it is used by the U.S. Coast Guard Station as a general equipment storage area.

5.2 Method

A 6-inch diameter diamond tip barrel coring devise powered by a 6 hp electric motor was used to core through the front outside wall and interior wall of the suspected room. During the coring, operators used supplied air breathing systems and continuously monitored the ambient air for Organic vapors, radiation, and explosive levels. Air monitoring was performed and supplied air was breathed in the event wall penetration resulted in a contaminant release.

The length of the coring barrel was 36 inches at full penetration. A 36-inch barrel was selected since the average thickness of the bunker wall in usable spaces was 18 inches.

5.3 Results

The coring barrel penetrated the front outside bunker wall to a depth of 36 inches without reaching an interior space. Coring was again performed on the inside bunker wall which was accessed through the interior space. During the coring of the interior wall, a 2-inch void was encountered at 16 inches of penetration. The coring barrel passed through the 2-inch void and continued coring into the next wall until a depth of 36 inches was achieved. At this depth no interior space was found to exist in the suspected room.

5.4 Conclusion

The east end of the bunker (building #619) does not appear to be a sealed room. This area of the bunker appears to be solid reinforced aggregate concrete. The matrix of the aggregate in the suspected room is identical to that of the usable rooms and walls. This probably means that all parts of the bunker were constructed at the same time and that a room was not later sealed off. In addition, construction of the bunker appears to be prefabricated. Walls were probably pre-formed in pieces and later assembled by a crane. This would account for the 2-inch void between the bunker interior wall and the suspected room. Lastly, the east corner faces Long Island Sound which would be where a potential attack would come from. It is, therefore, suspected that the east wall of the bunker was given extra strength as was the roof. Both the roof and the east bunker wall "suspected room" are constructed to a 7-foot thickness of reinforced concrete aggregate.

6.0 PRESENTATION OF RESULTS

This section contains a summary of sample analysis results and a presentation of groundwater standards and soil clean up criteria associated with the analytes measured. The analytical results are discussed and compared to the standards and criteria in Section 7 to determine the presence or absence of contamination at the site.

6.1 Analytical Results

Table 6.1 summarizes the monitoring well and other aqueous sample data. Soil sample data are presented in Table 6.2, sediment sample data are presented in Table 6.3 and Wipe sample data is presented in Table 6.4. Only analyte concentrations greater than detection limits were reported in Tables 6.1-6.4. The complete analytical results are presented in Appendix D.

6.2 Water and Soil Standards and Criteria

To present a basis for comparison of analyte concentrations measured to those acceptable or suggested for groundwater and soils, National Priority Drinking Water Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs) developed under the Safe Drinking Water Act, NY State groundwater standards, US soil background metal levels, NJ soil cleanup objectives and NJ surrogate or action levels of organics in soils have been presented in Tables 6.5 and 6.6.

The NJ objectives are presented to place the concentrations of metals and volatile organics detected in soil at the site into perspective, because no New York State Standards or criteria were

TABLE 6.1. AQUEOUS SAMPLES

			MW-1 2332-301	MW-2 2332-302	MW-3 2332-303	MW-4 2332-304	MW-5 2332-305	Samp Blk 2332-308	Trav Blk #1 2332-310	Trav Blk #2 2332-360
Volatile Organics			ND	ND	ND	ND	ND	ND	ND	ND
Semi-Volatile Organics										
Bis(2 ethylhexyl)phthalate)		ug/L	120	120	170	120	120	110	NA	NA
Total Metals										
25 Arsenic	as As	ug/L	<10	16	<10	<10	<10	<10	NA	NA
1000 Barium	as Ba	ug/L	200	230	<100	150	<100	<100	NA	NA
50 Chromium	as Cr	ug/L	31	97	32	72	<25	<10	NA	NA
25 Lead	as Pb	ug/L	7	30	7	330	<5	<5	NA	NA
FIELD MEASUREMENTS										
pH	pH units		6.6	6.4	7.5	6.5	5.6	NM	NM	NM
conductivity	umhos		430	210	470	790	210	NM	NM	NM
temperature	C		14	14	13	17	14	NM	NM	NM

NA - Not analyzed for this parameter
* units ug/kg
Note: only analyte concentrations greater than detection limits have been reported
NM = Not measured
Samp Blk = Sample Blank
Trav Blk = Travel Blank
ND = Not detected

TABLE 6.2. SOIL SAMPLES

		S-1 2332-320 ug/kg*	S-2 2332-321 ug/kg*	S-3 2332-322 ug/kg*	S-4 2332-323 ug/kg*	S-5 2332-324 ug/kg*	S-6 2332-325 ug/kg*	S-7 2332-326 ug/kg*	S-8 2332-327 ug/kg*	Samp Blk 2332-333 ug/L	Trav Blk 2332-335 ug/L	RECH Blank C-3839 ug/kg*	Lab Blk B-A104 ug/kg*	Lab Blk C-3816 ug/kg*
Volatile Organics														
Methylene chloride		<500	<500	<500	<500	<500	<500	<500	<500	31	12	1,400	NA	3
Toluene		<500	<500	<500	<500	<500	<500	<500	<500	5	6	1,000	NA	1.6
Semi Volatile Organics														
Fluoranthene		<300	2,000	TRACE	<300	TRACE	700	<300	600	<10	NA	NA	<300	NA
Pyrene		<300	1,700	TRACE	<300	<300	400	<300	TRACE	<10	NA	NA	<300	NA
Benzo(a)anthracene		<300	1,300	<300	<300	<300	TRACE	<300	<300	<10	NA	NA	<300	NA
Chrysene		<300	1,000	<300	<300	<300	TRACE	<300	<300	<10	NA	NA	<300	NA
Bis(2ethylhexyl)phthalate		700	700	1,500	1,400	1,700	1,300	1,500	1,000	53	NA	NA	700	NA
Benzo(b)fluoranthene		<300	2,100	<300	<300	TRACE	700	<300	<300	<10	NA	NA	<300	NA
Benzo(e)pyrene		<300	1,400	<300	<300	<300	700	<300	<300	<10	NA	NA	<300	NA
Ideno(1,2,3-c,d)pyrene		<300	600	<300	<300	<300	<300	<300	<300	<10	NA	NA	<300	NA
Benzo(g,h,i)perylene		<300	700	<300	<300	<300	<300	<300	<300	<10	NA	NA	<300	NA
Total Metals														
Silver	as Ag	<1,000	1,100	1,100	<1,000	<1,000	<1,000	<1,000	6,500	<10	NA	NA	NA	NA
Arsenic	as As	19,000	11,000	15,000	4,900	8,600	13,000	20,000	2,700	<10	NA	NA	NA	NA
Barium	as Ba	94,000	88,000	76,000	69,000	50,000	100,000	57,000	16,000	<100	NA	NA	NA	NA
Cadmium	as Cd	<700	<500	530	<500	<500	1,200	600	<800	<5	NA	NA	NA	NA
Chromium	as Cr	39,000	22,000	32,000	11,000	12,000	28,000	27,000	8,600	<10	NA	NA	NA	NA
Mercury	as Hg	97	140	420	830	740	390	1,200	70	<0.5	NA	NA	NA	NA
Lead	as Pb	40,000	100,000	80,000	100,000	250,000	140,000	45,000	57,000	<5	NA	NA	NA	NA
Selenium	as Se	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000	<10	NA	NA	NA	NA

TABLE 6.2 (Continued). SOIL SAMPLES

	S-11 2332-330 ug/kg*	S-12 2332-331 ug/kg*	Samp Blk #2 2332-337 ug/L	Lab Blk B-P102 ug/kg*
PCBs				
PCB-1242	<80	<80	<80	<80
PCB-1254	<160	<160	<160	<160
PCB-1221	<80	<80	<80	<80
PCB-1232	<80	<80	<80	<80
PCB-1248	<80	<80	<80	<80
PCB-1260	<160	<160	<160	<160
PCB-1016	<80	<80	<80	<80

Detection limits of aqueous samples are lower than soil samples
*dry wt basis
NA - Not analyzed for this parameter

TABLE 6.3. SEDIMENT SAMPLES

			Sed-1 2332-341	Sed-2 2332-342	Sed-3 2332-343	Sed Sample Blk 2332-346	Sed Travel Blk 2332-348
Volatile Organics			ND	ND	ND	ND*	ND*
Total Metals							
Arsenic	as As	ug/kg	4,900	5,000	2,800	<10*	NA
Barium	as Ba	ug/kg	<10,000	18,000	10,000	<100*	NA
Chromium	as Cr	ug/kg	13,000	19,000	12,000	<10*	NA
Mercury	as Hg	ug/kg	270	200	1,500	<.5*	NA
Lead	as Pb	ug/kg	210,000	225,000	270,000	<5*	NA
Petroleum Hydrocarbons		ug/kg	220,000	280,000	150,000	<1,000*	NA

NA - Not analyzed for this parameter
* units ug/L
Note: only analyte concentrations greater than detection limits have been reported
NM = Not measured
Samp Blk = Sample Blank
Trav Blk = Travel Blank
ND = Not detected

TABLE 6.4. WIPE SAMPLES

	Wipe 01 2352-350		Wipe 02 2352-351		Wipe 03 2352-352		Wipe 04 2352-353		Wipe Sample Blk 2352-356		
	Concentration (ug/wipe)	Detection Limit (ug/wipe)	Concentration (ug/wipe)	Detection Limit (ug/wipe)	Concentration (ug/wipe)	Detection Limit (ug/wipe)	Concentration (ug/wipe)	Detection Limit (ug/wipe)	Concentration (ug/wipe) Rep 01	Rep 02	Detection Limit (ug/wipe)
4,4' - DDT	4.2	0.01	1.7	0.01	3.2	0.01	4.1	0.01	ND	ND	0.01
4,4' - DDE	1.1	0.01	0.29	0.01	0.05	0.01	0.2	0.01	ND	ND	0.01
4,4' - DDD	0.09	0.01	0.42	0.01	0.53	0.01	0.8	0.01	ND	ND	0.01

ND = Not Detected

TABLE 6.5. WATER CRITERIA

	NATIONAL PRIMARY DRINKING WATER REGULATIONS MCLG (1)	MCL (2)	NEW YORK STATE GROUNDWATER STANDARDS (3)	DATA RANGES
	ug/L		ug/L	ug/L
Arsenic	50	50	25	<10-10
Barium	1,500	-	1,000	<10-16
Chromium	120	50	50	<10-97
Lead	20	50	25	<5-330
bis(2ethylhexylphthalate)	-	-	4,200	110-170

Footnotes:

1. MCLG - Maximum contaminant level goal; proposed values taken from 50 Federal Register 46936 (November 13, 1985).

2. MCL - Maximum contaminant level; interim guidance levels.

3. Water Quality Regulations, New York State Department of Conservation 11/29/84 and Environmental 8/31/78.

TABLE 6.6. SOIL CRITERIA

	DATA RANGES ug/kg	NJ Action Levels
Volatile Organics	<500	1,000
Extractable Organics	<300-1,700	10,000

	NJ Background[1,2] ug/kg	U.S Background[3] ug/kg	Data Ranges ug/kg	NJ Cleanup Levels[3]
Silver	NA	90	<1,000-4,500	5,000
Arsenic	NA	1,100-16,700	2,700-20,000	20,000
Barium	NA	NA	16,000-100,000	NA
Cadmium	1,000-4,000	10-1,000	<500-1,200	3,000
Chromium	5,000-48,000	1,000-1,500,000	8,600-39,000	100,000
Mercury	NA	10-4,600	70-1,200	1,000
Lead	1,000-180,000	2,000-200,000	45,000-250,000	250,000-1,000,000
Selenium	10-40,000	10-5,000	<1,000	4,000

Footnotes:

1. NJ Dept. of Environmental Protection, Summary of Approaches to Soil Clean Up Levels, January 1987.
2. NJ Cleanup Objectives cited to put the level of soil contamination into perspective. No New York Guidance is available.
3. NJ established surrogate or action level (1 ppm volatile organics in soil).

identified. The NJ regulations listed are in no manner applicable to the Fort Totten, NY site. The New Jersey Department of Environmental Protection guidance related to soil clean-up levels is included n Appendix G.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Introduction

The objective of this investigation was to provide a preliminary investigation to determine the presence or absence of chemical contamination which may have resulted from former DOD activities at Fort Totten and to determine the potential for contamination of local groundwater or surface water supplies. To accomplish this objective 5 groundwater wells were installed, and the following samples were collected from areas most suspect of contamination: 5 groundwater samples, 10 soil samples, 4 wipe samples, and 3 sediment samples.

New York State groundwater standards served as a basis for comparison. In the absence of New York soil clean-up regulations, New Jersey soil slean-up guidance levels were compared to analyte concentrations found.

7.2 Results

Volatile organic compounds were below detection limits for soils and groundwater, semivolatile organic compounds were measurable in some soil samples but well below NJ Clean-up criteria. PCBs in all soil samples were below detection limits. Although most total metal concentrations were below New York State groundwater standards, chromium and lead concentrations in MW-2 and MW-4 exceeded these. Mercury at 1200 ug/kg in (S-7) and

1500 ug/kg (Sed-3) exceeded NJ Cleanup criteria of 1000 ug/kg. Petroleum hydrocarbons concentrations of 220,000 ug/kg, 280,000 ug/kg and 150,000 ug/kg in Sed-1, Sed-2 and Sed-3, respectively exceeded NJ action levels. DDT, DDD, and DDE were detected in all wipe samples collected in buildings #619 and #624.

7.3 Conclusions

- There is little evidence of volatile or semivolatile organic compound contamination in groundwater, soils, or sediments.
- No evidence was detected of PCB contamination in soils near former locations of electrical transformers.
- Lead contamination in the groundwater of MW-2 and MW-4 may be attributed to past DOD activities. Lead is a common contaminant at former defense sites. However, chromium disposal has not been identified in available literature and may or may not be attributed to former defense activities. Mercury disposal onsite was reported. Therefore, mercury contamination in soils and sediments may have resulted from past DOD activities.
- Petroleum hydrocarbon concentrations in sediments exceeded NJ action levels. This contamination may be attributed to past DOD activities due to numerous oil spills at the site, that had occurred during DOD operations.
- The presence of pesticide contamination in buildings #619 and #624 is most probably due to past DOD activities. The storage of pesticides in these buildings had been reported in available information.
- Although results of the EM survey presented in Section 4 resulted in heavy interference from utility lines and debris, it is unlikely that drums or ordnance are buried onsite. This conclusion is based upon interviews with coast guard personnel, interpretation of survey data and existing drawings and available information regarding past DOD activities onsite.
- The east end of building #619 does not appear to contain a sealed room.

7.4 Recommendations

- Since the Scope of Work for this evaluation was to "confirm or deny" the presence of environmental contamination, it is recommended that a Risk Assessment at a minimum or an RI/FS at a maximum be performed since contamination does exist on this site. However, it should be noted that the groundwater on this site is not used as drinking water nor does it flow towards a drinking water source. Groundwater on this site discharges into Long Island Sound which is actually the Atlantic Ocean. The primary threat of concern to the environment and human health on this site appears to be the presence of mercury contamination in soil, marine sediments, and in the floor drainage system of building #615.

8.0 REFERENCE

Scope of Work for the Contamination Evaluation at Engineers School, Fort Totten, Queens New York, Project Number C02NY005700, September 26, 1986.

Law Environmental Services, Draft Report: "Defense Environmental Restoration Program Inventory Report for Former Nike Site HM-69 Homestead, Florida". September 1985.

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Water Quality Regulations Surface Water and Groundwater Classifications and Standards Section 703.5, 11/30/84 and 8/31/78.

New Jersey Department of Environmental Protection Summary of Approaches to Soil Cleanup Levels. January 1987.

Code of Federal Register Sections 261.31 & 261.33. July 1, 1985, pg. 266 and 374.

McMaster, B.N., Sosebee, J.B., Fraser, W.G., Govro, K.C., Jones, C.F., Grainger, S.A., and Civatarese, K.A., "Historical Overview of the Nike Missile System". September 1983.

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Barcelona, M.J. et. al., "Practical Guide for Groundwater Sampling", Illinois State Water Survey, SWS Contract Report 374, 1985, pp. 43-45.

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APPENDIX A

WELL LOGS AND FIELD DATA

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GEOLOGIC DRILL LOG

PROJECT: Army Corps of Engineers	JOB NO. 2332	SHEET 1 of 2	BORING NO. MW-1 (A-B)
LOCATION: Ft Totten	COORDINATES:	GROUND ELEV.:	TOTAL DEPTH: 33'
DRILL CONTRACTOR: R+R Int.	INSPECTOR: M. Zirbel	BEGUN: 6/2/87 10 am	
DRILL RIG: CME 75	DRILLER: J. Bucksav	FINISHED: 6/6/87	
HOLE SIZE: 11"	SAMPLER:	WEATHER: Oc. Cldy, Warm, humid, Rain	GROUNDWATER (DEPTH, EL.): 15.09' below Ground
CASING LEFT IN HOLE (DIA./LENGTH):	DRILLING FLUID: None (HSA)	TOP OF ROCK (DEPTH, EL.): —	

Depth	Sample Type/No.	Sample Depth	Sample Recovery	Soil Blows per 6 inches	Rock % Core Rec.	Elevation	Graphic Log	Description and Classification	Field Test	Notes
0	1	0-2	1.3	4-7-10-8				0-.5' Brown, dry, loose, silty f. sand, many fine roots .5-1.3' Brown, dry, compact, silty f. sand.		Hnu = 0 Rad. = norm. Hg Vapor at hole = 0
4'	2	4-6	1.6	8-13-13-13				4-4.6' Brown, moist, compacted, silty f. sand, some weathered pebbles 4.6-5.6' Brown, moist, compact, f. sand, tr. silt		Hnu = 0 Rad. = norm Rock at 5'
6'	3	6-7.3	1.3	7-5-50/.3'				6-6.3' Brown, moist, compact, silty f. sand. 6.3-6.9' Brown, moist, f. m. sand, compact 6.9-7.3' Brown, moist, silty f. sand		Hnu = 0 Rad = norm
	Split Spoon Refusal @ 7.3'									
	Auger Refusal @ 7.3'									
						Moved MW-1 ~15' SW (Downhill)				
8'	4	8-10	1.9	13-16-16-12				8-9.4' Brown, moist, compact, f. sand, tr. silt. Some black mottles 9.4-10' Brown, moist, compact, silty f. sand w/few pebbles, little Gravel		Hnu = 0 Rad = norm
10'	5	10-12	1.2	5-8-12-16				Brown, moist, compact, f. sand, trace m. sand, tr. silt; some black mottles		Hnu = 0 Rad: norm
15'	6	15-17	1.8	10-9-12-13				15-15.8 Brown, moist, Compact, f. sand, tr. silt, few small pebbles, black mottles. 15.8-16.5 gray/brown, moist, compact, f. sand + silt. 16.5-17 Brown, moist, compact, f. sand, silt, thin lenses of silt, black mottles		Hnu = 0 Rad = norm

MW-1A (samples 1–3); MW-1B (samples 4–6)

SAMPLE TYPES: SS: SPLIT SPOON, ST: SHELBY TUBE, R: ROCK CORE, O: OTHER	COMPLETION NOTES:	BORING NO.: MW-1

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GEOLOGIC DRILL LOG

PROJECT: Army Corps of Engineers Ft. Dix	JOB NO. 2332	SHEET 2 of 2	BORING NO. MW-1 (A+B)

DEPTH	SAMPLE TYPE/NO.	SAMPLE DEPTH	SAMPLE RECOVERY	SOIL BLOWS PER 6 INCHES	ROCK % CORE REC.	ELEVATION	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION		NOTES
20'	7	20-22	1.4	6-9-12-14				Brown, wet, compact, v.f. sand, w. silt, several pebbles, black mottles		Water between 20-22' est. 21' Hnu=0 Rad=norm
25	8	25-27	1.7	9-10-16-20				25-26 Brown, wet, compact, silty v.f. sand 26-26.3 Gray, silty clay lens 26.3-26.9 Brown, silty f. sand, compact, appears dry 26.9 Gray, wet, silty f. sand		Hnu=0 Rad=norm
30'	9	30-32	1.9	8-12-17-30		-		Gray, wet, compact, f. sand and silt. Interbedded fine lenses are apparent. Augered to 33' g.o.b.		Hnu=0 Rad=norm

MW-1B

Flushed augers w/110 gal potable water.

Set: 10', 2", .01 slot PVC screen 32-22' below Ground

Riser: 25', 2" PVC 22' below to 3' above Ground

7 bags Sand 33'-20'

1½ bucket Bentonite pellets 20'-18'

8 bags Type I Portland Cement Bentonite 18'-0'

SAMPLE TYPES: SS = SPLIT SPOON, ST = SHELBY TUBE, D = [illegible], C = CORED	COMPLETION NOTES:	BORING NO.: MW-1

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GEOLOGIC DRILL LOG

PROJECT:	JOB NO.	SHEET	BORING NO.
Army CE Ft Totten	2332	1 of 2	MW-2

LOCATION:	COORDINATES:	GROUND ELEV.	TOTAL DEPTH
Queens, NY			25'

DRILL CONTRACTOR: R+R Itl.	INSPECTOR: M. Zirbel	BEGUN: 6/4/87
DRILL RIG: CME 75	DRILLER: J. Buckson	FINISHED: 6/6/87

HOLE SIZE:	SAMPLER:	WEATHER:	GROUNDWATER (DEPTH, EL.):
11" (6¼" id HSA)		Rain, cool	15' below Ground

CASING LEFT IN HOLE (DIA./LENGTH):	DRILLING FLUID:	TOP OF ROCK (DEPTH, EL.):
	None (HSA)	

DEPTH	SAMPLE TYPE/NO.	SAMPLE DEPTH	SAMPLE RECOVERY	SOIL: BLOWS PER 6 INCHES	ROCK: % CORE REC.	ELEVATION	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	FIELD TEST	NOTE:
0	1	0-2	1.4	4-7-6-3				Brown, Dry, loose silt w/ f-m sand and clay, few small stones. 0-.5 Dk. organic matter and many sm. roots. 5-20 Cinders and black stains		Hnu = 2 Rad: norm
2.5	2	2.5-4.5	1.8	3-4-5-4				Apparent Fill; lt & dk brown mixed, moist, loose, silt w/ f-m sand, clay, few small stones. Some Black Cinders		Hnu = 0 Rad: norm
5.0	3	5-7	1.8	5-8-9-14				5-5.8 lt & dk brown mixed, moist, loose, silt w/ f-m sand and clay, few small stones and cinders. 5.8-6.5 Brown, moist, loose, f. sand w/ silt. 6.5-7.0 Brown, moist, st. ff, silt ~~clay~~ w/ f. sand and clay		Hnu = 0 Rad: norm
7.5	4	7.5-9.5	1.8	9-11-30-31				7.5-8.3 Brown, moist, st. ff, silt w/ f. sand and clay. 8.3-9.5 Brown with black streaks along broken surfaces, loose, moist, f. sand w/ silt, except at: 9-9.3 black, moist, loose, f-c sand.		Hnu = 0 Rad: norm
10	5	10-11	.7	6-50/1" S.S. refusal. * Auger refusal at 12'				Brown, loose, moist, silt w/ f. sand and clay. Some small stones and cinders.		Hnu = 0 Rad: norm
15	6	15-17	1.7	14-7-12-19				15-16 Brown, loose, moist, silt w/ f. sand and clay, some small stones + cinders. 16-16.3 Brown, st. ff, moist, silt with clay, little f. sand. Thin laminations throughout. 16.3-17 **Brown, moist, loose f. sand w/ silt.		Hnu = 0 Rad: norm **

SAMPLE TYPES:	COMPLETION NOTES:	BORING NO.:
SS: SPLIT SPOON, ST: SHELBY TUBE, R: ROCK CORE, O: OTHER		MW-2

* Moved Borehole ≈10' West (away from Bldg 624)
** out of fill

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GEOLOGIC DRILL LOG

PROJECT:	JOB NO.	SHEET	BORING NO.
Army C.E. Ft Totten	2332	2 of 2	MW-2

Depth	Sample No./Type	Sample Depth	Sample Recovery	SOIL Blows per 6 inches	ROCK % Core Rec.	Elevation	Graphic Log	DESCRIPTION AND CLASSIFICATION	Soil/Rock Type	NOTES ON: WATER LEVELS, LOSS OR GAIN OF CIRCULATION, CASING, ETC.
20	7	20-22	1.8	8-10-14-19				Brown, moist, stiff, f. sand and silt layers approx 1 inch thick. Thin lamination apparent.		HNu=0 Rad=norm
25	8	25-27	1.7	6-8-10-14				Brown, wet, compact, f. sand e.o.b. 25' Set well: Screen 10.00', 2" PVC, .010 slot 14-24' Riser 16.0', 2" PVC 14' to 2 ft. above ground Sand - 7 bags 30/50 Ottawa Flint Shot 12'-25' Bentonite Pellets 3/8"; 1 bucket 10-12' Grout - Portland Type I and Bentonite 10 bags		HNu=0 Rad=norm

SAMPLE TYPES: SS = Split Spoon, ST = Shelby Tube, R = Rock Core, O = Other

BORING NO.: MW-2

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GEOLOGIC DRILL LOG

PROJECT: Army C.E. - Ft Totten	JOB NO. 2332	SHEET 1 of 2	BORING NO. MW-3
LOCATION: Queens, NY	COORDINATES:	GROUND ELEV.:	TOTAL DEPTH: 30'
DRILL CONTRACTOR: R & R	INSPECTOR: M. Ziobel	START: 6/3/87	
DRILL RIG: CME	DRILLER: J. Bucksar	FINISH: 6/6/87	
HOLE SIZE: 11"	SAMPLER: (W. Tail):	WEATHER: Warm, cloudy	GROUNDWATER (DEPTH/EL.): 12.56 below Ground
CASING LEFT IN HOLE (DIA./LENGTH):	DRILLING FLUID: None (HSA)	TOP OF ROCK (DEPTH/EL.):	

DEPTH	SAMPLE DEPTH	SAMPLE NO.	SAMPLE RECOVERY	SOIL: BLOWS PER 6 INCHES	ROCK: % CORE REC.	ELEVATION	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	FIELD TEST	NOTE: WATER LEVELS, WATER RETURN, CHARACTER OF DRILLING, ETC.
0	1	0-2	1.5	4-5-7-19				0-.5 brown, dry, loose, loamy f. sand (f. sand & silt) many sm. roots .5-2.0 brown, moist, f. sand and silt, few small stones, cinders: at .5-2.0 - noticeable black stain, Hnu reading - probably fuel oil.		Hnu: 2 Rad: none
2	2.5'	2.5-4.5	1.2	4-4-6-5				2.5-4.5 brown, moist, loose, fine sand and silt. Stained black and contains some black cinders. Noticeable oil smell		Oil smell Hnu: ? Rad: none Hnu: 2 in the breathing zone
3	5.0'	5-7	1.8	10-8-7-4				5.0-5.5 Brown, moist, f. sand and silt - stained black Brick fragment at ~5.5 5.5-7.0' Brown, moist f. sand, tr. silt, loose.		Hnu: 1 Rad: none
4	7.5	7.5-9.5	1.7	14-12-12-18				Brown, moist, loose, f. sand, tr. silt; few 1" stones.		Hnu: 0 Rad: none
5	10.0'	10-12	1.9	6-4-8-12				1" concrete fragment at top 10-11 Brown, moist, loose fine sand, tr. silt. Reddish just above clay layer - small 1" stones 11-11.5 Brown, moist, compact, silty clay 11.5-12 Brown, moist, loose, f. sand w/silt, ~~with~~		Hnu: 3 in hole; Hnu: 0 in breathing zone Sample: Hnu: 0 Rad: none. Check Hnu reading at hole = 0
6	15.0'	15-17	.5	9-15-14-18				1" stone at top Brown, moist, loose, f. sand - and f. sand w/silt at bottom.		Hnu: .5 (cuttings on top of spoons) Rad: none

SAMPLE TYPES: SS: SPLIT SPOON, ST: SHELBY TUBE R: ROCK CORE, O: OTHER	COMPLETION NOTES:	BORING NO.: MW-3

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GEOLOGIC DRILL LOG

PROJECT: Army C.o.E. - Ft Totten	JOB NO. 2332	SHEET 2 of 2	BORING I.D. MW-3

DEPTH	SAMPLE TYPE/NO.	SAMPLE DEPTH	SAMPLE RECOVERY	SOIL: BLOWS PER 6 INCHES	CORE: % REC.	ELEVATION	STRATA LINE	DESCRIPTION AND CLASSIFICATION			NOTES
20	7	20-22	1.6	15-17-15-21				Brown, wet, hard, f. sand & silt, few small stones			water ~20' Hnu = 0 Rad = 0 cpm
25	8	25-27	1.8	11-10-17-20				25-25.5 Brown, wet, hard, silt, with laminations 25.5-27 Brown, wet, hard, f. sand with silt, contains thin dk. bands and silt lenses			Hnu = 0 Rad: norm
30	9	30-32	1.7	9-17-23-38				Brown, wet, hard, f. sand & silt, thin brown laminations throughout.			Hnu = 0 Rad = norm
								e.o.b. at 30' water level at 15' in auger Set: 10' of 2" .01 slot PVC screen 19-29' riser 2 ft above ground to 19' depth 6½ bags 40/60 Otter flint shot 17 - 30' 3/4 bucket 3/8" Bentonite Pellets 15-17' 11½ bags Portland Type I Grout to 15'			Conductivity of water = 380 µmhos/cm

SAMPLE TYPES: SS = SPLIT SPOON, ST = SHELBY TUBE, B = BACK ... , C = CORE

COMPLETION NOTES:

BORING NO.: MW-3

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GEOLOGIC DRILL LOG

PROJECT: Army CE - Ft. Totten	JOB NO. 2332	SHEET 1 of 1	BORING NO. MW-4
LOCATION: Queens, NY	COORDINATES:	GROUND ELEV.	TOTAL DEPTH: 12'
DRILL CONTRACTOR: R+R Intl.	INSPECTOR: M. Zirbel	BEGUN: 6/6/87	
DRILL RIG: CME 75	DRILLER: J. Bucksar	FINISHED: 6/6/87	
HOLE SIZE: 11" **	SAMPLER: (wt. fall):	WEATHER: Clear, Cool	GROUNDWATER (DEPTH/EL.): 5.7 below Ground *
CASING LEFT IN HOLE (DIA./LENGTH):	DRILLING FLUID: None (HSA)	TOP OF ROCK (DEPTH, EL.):	

DEPTH	SAMPLE TYPE/NO.	SAMPLE DEPTH	SAMPLE RECOVERY	SOIL BLOWS PER 6 INCHES	ROCK % CORE REC.	ELEVATION	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	FIELD TEST	NOTES
.5	1	.5-2.5	1.6	8-6-9-9				.5-1.5 Black, moist, loose, m-f sand, tr. silt, many small stones, Cinders and Black stains at 1-1.5'. 1.5-2.5 Brown, moist, loose, f. sand. Rust stains along fissures in sand.		Hnu: 0 Rad: norm Hg: 0 at hole
2.5	2	2.5-4.5	1.3	24-9-12-15				Brown, moist, loose, f. sand. few Rusty reddish staining in horizontal bands		Hnu: 0 Rad: norm Hg: 0 at hole
5	3	5-7	1.6	9-10-9-12				Brown, wet, hard, f. sand w/silty Interbedded layers of f. sand (1-3" thick); Some small stones and discrete peices of clay		Hnu: 0 Rad: norm Hg: 0 at hole Water at 5'
7.5	-	7.5	0	15-22-18-16				No Recovery		
10	4	10-12	1.8	5-4-4-6				10-10.8 Brown, wet, loose, f. sand, w/silt. 10.8-11.2 Brown, wet, loose, f-m sand, tr. silt. 11.2-12 Gray w/Brown mottles, wet, stiff, clay		Hnu: 0 Rad: normal
							***	E.O.B. 12'. Screen: 6-11'; 5', .01 slot, PVC, 2". Riser: 0-6'; 6', 2" PVC. Sand: 5-12'; 80/50 Ottawa flintshot 2 1/2 bags. Bentonite: 4-5'; 3/8" pellets; 1 bucket. Grout 2-4'; Portland Type I w/Bentonite powder - 1/2 bag		

SAMPLE TYPES:
SS: SPLIT SPOON, ST: SHELBY TUBE
R: ROCK CORE, O: OTHER

COMPLETION NOTES:

BORING NO.: MW-4

* All Depths measured from surface of road

** Coring machine was used to create 18" hole in road

*** Riser was trimmed flush with road and Road box was installed instead of protective casing.

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GEOLOGIC DRILL LOG

PROJECT: Army CoE Ft Totten	JOB NO. 2332	SHEET 1 of 2	BORING NO. MW-5
LOCATION: Queens, NY	COORDINATES:	GROUND ELEV.	TOTAL DEPTH: 25'
DRILL CONTRACTOR: R+R Tech.	INSPECTOR: M. Ziobel	BEGUN: 6/5/87	
DRILL RIG: CME 75	DRILLER: J. Bucksav	FINISHED: 6/6/87	
HOLE SIZE: 11"	SAMPLER: (W., Tab.):	WEATHER: Clear, Sunny	GROUNDWATER (DEPTH / EL.): 17' below ground
CASING LEFT IN HOLE (DIA./LENGTH):	DRILLING FLUID: None (HSA)	TOP OF ROCK (DEPTH, EL.): —	

DEPTH	SAMPLE TYPE/NO.	SAMPLE DEPTH	SAMPLE RECOVERY	SOIL BLOWS PER 6 INCHES	ROCK % CORE REC.	ELEVATION	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	FIELD TEST	NOTE: WATER LEVEL, CHANGE IN DRILLING, ETC.
0	1	0-2	1.5	4-3-3-3				0-.5 Topsoil + sod, DK Brown, moist, loose, f. sand and silt .5-2 Brown, moist, loose, f. sand and silt.		Hnu = 0 Rad = norm
2.5	2	2.5-4.5	1.9	3-2-4-5				2.5-3.5 Brown, moist, hard, f. sand and silt 3.5-4 Brown + Grayish thin laminations, moist, hard, f. sand + silt 4-4.5 Gray, moist, loose, f. sand, thin brown laminations		Hnu = 0 Rad = norm
5	3	5-7	1.6	3-4-8-50/.4' Spoon refusal				5-5.5 Brown, moist, stiff, silt w/ f. sand, 5.5-6.5 Gray & brown laminations, moist, loose, f. sand, tr. silt		Hnu = 0 Rad = norm *
7.5	4	7.5-9.5	1.7	5-8-9-15				Brown, moist, loose, f. sand, tr. silt. Numerous stones and pebbles @ 9-9.5.		** Hnu = 0 Rad = norm
10	5	10-12	1.5	8-8-5-7				10-11.5 Brown, wet, loose, f-c sand w/ trace silt and numerous small stones 11.5-11.6 Brown, wet, loose, m-c sand 11.6-12 Brown, stiff, wet, f. sand + silt		Hnu = 0 Rad = norm
15	6	15-17	1.9	4-7-11-13				15-15.7 Brown, wet, hard, f-m sand, tr. silt 15.7-16.4 Gray, wet, stiff clay w/ silt, many thin black laminations 16.4-17 Brown, wet, loose, m. sand		Hnu = 0 Rad = norm

SAMPLE TYPES:
S: SPLIT SPOON, ST: SHELBY TUBE
R: ROCK CORE, O: OTHER

COMPLETION NOTES:

BORING NO.: MW-5

* Hit sewer pipe at ~7' - moved well NE ~4'
** Bored to 7.5 in new hole

METCALF & EDDY
ENGINEERS

GEOLOGIC DRILL LOG

PROJECT: Army CoE Ft Totten	JOB NO. 2332	SHEET 2 of 2	BORING NO.: MW-5

DEPTH IN FEET	SAMPLE NO. AND TYPE	SAMPLE DEPTH	PENETRATION RESISTANCE	SOIL: BLOWS PER 6 INCHES	ROCK: % CORE REC.	ELEVATION	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION	WELL CONSTR.	NOTES ON: WATER LEVELS, WATER LOSS, CAVING OF HOLE, DRILLING, ETC.
20	7	20-22	1.8	3-9-11-11				20-20.5 Brown, loose, moist, f. sand w/silt 20.5-21 Gray, moist, stiff, clay, thin laminations. 21-22 Brown, loose, wet, f-m sand, tr. silt.		H Hnu = 0 Rad = norm
25	8	25-27	.6	10-21-19-22				Top .8' Brown & Gray mottled, stiff, wet, clay Bottom .2 Black, loose, wet m. sand E.O.B. @ 25'		Hnu = 0 Rad = norm
								Set-well: Screen - 10', 2" PVC, .01 slot Riser - 15', 2" PVC Sand - 30/50 Ottawa Flint, bot Bentonite - 3/8" pellets Grout - Portland Type I cement w/ Bentonite powder	13-23' 13 to 2' above ground 12'-25' - 6 1/2 bags 9-11' 11-0	1 1/2 buckets

SAMPLE TYPES: SS = SPLIT SPOON, ST = SHELBY TUBE, R = ROCK CORE, O = OTHER

CONTINUATION NO.'S:

BORING NO.: MW-5

water at 24' inside auger

WATER CONTENT

LABORATORY NO. 018-GEOTECH ACCT. ABBR. USCE-FORT TOTTEN

SAMPLE NO. VARIOUS ACCT. NO. 2332

DATE TESTED JUNE 17 1987 TESTED BY W. CHECCHI

	25'-27'	20'-22'	20'-22'	10'-11.2'	Sandy clay 20'
TEST NUMBER	MW1B-S8	MW-2 S7	MW3 S7	MW4 S4	MW5-S7
TARE NUMBER	1R	~~1F~~ 1P	1L	1N	1A
A. WEIGHT OF WET SOIL + TARE	352.74	418.~~88~~	446.09	386.72	178.04
B. WEIGHT OF DRY SOIL + TARE	292.74	347.78	397.26	348.50	157-14
C. WEIGHT OF WATER, W_w=(A-B)	60.00	70.44	48.83	28.22	20.90
D. WEIGHT OF TARE	51.34	51.53	51.53	49.30	51.43
E. WEIGHT OF DRY SOIL, W_s=(B-D)	241.40	296.25	345.73	299.20	95.71
F. WATER CONTENT, W=(C/E x 100)	24.9	23.8	14.1	9.4	21.8

Sand!

TEST NUMBER	MW15-S7				
TARE NUMBER	1S				
A. WEIGHT OF WET SOIL + TARE	271.28				
B. WEIGHT OF DRY SOIL + TARE	240.68				
C. WEIGHT OF WATER, W_w=(A-B)	30.60				
D. WEIGHT OF TARE	51.24				
E. WEIGHT OF DRY SOIL, W_s=(B-D)	189.44				
F. WATER CONTENT, W=(C/E x 100)	16.2				

7/6/87 HYDROGUETTES

TEST NUMBER	MW3 S7	MW2 S7	MW5 S7	MW5-S7	MW 1B S8
TARE NUMBER					
A. WEIGHT OF WET SOIL + TARE	~~168.83~~				
B. WEIGHT OF DRY SOIL + TARE	168.83	108.91	156.09	153.61	135.22
C. WEIGHT OF WATER, W_w=(A-B)	~~31.2~~				
D. WEIGHT OF TARE	31.86	31.91	51.43	50.43	50.92
E. WEIGHT OF DRY SOIL, W_s=(B-D)	136.97	77.00	104.66	103.18	84.30
F. WATER CONTENT, W=(C/E x 100)					

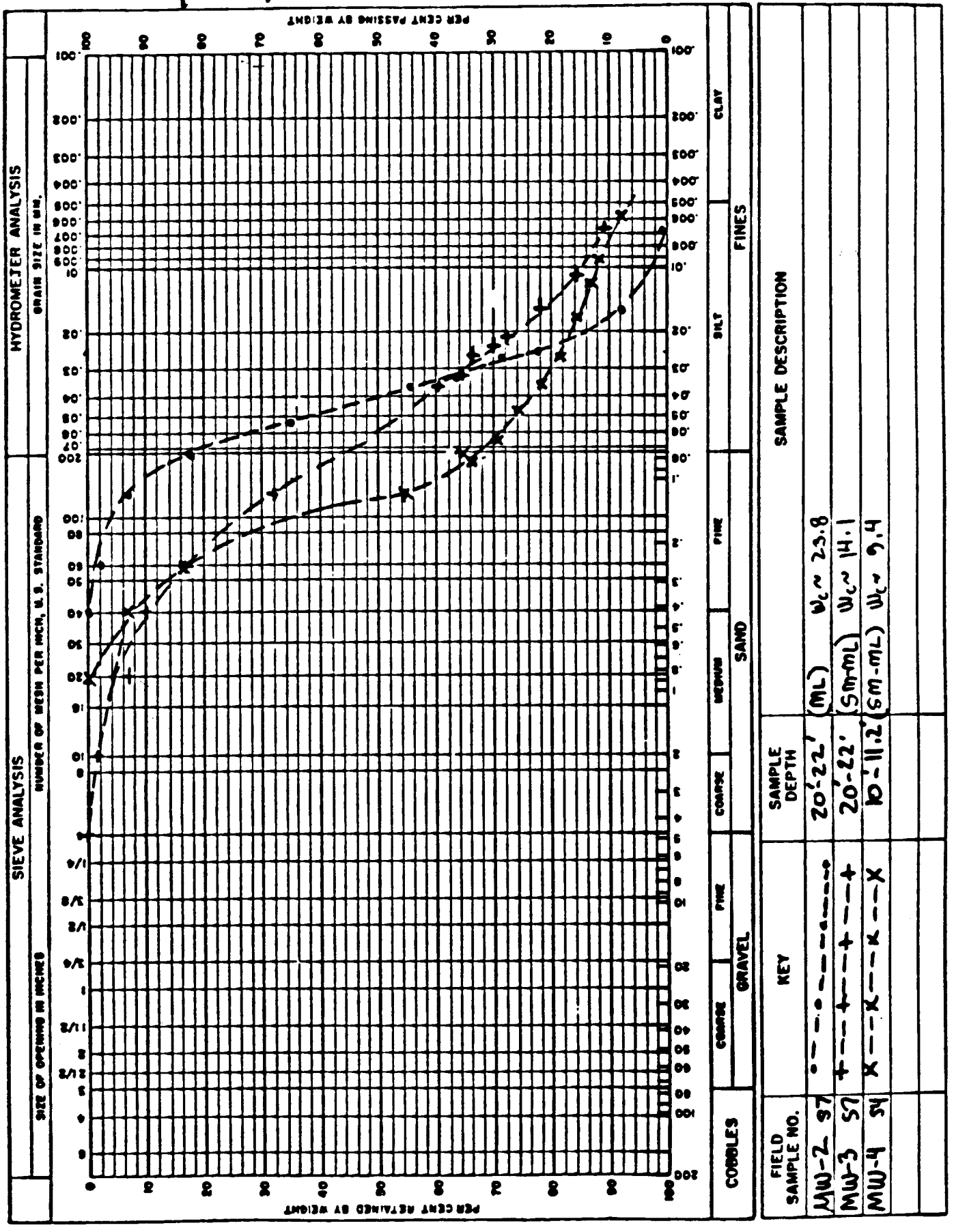
TEST NUMBER	MW4 S4				
TARE NUMBER					
A. WEIGHT OF WET SOIL + TARE					
B. WEIGHT OF DRY SOIL + TARE	143.59				
C. WEIGHT OF WATER, W_w=(A-B)					
D. WEIGHT OF TARE	50.69				
E. WEIGHT OF DRY SOIL, W_s=(B-D)	92.90				
F. WATER CONTENT, W=(C/E x 100)					

GRADATION CURVES

LABORATORY NO. 018 - GEOTECH
ACCT. ABBR. USCE - FT. TOTTEN

FIELD SAMPLE NOS. VARIOUS
ACCT. NO. 2332

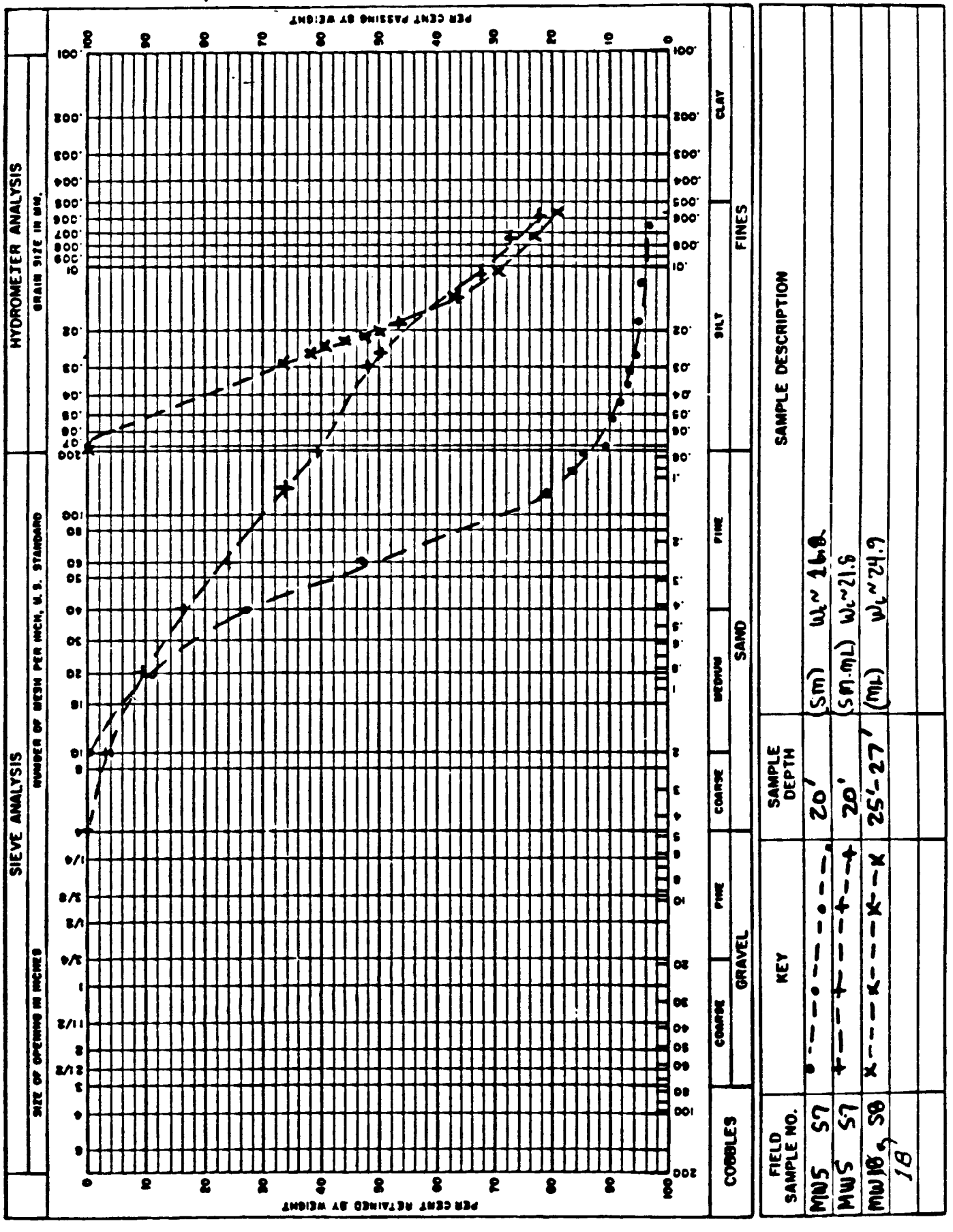
DATE TESTED July 6 1987
TESTED BY W. CHECCHI



FIELD SAMPLE NO.	KEY	SAMPLE DEPTH	SAMPLE DESCRIPTION
MW-2 S7	•---•---•---•	20'-22'	(ML) w_c ~ 23.8
MW-3 S7	+---+---+---+	20'-22'	(SM-ML) w_c ~ 14.1
MW-4 S4	X---X---X---X	10'-11.2'	(SM-ML) w_c ~ 9.4

GRADATION CURVES

LABORATORY NO. 018 - GEOTECH
ACCT. ABBR. USCE FT. TOTTEN
FIELD SAMPLE NOS. VARIOUS
ACCT. NO. 2332
DATE TESTED JULY 6 1987
TESTED BY W. CHECCHI



FIELD SAMPLE NO.	KEY	SAMPLE DEPTH	SAMPLE DESCRIPTION
MW5 S7	•---•---•---•---	20'	(SM) W_N 16.8
MW5 S7	+---+---+---+---+	20'	(SM-ML) W_N 21.8
MW10 S8	x---x---x---x---x	25'-27'	(ML) W_N 24.9
18'			

METCALF & EDDY, ENGINEERS.

SIEVE ANALYSIS

LABORATORY NO. 018-GEOTECH
FIELD SAMPLE NO. MW 18 SB (25'-27')
DATE TESTED July 6,7 1987

ACCT. ABBR. USCE-FT. TOTTEN
ACCT. NO. 2332
TESTED BY W. CHECCHI

WT. TOTAL DRY SAMPLE + TARE 135.22
WT. TARE # 50.92
WT. TOTAL DRY SAMPLE 84.30

WT. RETAINED #10 SIEVE _____ % PLUS #10 _____
WT. PASSING #10 SIEVE _____ % MINUS #10 _____

SPLIT PORTION PASSING #10 SIEVE (approx. 115 gm max.)

WT. PASSING #10 SIEVE + TARE _____
WT. TARE # _____
WT. PASSING #10 SIEVE _____

WASH PORTION PASSING #10 SIEVE

WT. RETAINED #200 SIEVE + TARE _____
WT. TARE # _____
WT. RETAINED #200 SIEVE _____
WT. PASSING #200 SIEVE _____

U.S. SIEVE NO.	CUMULATIVE WEIGHT RETAINED	% RETAINED
3"		
2"		
1 1/2"		
1"		
3/4"		
3/8"		
NO. 4		
NO. 10		
PAN		

U.S. SIEVE NO.	CUMULATIVE WEIGHT RETAINED	% PASSING 10% RETAINED A	% TOTAL SAMPLE RETAINED B
#20			
#40			
#60			
#140			0
#200	4.00		4.7
PAN -200			
WASHED -200			
TOTAL -200			

B = % PLUS #10 + % MINUS #10 x A

B = _____ + _____ x A

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#309
6/83

SIEVE ANALYSIS

LABORATORY NO. 018 -GEOTECH
FIELD SAMPLE NO. MW-2 S7 (20'-22')
DATE TESTED July 6,7 1987

ACCT. ABBR. USCG FT. TOTTEN
ACCT. NO. 2332
TESTED BY W. CHECCHI

WT. TOTAL DRY SAMPLE + TARE 108.91
WT. TARE # 1P 31.91
WT. TOTAL DRY SAMPLE 77.00

WT. RETAINED #10 SIEVE _____ % PLUS #10 _____
WT. PASSING #10 SIEVE _____ % MINUS #10 _____

SPLIT PORTION PASSING #10 SIEVE (approx. 115 gm max.)

WT. PASSING #10 SIEVE + TARE _____
WT. TARE # _____
WT. PASSING #10 SIEVE _____

WASH PORTION PASSING #10 SIEVE

WT. RETAINED #200 SIEVE + TARE _____
WT. TARE # _____
WT. RETAINED #200 SIEVE _____
WT. PASSING #200 SIEVE _____

U.S. SIEVE NO.	CUMULATIVE WEIGHT RETAINED	% RETAINED
3"		
2"		
1 1/2"		
1"		
3/4"		
3/8"		
NO. 4		
NO. 10		
PAN		

U.S. SIEVE NO.	CUMULATIVE WEIGHT RETAINED	% PASSING 10% RETAINED A	% TOTAL SAMPLE RETAINED B
#20			
#40	0		0.0
#60	1.92		2.5
#140	6.01		7.8
#200	13.56		17.6
PAN -200			
WASHED -200			
TOTAL -200			

B = % PLUS #10 + % MINUS #10 x A

B = _____ + _____ x A

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FORM 309
6/83

SIEVE ANALYSIS

LABORATORY NO. 018-GEOTECH1 ACCT. ABBR. USCG-FT. TOTTEN

FIELD SAMPLE NO. MW-3 S7 (20'-22') ACCT. NO. 2332

DATE TESTED July 6,7 1987 TESTED BY W. CHECCHI

WT. TOTAL DRY SAMPLE + TARE 168.83

WT. TARE # 1L 31.86

WT. TOTAL DRY SAMPLE 136.97

WT. RETAINED #10 SIEVE _____ % PLUS #10 _____

WT. PASSING #10 SIEVE _____ % MINUS #10 _____

SPLIT PORTION PASSING #10 SIEVE (approx. 115 gm max.)

WT. PASSING #10 SIEVE + TARE _____

WT. TARE # _____

WT. PASSING #10 SIEVE _____

WASH PORTION PASSING #10 SIEVE

WT. RETAINED #200 SIEVE + TARE _____

WT. TARE # _____

WT. RETAINED #200 SIEVE _____

WT. PASSING #200 SIEVE _____

U.S. SIEVE NO.	CUMULATIVE WEIGHT RETAINED	% RETAINED
3"		
2"		
1 1/2"		
1"		
3/4"		
3/8"		
NO. 4		0
NO. 10	2.11	1.5
PAN		

U.S. SIEVE NO.	CUMULATIVE WEIGHT RETAINED	% PASSING 10% RETAINED A	% TOTAL SAMPLE RETAINED B
#20	10.14		7.4
#40	19.89		10.1
#60	22.46		16.4
#140	43.83		32.0
#200	58.06		62.5
PAN -200			
WASHED -200			
TOTAL -200			

B = % PLUS #10 + % MINUS #10 x A

B = _____ + _____ x A

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M 309
.6/83

SIEVE ANALYSIS

LABORATORY NO. 018 - GEOTECH
FIELD SAMPLE NO. MW 4 S4 (10-11.2)
DATE TESTED July 6,7, 1987

ACCT. ABBR. USGS FT. TOTTEN
ACCT. NO. 2332
TESTED BY W. CHECCHI

WT. TOTAL DRY SAMPLE + TARE 143.59
WT. TARE # 50.69
WT. TOTAL DRY SAMPLE 92.90

WT. RETAINED #10 SIEVE _____ % PLUS #10 _____
WT. PASSING #10 SIEVE _____ % MINUS #10 _____

SPLIT PORTION PASSING #10 SIEVE (approx. 115 gm max.)

WT. PASSING #10 SIEVE + TARE _____
WT. TARE # _____
WT. PASSING #10 SIEVE _____

WASH PORTION PASSING #10 SIEVE

WT. RETAINED #200 SIEVE + TARE _____
WT. TARE # _____
WT. RETAINED #200 SIEVE _____
WT. PASSING #200 SIEVE _____

U.S. SIEVE NO.	CUMULATIVE WEIGHT RETAINED	% RETAINED
3"		
2"		
1 1/2"		
1"		
3/4"		
3/8"		
NO. 4		
NO. 10		
PAN		

U.S. SIEVE NO.	CUMULATIVE WEIGHT RETAINED	% PASSING 10% RETAINED A	% TOTAL SAMPLE RETAINED B
#20	0		0
#40 6.3	6.35		6.8
#60	15.79		17.0
#140	50.82		54.7
#200	60.23		64.8
PAN -200			
WASHED -200			
TOTAL -200			

B = % PLUS #10 + % MINUS #10 x A

B = _____ + _____ x A

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FORM M309
REV. 8/83

SIEVE ANALYSIS

LABORATORY NO. 018-GEOTECH
ACCT. ABBR. USCG- FT. TOTTEN
FIELD SAMPLE NO. MW 6 S7 20' (SAND)
ACCT. NO. 2332
DATE TESTED July 6,7 1987
TESTED BY W. CHECCHI

WT. TOTAL DRY SAMPLE + TARE 153.61
WT. TARE # 1C 50.43
WT. TOTAL DRY SAMPLE 103.18

WT. RETAINED #10 SIEVE _____ % PLUS #10 _____
WT. PASSING #10 SIEVE _____ % MINUS #10 _____

SPLIT PORTION PASSING #10 SIEVE (approx. 115 gm max.)

WT. PASSING #10 SIEVE + TARE _____
WT. TARE # _____
WT. PASSING #10 SIEVE _____

WASH PORTION PASSING #10 SIEVE

WT. RETAINED #200 SIEVE + TARE _____
WT. TARE # _____
WT. RETAINED #200 SIEVE _____
WT. PASSING #200 SIEVE _____

U.S. SIEVE NO.	CUMULATIVE WEIGHT RETAINED	% RETAINED
3"		
2"		
1 1/2"		
1"		
3/4"		
3/8"		
NO. 4	0	0
NO. 10	0.95	0.9
PAN		

U.S. SIEVE NO.	CUMULATIVE WEIGHT RETAINED	% PASSING 10% RETAINED A	% TOTAL SAMPLE RETAINED B
#20	11.56		11.2
#40	28.17		27.3
#60	48.91		47.4
#140	81.82		79.3
#200	87.77		85.1
PAN -200			
WASHED -200			
TOTAL -200			

B = % PLUS #10 + % MINUS #10 × A

B = _____ + _____ × A

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FC 1309
REV. 6/83

SIEVE ANALYSIS

LABORATORY NO. 018 - GEOTECH
ACCT. ABBR. USCE - FT. TOTTEN
FIELD SAMPLE NO. MWS 87 (20')
ACCT. NO. 2332
DATE TESTED July 6,7 1987
TESTED BY W. CHECCHI

WT. TOTAL DRY SAMPLE + TARE 156.09
WT. TARE # 51.43
WT. TOTAL DRY SAMPLE 104.66

WT. RETAINED #10 SIEVE _____ % PLUS #10 _____
WT. PASSING #10 SIEVE _____ % MINUS #10 _____

SPLIT PORTION PASSING #10 SIEVE (approx. 115 gm max.)

WT. PASSING #10 SIEVE + TARE _____
WT. TARE # _____
WT. PASSING #10 SIEVE _____

WASH PORTION PASSING #10 SIEVE

WT. RETAINED #200 SIEVE + TARE _____
WT. TARE # _____
WT. RETAINED #200 SIEVE _____
WT. PASSING #200 SIEVE _____

U.S. SIEVE NO.	CUMULATIVE WEIGHT RETAINED	% RETAINED
3"		
2"		
1 1/2"		
1"		
3/4"		
3/8"		
NO. 4	0	0
NO. 10	3.65	3.5
PAN		

U.S. SIEVE NO.	CUMULATIVE WEIGHT RETAINED	% PASSING 10% RETAINED A	% TOTAL SAMPLE RETAINED B
#20	10.15		9.7
#40	17.19		16.4
#60	25.22		24.1
#140	35.16		33.6
#200	41.60		39.7
PAN -200			
WASHED -200			
TOTAL -200			

B = % PLUS #10 + % MINUS #10 x A
B = _____ + _____ x A

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FORM 309
1/.6/83

METCALF & EDDY

GRAIN SIZE ANALYSIS-HYDROMETER METHOD

Project USCE - FT. TOTTEN Job No. 2332

Location of Project QUEENS, NY Boring No. MW 18 Sample No. S8

Description of Soil _____ Depth of Sample 25'-27'

Tested By W. CHECCHI Date of Testing July 6, 1987

Hydrometer analysis (A)

Hydrometer no. 152 H G, of solids = 2.65 a = 1.00

Dispersing agent $NaPO_3$ Amount 4% Wt. of soil, W, 84.30

Zero correction _____ Meniscus correction 1

Date	Time of reading	Elapsed time, min	Temp., °C	Actual Hyd. reading R_a	Corr. Hyd. reading R_c	% Finer	Hyd. Corr. only for meniscus R	L from Table 6-5	$\sqrt{\frac{L}{t}}$	K from Table 6-4	D, mm
(4) 7/6/87	2057	0	20							.0137	
		.25		+60							
		.5		+60							
		1		+60							
		1.5		59	56	66.4	60	6.5			.0285
		2		55	52	61.7	56	7.1			.0258
		2.5		52	49	58.1	53	7.6			.0239
		3		50	47	55.6	51	7.9			.0222
		3.5		47	44	52.2	48	8.4			.0212
		4		45	42	49.8	46	8.8			.0203
		11		34	31	36.8	35	10.5			.0134
		21		28	25	29.6	29	11.5			.0101
		43		22.5	19.5	23.1	23.5	12.45			.0074
		77		19	16	19.0	20	13.0			.0056
		167		15.5	12.5	14.8	16.5	13.6			.0039
7/7	0935	718		13	10	11.9	14	14.0			.0019

$R_c = R_{actual}$ - zero correction + C_t % finer = $R_c(a)/W_s$ $D = K\sqrt{L/t}$

71 4.00

FORM 328 (REV 12/86)

METCALF & EDDY

GRAIN SIZE ANALYSIS-HYDROMETER METHOD

Project USCE - FT. TOTTEN Job No. 2332

Location of Project QUEENS, NY Boring No. MW-2 Sample No. S7

Description of Soil _____ Depth of Sample 20'-22'

Tested By W. CHECCHI Date of Testing JULY 6 1987

Hydrometer analysis (5)

Hydrometer no. 152 H G_s of solids = 2.65 a = 1.00

Dispersing agent $NaPO_3$ Amount 4% Wt. of soil, W, 77.00

Zero correction _____ Meniscus correction 1

Date	Time of reading	Elapsed time, min	Temp., °C	Actual Hyd. reading R_a	Corr. Hyd. reading R_c	% Finer	Hyd. Corr. only for meniscus R	L from Table 6-5	$\sqrt{\frac{L}{t}}$	K from Table 6-4	D, mm
(20) 7/6/87	2113		20							.0137	
		.5		53	50	64.9	54	7.4			.0527
		1		42	49	63.6	43	9.2			.0416
		1.5		37	34	44.2	38	10.1			.0355
		2		31	28	36.4	32	11.1			.0329
		3		25	22	28.6	26	12.0			.0274
		4		20	17	22.1	21	12.9			.0246
		12		9	6	7.8	10	14.7			.0152
		60		3	0	0	4	15.6			.0069

$R_c = R_{actual}$ - zero correction + C_t % finer = $R_c(a)/W_s$ $D = K\sqrt{L/t}$

FORM 308 (REV. 12/85)

2M 13.56

METCALF & EDDY

GRAIN SIZE ANALYSIS-HYDROMETER METHOD

Project USCE - FT. TOTTEN Job No. 2332

Location of Project QUEENS, N.Y. Boring No. MW 3 Sample No. S7

Description of Soil _____ Depth of Sample 20-22'

Tested By W. CHECCHI Date of Testing JULY 6 1987

Hydrometer analysis (D)

Hydrometer no. 152 H G, of solids = 2.65 a = 1.00

Dispersing agent $NaPO_3$ Amount 4% Wt. of soil, W, 136.97

Zero correction _____ Meniscus correction 1

Date	Time of reading	Elapsed time, min	Temp., °C	Actual Hyd. reading R_a	Corr. Hyd. reading R_c	% Finer	Hyd. Corr. only for meniscus R	L from Table 6-5	$\sqrt{\frac{L}{t}}$	K from Table 6-4	D, mm
(26) 7/6/87	2119	0	20							.0157	
		0.5		+60							
		1		57	54	39.4	58	6.8			.0357
		1.5		51.5	48.5	35.4	52.5	7.7			.0310
		2		49	46	33.6	50	8.1			.0276
		3		44	41	29.9	45	8.9			.0236
		4		41	38	27.7	42	9.4			.0210
		8.5		33	30	21.9	34	10.7			.0154
		22		24	21	15.3	25	12.2			.0102
		55.5		17.5	14.5	10.6	18.5	13.25			.0067
		148		12	9	6.6	13	14.2			.0042
7/7	[illegible]	695		8	5	3.6	9	14.8			.0020

$R_c = R_{actual}$ - zero correction + C_m % finer = $R_c(a)/W_s$ $D = K\sqrt{L/t}$

[illegible] 2.11

[illegible] 9.39

[illegible] 58.06

FORM 205 (REV. 1988)

METCALF & EDDY

GRAIN SIZE ANALYSIS-HYDROMETER METHOD

Project USCE - FT. TOTTEN Job No. 2332

Location of Project QUEENS, NY Boring No. MW 4 Sample No. S4

Description of Soil _____ Depth of Sample 10 - 11.2

Tested By W. CHECCHI Date of Testing July 6, 1987

Hydrometer analysis (E)

Hydrometer no. 152 H G, of solids = 2.65 a = 1.00

Dispersing agent $NaPO_3$ Amount 4% Wt. of soil, W. 92.90

Zero correction 3 Meniscus correction 1

Date	Time of reading	Elapsed time, min	Temp., °C	Actual Hyd. reading R_a	Corr. Hyd. reading R_c	% Finer	Hyd. Corr. only for meniscus R	L from Table 6-5	$\sqrt{\frac{L}{t}}$	K from Table 6-4	D, mm
7/6/87	2053	0	20							.0137	
"		.25		34	31	33.4	35	18.5			.0888
		.5		30	27	29.1	31	11.2			.0648
		1		27	24	25.8	28	11.8			.0471
		2		23	20	21.5	24	12.4			.0341
		4		20	17	18.3	21	12.9			.0246
		9		17.5	14.5	15.6	18.5	13.25			.0166
		19		15	12	12.9	16	13.7			.0116
		31		14	11	11.8	15	13.8			.0091
		81.5		10	7	7.5	11	14.5			.0058
		172		9	6	6.4	10	14.7			.0040

$R_c = R_{actual}$ - zero correction + C_t % finer = R_c/W_s $D = K\sqrt{L/t}$

28 6.35

70 60.23

FORM 205 (REV. 12/85)

METCALF & EDDY

GRAIN SIZE ANALYSIS-HYDROMETER METHOD

Project USCE - FT. TOTTEN Job No. 2332

Location of Project QUEENS, NY Boring No. MW 5 Sample No. S7

Description of Soil _____ Depth of Sample 20' (SAND)

Tested By W. CHECCHI Date of Testing July 6, 1987

Hydrometer analysis (6)

Hydrometer no. 152 H G, of solids = 2.65 a = 1.00

Dispersing agent $NaPO_3$ Amount 4% Wt. of soil, W. 103.18

Zero correction _____ Meniscus correction 1

	Date	Time of reading	Elapsed time, min	Temp., °C	Actual Hyd. reading R_a	Corr. Hyd. reading R_c	% Finer	Hyd. Corr. only for meniscus R	L from Table 6-5	$\sqrt{\frac{L}{t}}$	K from Table 6-4	D, mm
(10)	7/6/87	2803	.25		20	17	16.5	21	12.9		.0137	.0984
			.5		14	11	10.7	15	13.8			.0720
			1		12.5	9.5	9.2	13.5	14.1			.0514
			1.5		11.0	8	7.8	12	14.3			.0423
			2		10.5	7.5	7.3	11.5	14.4			.0368
			3		10	7	6.8	11	14.5			.0301
			4		9	6	5.8	10	14.7			.0263
			9.5		8.5	5.5	5.3	9.5	14.8			.0171
			21.5		8	5	4.8	9	14.8			.0114
			72.		6	3	2.9	7	15.2			.0063
		16	162		5	2	1.9	6	15.3			.0042

$R_c = R_{actual}$ - zero correction + C_m 0.95

% finer = $R_c(a)/W_s$

$D = K\sqrt{L/t}$

20 ZN 28.17

3 87.77

FORM 308 (REV. 12/85)

METCALF & EDDY

GRAIN SIZE ANALYSIS-HYDROMETER METHOD

Project USCE - FT TOTTEN Job No. 2332

Location of Project QUEENS, N.Y. Boring No. MW 5 Sample No. S7

Description of Soil _____ Depth of Sample 20'

Tested By W. CHECCHI Date of Testing JULY 6 1987

Hydrometer analysis (4)

Hydrometer no. 152 H G, of solids = 2.65 a = 1.00

Dispersing agent $NaPO_3$ Amount 4% Wt. of soil, W, 104.66

Zero correction _____ Meniscus correction 1

Date	Time of reading	Elapsed time, min	Temp., °C	Actual Hyd. reading R_a	Corr. Hyd. reading R_c	% Finer	Hyd. Corr. only for meniscus R	L from Table 6-5	$\sqrt{\frac{L}{t}}$	K from Table 6-4	D, mm
7/6/87	2108	0	20							.0137	
		.25		+60							
		.5		+60							
		1		60	57	54.5					
		1.5		57	54	51.6	58	6.8			.0292
		2		55	52	49.7	56	7.1			.0258
		4		51.5	48.5	46.3	52.5	7.7			.0190
		10.5		41	38	36.3	42	9.4			.0130
		18.5		36.5	33.5	32.0	37.5	10.15			.0101
		36		31	28	26.8	32	11.1			.0076
		63		26	23	22.0	27	11.9			.0059
		158		20	17	16.2	21	12.9			.0039
7/7	0956	663		14.5	11.5	11.0	15.5	13.75			.0020

(15)

$R_c = R_{actual}$ - zero correction + C_m % finer = $R_c(a)/W_s$ $D = K\sqrt{L/t}$

25 3.65
34 17.19
3I 41.60

FORM 205 (REV. 1986)

APPENDIX B

MONITORING WELL COMPLETION DIAGRAMS

GROUND WATER INSTALLATION	PROJECT: Ft Totten Army COE	JOB NO. 2332	WELL NO. AW-1
DRILLING CONTRACTOR: R & R International	COORDINATES:		
BEGUN: 6/2/07 FINISHED 6/8/07	SUPERVISOR: M. Zinbel DRILLER: J. Buckson	WELL SITE:	WATER LEVEL DEPTH/ELEV 15' below Ground

REFERENCE POINT & ELEVATION:

3-2"x3' steel posts

3'x3'x4" concrete pad

	DEPTH IN	ELEV. IN
TOP OF SURFACE CASING: 2.2'		63.57
TOP OF RISER CASING: 2'		
GROUND SURFACE	0	61.5
GENERALIZED GEOLOGIC LOG		
SURFACE CASING: DIA.: 4" TYPE: Steel		
BOTTOM OF SURFACE CASING	2.8'	58.7
BACKFILL: TYPE: Type II cement-bentonite mixture 8 bags		
RISER CASING: DIA.: 2" TYPE: PVC		
TOP OF SEAL	18	43.5
ANNULAR SEAL: TYPE: 3/8" Bentonite Pellets 1½ buckets		
BOTTOM OF SEAL	20'	41.5
TOP OF SCREEN	22'	39.5
FILTER MATERIAL: TYPE: Ottawa Flintshot 7 bags		
SCREEN: DIA.: 2" TYPE: PVC OPENING WIDTH: .01 TYPE: Slot		
BOTTOM OF SCREEN	32'	29.5
~~BOTTOM OF SUMP~~	—	
BOTTOM OF HOLE	33'	28.5

METHOD DRILLED: 6¼" HSA

METHOD DEVELOPED: Bailing

TIME DEVELOPED: 4 hours

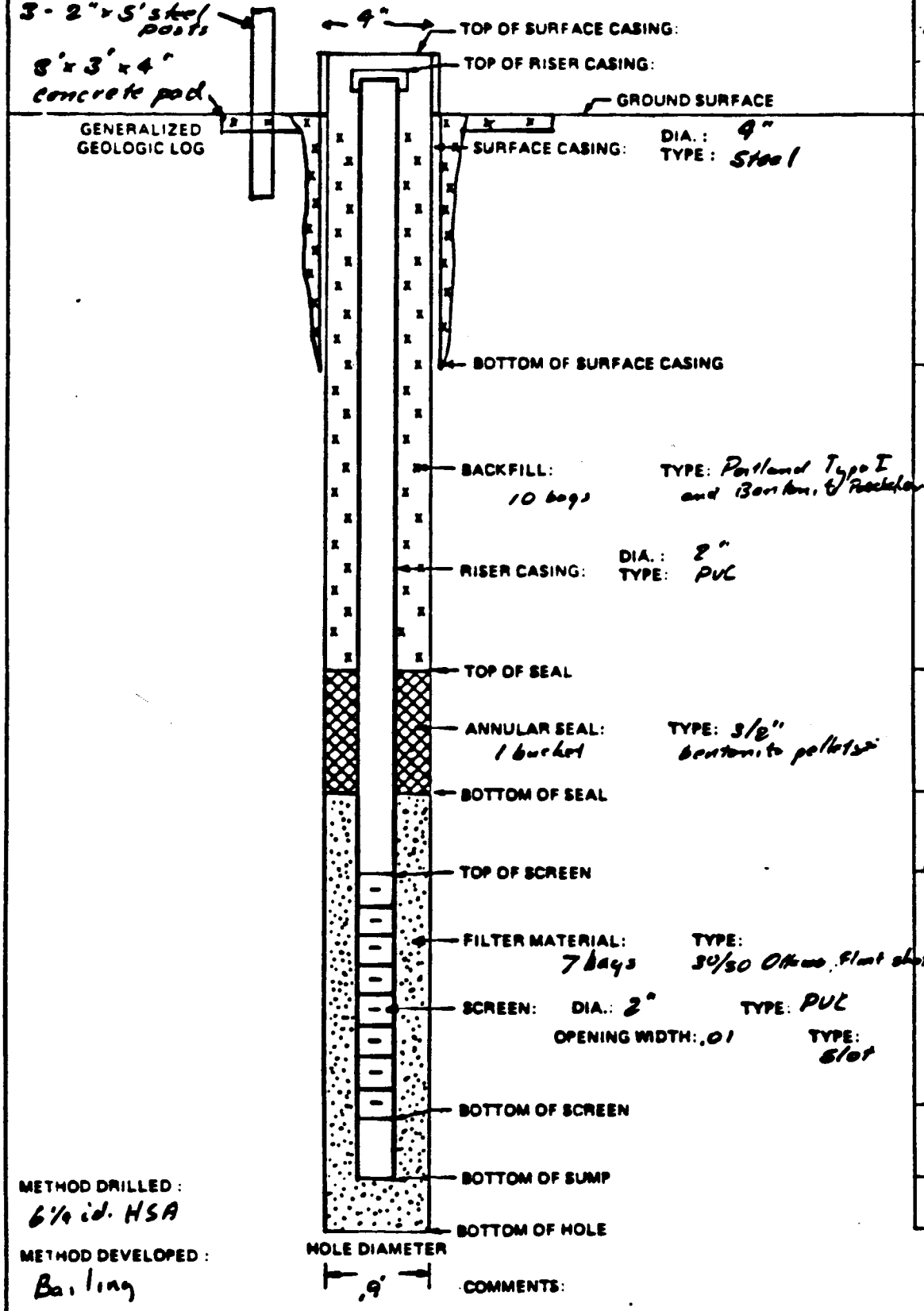
HOLE DIAMETER ← .9' →

COMMENTS:

Metcalf & Eddy

GROUND WATER INSTALLATION	PROJECT: Army CoE Ft Totten JOB NO. 2332	WELL NO. MW-2
DRILLING CONTRACTOR: R+R International	COORDINATES:	
BEGUN: 6/4/87 FINISHED 6/6/87	SUPERVISOR: M. Zabel DRILLER: J. Buchan	WELL SITE:
WATER LEVEL DEPTH/ELEV. 15' below Ground		

REFERENCE POINT & ELEVATION:



	DEPTH IN	ELEV. IN
TOP OF SURFACE CASING:	2.3	61.13
TOP OF RISER CASING:	2.0	58.9
BOTTOM OF SURFACE CASING	2.7	56.2
TOP OF SEAL	10	48.9
BOTTOM OF SEAL	12'	46.9
TOP OF SCREEN	14'	44.9
BOTTOM OF SCREEN	24'	34.9
BOTTOM OF HOLE	25'	33.9

METHOD DRILLED: 6¼ id. HSA

METHOD DEVELOPED: Bailing

TIME DEVELOPED: 4½ hours

COMMENTS:

GROUND WATER INSTALLATION

PROJECT: Army CoE - Ft Totten JOB NO. 2332 WELL NO. MW-3

DRILLING CONTRACTOR: R + R International

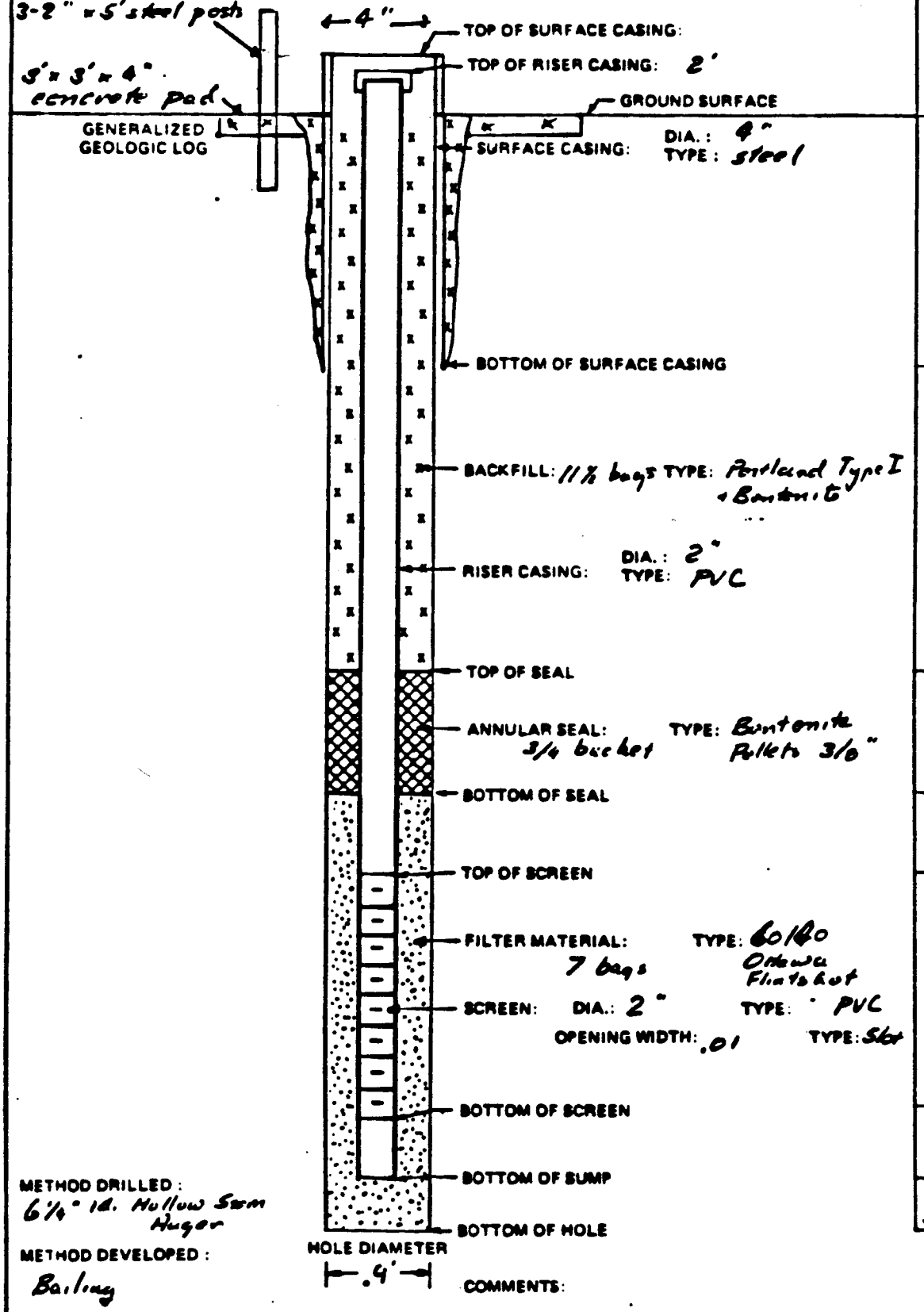
COORDINATES:

BEGUN: 6/3/87 FINISHED: 6/7/87 SUPERVISOR: M. Zinbel DRILLER: J. Bucksat

WELL SITE:

WATER LEVEL DEPTH/ELEV 12.56 below Ground

REFERENCE POINT & ELEVATION:



	DEPTH IN	ELEV. IN
TOP OF SURFACE CASING:	2.2	59.28
TOP OF RISER CASING: 2'	2.0	57.1
GROUND SURFACE		
BOTTOM OF SURFACE CASING	2.8	54.3
TOP OF SEAL	15.0'	42.1
BOTTOM OF SEAL	17.0'	40.1
TOP OF SCREEN	19.0'	38.1
BOTTOM OF SCREEN	29.0'	28.1
BOTTOM OF SUMP		
BOTTOM OF HOLE	30.0'	27.1

METHOD DRILLED: 6¼" I.D. Hollow Stem Auger

METHOD DEVELOPED: Bailing

TIME DEVELOPED: 4 hours

COMMENTS:

Metcalf & Eddy

GROUND WATER INSTALLATION

PROJECT: Army CoE Ft. Totten JOB NO. 2332 WELL NO. MW-4

DRILLING CONTRACTOR: R. R International

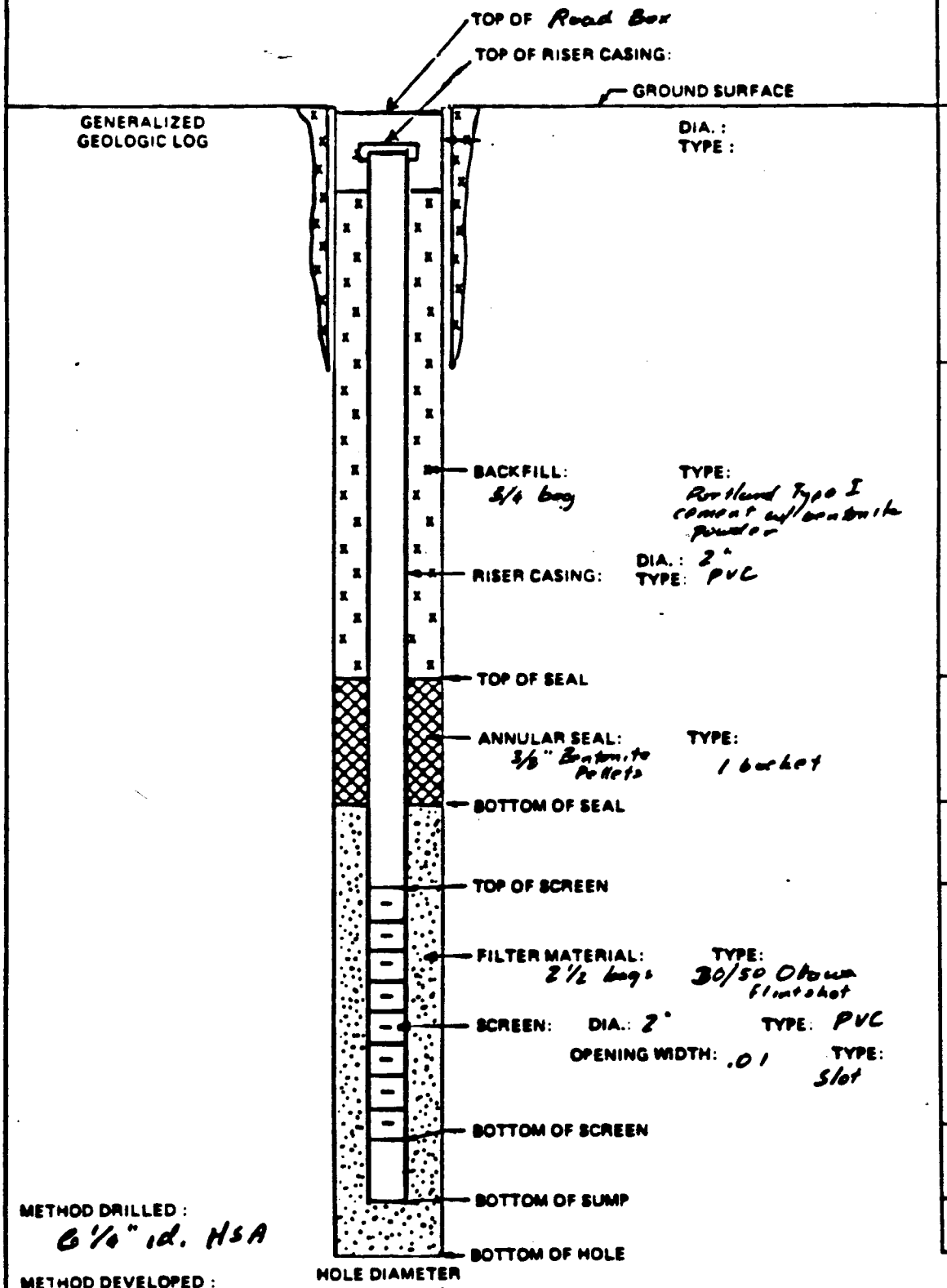
COORDINATES:

BEGUN 6/6/87 FINISHED 6/5/87 SUPERVISOR: M. Zimbel DRILLER: J. Buckner

WELL SITE:

WATER LEVEL DEPTH/ELEV. 5.7 below Ground

REFERENCE POINT & ELEVATION:



DEPTH IN	ELEV. IN
	12.15
	11.92
4	8.15
5	7.15
6	6.15
11	1.15
12	0.15

METHOD DRILLED: 6 1/4" id. HSA

METHOD DEVELOPED: Bailing

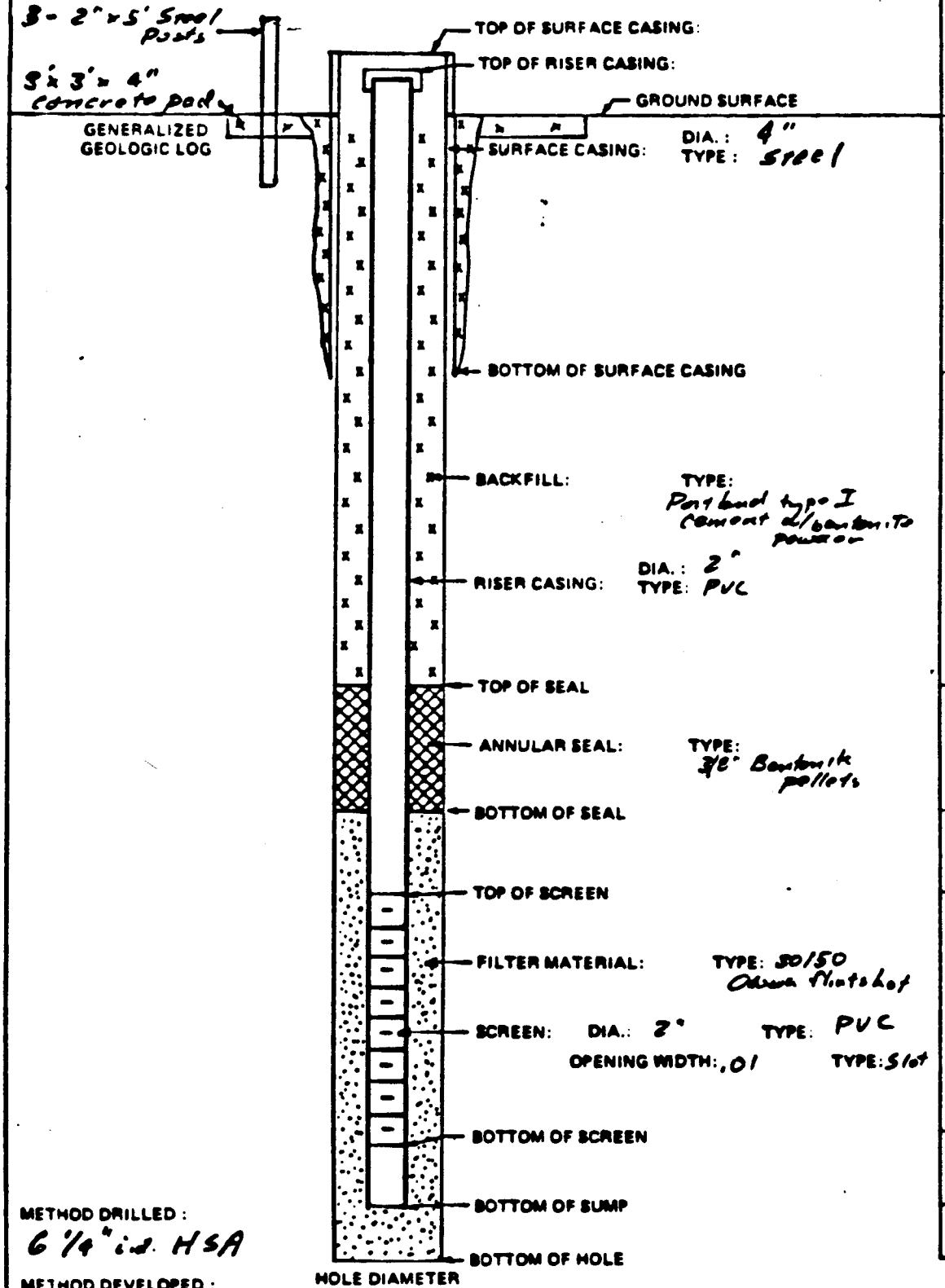
TIME DEVELOPED: 4 hours

COMMENTS: Set in concrete roadway

Metcalf & Eddy

GROUND WATER INSTALLATION	PROJECT: Army CoE Ft Totten JOB NO. 2332	WELL NO. MW-6
DRILLING CONTRACTOR: R·R International	COORDINATES:	
BEGUN: 6/5/87 FINISHED: 6/6/87	SUPERVISOR: M. Zirbel DRILLER: J. Buckner	WELL SITE:
WATER LEVEL DEPTH/ELEV: 17' below Ground		

REFERENCE POINT & ELEVATION:



	DEPTH IN	ELEV. IN
TOP OF SURFACE CASING:	2.2'	27.15
TOP OF RISER CASING:	2.0'	
GROUND SURFACE		25.0
BOTTOM OF SURFACE CASING	2.8	22.2
TOP OF SEAL	9	16.0
ANNULAR SEAL: TYPE: 3/8" Bentonite pellets		
BOTTOM OF SEAL	11	14.0
TOP OF SCREEN	13	12.0
FILTER MATERIAL: TYPE: 20/50 Ottawa Flint Silica		
SCREEN: DIA.: 2" TYPE: PVC OPENING WIDTH: .01 TYPE: Slot		
BOTTOM OF SCREEN	23	2.0
BOTTOM OF SUMP		
BOTTOM OF HOLE	25	0.0

METHOD DRILLED: 6 1/4" i.d. HSA

METHOD DEVELOPED: Bailing

TIME DEVELOPED: 4 hrs

COMMENTS:

Metcalf & Eddy

APPENDIX C

WELL SURVEY DATA

J 2332 FT. TOTTEN
USCE

(5)

BENCHMARK #1, DISC 2,
National Ocean Survey
WASHINGTON, D.C.
PER: TIDAL DATUM SECTION (301) 443-8469
NOMA 123
6001 EXEC. BLVD KENSINGTON, MD.
1975

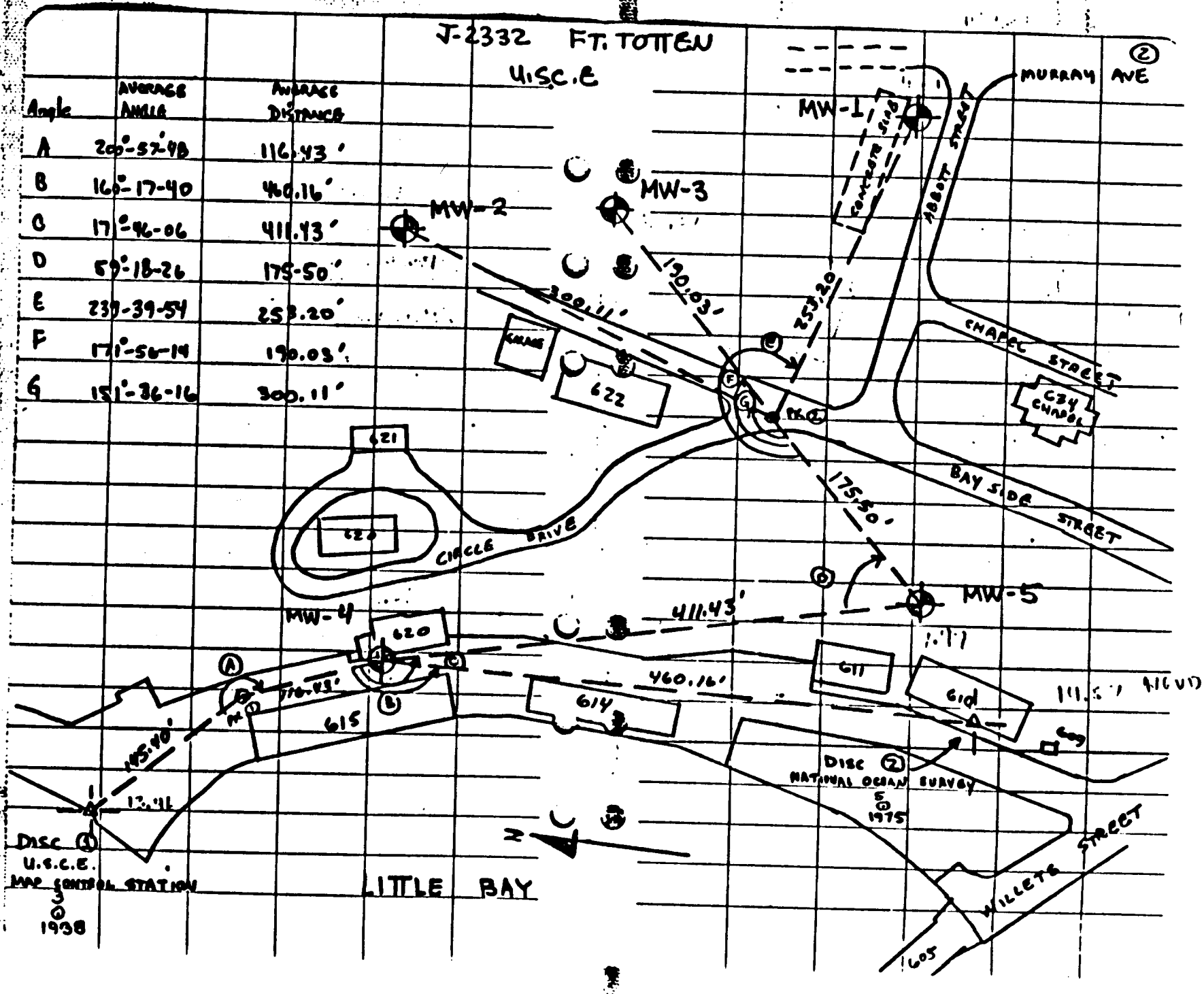
0.00 AT Mean low low Water
0.28 = Mean low Water
3.16 = N.G.V.D.
3.85 = Mean Tide
7.42 = Mean High Water
7.78 = Mean High High Water

DISC ELEV. = 17.73 {ABOVE MLLW} OR 14.57 NGVD

BENCHMARK #2, DISC 1
United States Corps of Engineers
Map Control Station
1938

ELEVATION = 16.34 {M.L.W.}
OR
16.62 {ABOVE MLLW}
OR
13.46 NGVD

BM 1	+5.22	19.79		14.57	(NGVD)	
TP 1	+5.31	17.78	-7.32	12.47		
BM 2	+3.21	16.67	-4.32	13.46		
TP 2	+5.44	17.59	-4.52	12.15	Concrete	MW-4
			-5.67	11.92	Hi. Pt.	MW-4 PVC Riser
			-5.72	11.87	Lo Pt.	MW-4 PVC. Riser
BM-1	+4.03	18.60	-3.02	14.57	disc 2	
TP 3	+12.46	28.80	-2.26	16.34		
TP 4	+11.35	38.50	-1.65	27.15	TOP PROTECT.	MW-5
			-11.49	27.01	TOP PVC	MW-5
			-13.5	25.0	GROUND	MW-5
TP.5	+19.89	53.64	-4.75	33.75		
TP.6	+8.19	61.39	-0.44	53.20		
			-0.26	61.13	TOP PROTECT	MW-2
			-0.33	61.06	TOP PVC	MW-2
			-2.5	58.9	GROUND	MW-2
TP.7	+5.63	64.91	-2.11	59.28	TOP PROTECT.	MW-3
			-5.78	59.13	TOP PVC	MW-3
			-7.8	57.1	GROUND	MW-3
T.P. 8	+3.21	66.78	-1.34	63.57	TOP PROTECT	MW-1
			-3.38	63.40	TOP PVC	MW-1
			-5.3	61.5	GROUND	



Angle	Average Angle	Average Distance
A	20°-52-48	116.43'
B	16°-17-40	460.16'
C	17°-46-06	411.43'
D	59°-18-26	175.50'
E	239-39-54	253.20'
F	171°-56-14	190.03'
G	151°-36-16	300.11'

APPENDIX D

RAI ANALYTICAL DATA

Field Identification: 2332-301 Fort Totten Well #1 Matrix: Water
Laboratory Number: 10,465-3

Parameter	Date Analyzed	Method/Reference	Concentration
Silver, recoverable (mg/L)	7/30/87	6010/1	<0.01
Arsenic, recoverable (mg/L)	8/12/87	7060/1	<0.01
Barium, recoverable (mg/L)	7/30/87	6010/1	0.2
Cadmium, recoverable (mg/L)	7/30/87	6010/1	<0.005
Chromium, recoverable (mg/L)	7/30/87	6010/1	0.031
Mercury, recoverable (mg/L)	7/28/87	7470/1	<0.0005
Lead, recoverable (mg/L)	8/11/87	6010/1	0.0072
Selenium, recoverable (mg/L)	8/14/87	7740/1	<0.01

Field Identification: 2332-302 Fort Totten Well #2 Matrix: Water
Laboratory Number: 10,465-6

Parameter	Date Analyzed	Method/Reference	Concentration
Silver, recoverable (mg/L)	7/30/87	6010/1	<0.01
Arsenic, recoverable (mg/L)	8/12/87	7060/1	0.016
Barium, recoverable (mg/L)	7/30/87	6010/1	0.23
Cadmium, recoverable (mg/L)	7/30/87	6010/1	<0.005
Chromium, recoverable (mg/L)	7/30/87	6010/1	0.097
Mercury, recoverable (mg/L)	7/28/87	7470/1	<0.0005
Lead, recoverable (mg/L)	8/11/87	6010/1	0.030
Selenium, recoverable (mg/L)	8/14/87	7740/1	<0.01

Field Identification: 2332-303 Fort Totten Well #3 Matrix: Water
Laboratory Number: 10,465-9

Parameter	Date Analyzed	Method/Reference	Concentration
Silver, recoverable (mg/L)	7/30/87	6010/1	<0.01
Arsenic, recoverable (mg/L)	8/12/87	7060/1	<0.01
Barium, recoverable (mg/L)	7/30/87	6010/1	<0.1
Cadmium, recoverable (mg/L)	7/30/87	6010/1	<0.005
Chromium, recoverable (mg/L)	7/30/87	6010/1	0.032
Mercury, recoverable (mg/L)	7/28/87	7470/1	<0.0005
Lead, recoverable (mg/L)	8/11/87	6010/1	0.0069
Selenium, recoverable (mg/L)	8/14/87	7740/1	<0.01

Field Identification: 2332-304 Fort Totten Well #4 Matrix: Water
Laboratory Number: 10,465-12

Parameter	Date Analyzed	Method/Reference	Concentration
Silver, recoverable (mg/L)	7/30/87	6010/1	<0.01
Arsenic, recoverable (mg/L)	8/12/87	7060/1	<0.01
Barium, recoverable (mg/L)	7/30/87	6010/1	0.15
Cadmium, recoverable (mg/L)	7/30/87	6010/1	<0.005
Chromium, recoverable (mg/L)	7/30/87	6010/1	0.072
Mercury, recoverable (mg/L)	7/28/87	7470/1	<0.0005
Lead, recoverable (mg/L)	8/11/87	6010/1	0.33
Selenium, recoverable (mg/L)	8/14/87	7740/1	<0.01

Field Identification: 2332-306 Fort Totten Well #6 Matrix: Water
Laboratory Number: 10,465-15

Parameter	Date Analyzed	Method/Reference	Concentration
Silver, recoverable (mg/L)	7/30/87	6010/1	<0.01
Arsenic, recoverable (mg/L)	8/12/87	7060/1	0.018
Barium, recoverable (mg/L)	7/30/87	6010/1	0.19
Cadmium, recoverable (mg/L)	7/30/87	6010/1	<0.005
Chromium, recoverable (mg/L)	7/30/87	6010/1	0.071
Mercury, recoverable (mg/L)	7/28/87	7470/1	<0.0005
Lead, recoverable (mg/L)	8/11/87	6010/1	0.016
Selenium, recoverable (mg/L)	8/14/87	7740/1	<0.01

Field Identification: 2332-308 Well Samp Blk Matrix: Water
Laboratory Number: 10,465-18

Parameter	Date Analyzed	Method/Reference	Concentration
Silver, recoverable (mg/L)	7/30/87	6010/1	<0.01
Arsenic, recoverable (mg/L)	8/12/87	7060/1	<0.01
Barium, recoverable (mg/L)	7/30/87	6010/1	<0.1
Cadmium, recoverable (mg/L)	7/30/87	6010/1	<0.005
Chromium, recoverable (mg/L)	7/30/87	6010/1	<0.01
Mercury, recoverable (mg/L)	7/28/87	7470/1	<0.0005
Lead, recoverable (mg/L)	8/11/87	6010/1	<0.005
Selenium, recoverable (mg/L)	8/14/87	7740/1	<0.01

Field Identification: 2332-305 Fort Totten Well #5 Matrix: Water
Laboratory Number: 10,465-22

Parameter	Date Analyzed	Method/Reference	Concentration
Silver, recoverable (mg/L)	7/30/87	6010/1	<0.01
Arsenic, recoverable (mg/L)	8/12/87	7060/1	<0.01
Barium, recoverable (mg/L)	7/30/87	6010/1	<0.1
Cadmium, recoverable (mg/L)	7/30/87	6010/1	<0.005
Chromium, recoverable (mg/L)	7/30/87	6010/1	<0.025
Mercury, recoverable (mg/L)	7/28/87	7470/1	<0.0005
Lead, recoverable (mg/L)	8/11/87	6010/1	<0.005
Selenium, recoverable (mg/L)	8/14/87	7740/1	<0.01

References: 1) EPA SW 846, 2nd Edition

LABORATORY CONTROL SAMPLE

Lab Number: 10429 Site: Fort Totten

WS 378 CONC. 12 (DOUBLE CONC.)

	True Value	Found	% Recovery	Method
Silver	0.092	0.038	41	7760
Arsenic	0.124	0.123	99	7060
Barium	0.924	0.841	91	7080
Cadmium	0.0148	0.012	81	7130
Chromium	0.134	0.131	98	7190
Mercury	0.016	0.017	107	7470
Lead	0.126	0.117	93	7420
Selenium	0.0186	0.0161	87	7740

CALIBRATION VERIFICATION

Lab Number: 10429

Site: Fort Totten
Units: mg/L

METALS:

	True Value	Found	%R	Method
Arsenic	0.050	0.048	96	7060
Barium	20.0	20.0	100	7080
Cadmium	0.50	0.492	98	7130
Chromium	1.0	0.985	98.5	7190
Lead	10.0	10.0	100	7420
Mercury	0.0050	0.00515	103	7470
Selenium	0.050	0.049	99	7740
Silver	1.0	0.998	99.8	7760

1) Control Limits: Mercury and Tin 80-120; Other Metals 90-110
2) Indicate Analytical Method Used: P-ICP; A-Flame AA; F-Furnace AA

CALIBRATION VERIFICATION SOURCES

Dilution of Commercial AA Standard unless otherwise specified.

QUALITY ASSURANCE/QUALITY CONTROL

MERCURY

1. Blank Data

Blank Number	Results (ug/g)
HgB 68	<0.05

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-27	2332-328	0.207	1.0	1.23	102

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-27	2332-328	0.209	0.204	0.207	2.4

SILVER

1. Blank Data

Blank Number	Results (ug/g)
MB 366	<0.5

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-3	2332-320	<1	7.2	7.0	97
10429-21	2332-326	<1	6.0	5.8	97

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-3	2332-320	<1	<1	<1	NC
10429-21	2332-326	<1	<1	<1	NC

ARSENIC

1. Blank Data

Blank Number	Results (ug/g)
MB 366	<1

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-3	2332-320	19	7.2	22.5	49
10429-21	2332-326	20	6.0	22.8	47

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-3	2332-320	20	18	19	10.5
10429-21	2332-326	21	19	20	10

BARIUM

1. Blank Data

Blank Number	Results (ug/g)
MB 366	<10

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-3	2332-320	94	724	757	91
10429-21	2332-326	5	602	617	102

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-3	2332-320	93	95	94	2
10429-21	2332 326	58	56	57	3.5

BARIUM

CADMIUM

1. Blank Data

Blank Number	Results (ug/g)
MB 366	<0.5

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-3	2332-320	0.72	72	71	98
10429-21	2332-326	<0.6	60.2	55	90

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-3	2332-320	0.69	0.74	0.72	6.9
10429-21	2332-326	<0.6	<0.6	<0.6	NC

CHROMIUM

1. Blank Data

Blank Number	Results (ug/g)
MB 366	<1

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-3	2332-320	39	725	796	104
10429-21	2332-326	27	602	640	102

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-3	2332-320	38	39	39	2.6
10429-21	2332-326	26	27	27	3.7

BARIUM

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.1

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	0.2	5.0	4.94	95

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	0.1	0.2	0.2	50

CHROMIUM

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.01

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	0.031	5.0	5.4	107

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	0.032	0.029	0.031	9.7

LEAD

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.1

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	<0.1	5.0	4.97	99

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	<0.1	<0.1	<0.1	NC

NC = not calculable due to results below detection limit.

SELENIUM

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.01

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	<0.01	0.05	0.0111	22

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	<0.01	<0.01	<0.01	NC

NC = not calculable due to results below detection limit.

SILVER

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.02

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	<0.01	0.05	0.053	106

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	<0.01	<0.01	<0.01	NC

CADMIUM

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.005

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	<0.005	0.5	0.477	94

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	<0.005	<0.005	<0.005	NC

NC = Not calculable due to result below detection limit.

SELENIUM

1. Blank Data

Blank Number	Results (ug/g)
MB 366	<1

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-3	2332-320	<1	7.2	4.1	57
10429-21	2332-326	<1	6.0	2.6	43

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-3	2332-320	<1	<1	<1	NC
10429-21	2332-326	<1	<1	<1	NC

NC = Not calculable due to result below detection limit.

LEAD

1. Blank Data

Blank Number	Results (ug/g)
MB 366	<1

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-3	2332-320	40	724	684	89
10429-21	2332-326	45	602	578	89

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-3	2332-320	40	40	40	0
10429-21	2332-326	47	43	45	8.9

ARSENIC

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.01

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	<0.1	0.05	0.0427	85

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	<0.01	<0.01	<0.01	NC

NC = Not calculable due to result below detection limit.

MERCURY

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.0005

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	<0.0005	0.01	0.00755	76

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	<0.0005	<0.0005	<0.0005	NC

NC = Not calculated due to result below detection limit.

Lab Number: STD 50 PPB (run as a sample)
Sample Designation: C3841
Date Analyzed: 8/3/87
Matrix: Soil

VOLATILE ORGANICS	CONC. OF STANDARD (ug/g)	CONC. FOUND (ug/g)	% RECOVERY	DETECTION LIMIT (ug/g)
CHLOROMETHANE	6.2	*	0.0	1.0
VINYL CHLORIDE	6.2	*	0.0	1.0
CHLOROETHANE	6.2	6.8	109.7	0.5
BROMOMETHANE	6.2	*	0.0	0.5
METHYLENE CHLORIDE	6.2	3.7	59.7	0.5
1,1-DICHLOROETHYLENE	6.2	5.8	93.5	0.5
1,1-DICHLOROETHANE	6.2	5.5	88.7	0.5
1,2-trans-DICHLOROETHYLENE	6.2	5.9	95.2	0.5
CHLOROFORM	6.2	5.6	90.3	0.5
1,2-DICHLOROETHANE	6.2	6.0	96.8	0.5
1,1,1-TRICHLOROETHANE	6.2	5.6	90.3	0.5
CARBON TETRACHLORIDE	6.2	5.7	91.9	0.5
BROMODICHLOROMETHANE	6.2	6.1	98.4	0.5
1,2-DICHLOROPROPANE	6.2	6.1	98.4	0.5
1,3-trans-DICHLOROPROPENE	4.8	6.2	129.2	0.5
TRICHLOROETHYLENE	6.2	6.2	100.0	0.5
BENZENE	6.2	6.1	98.4	0.5
1,3-cis-DICHLOROPROPENE	7.8	6.1	78.2	0.5
1,1,2-TRICHLOROETHANE	6.2	6.7	108.1	0.5
2-CHLOROETHYL VINYL ETHER	6.2	6.2	100.0	0.5
DIBROMOCHLOROMETHANE	6.2	6.5	104.8	0.5
BROMOFORM	6.2	6.5	104.8	0.5
TETRACHLOROETHYLENE	6.2	6.4	103.2	0.5
1,1,2,2-TETRACHLOROETHANE	6.2	6.6	106.5	0.5
TOLUENE	6.2	6.6	106.5	0.5
CHLOROBENZENE	6.2	6.1	98.4	0.5
ETHYLBENZENE	6.2	5.9	95.2	0.5
ACETONE	6.2	5.7	91.9	2.5
CARBON DISULFIDE	6.2	5.9	95.2	0.5
THF	6.2	6.2	100.0	2.5
MEK	6.2	6.6	106.5	2.5
VINYL ACETATE	6.2	5.6	90.3	1.0
MIBK	6.2	5.6	90.3	2.5
2-HEXANONE	6.2	6.0	96.8	2.5
STYRENE	6.2	6.1	98.4	0.5
XYLENES	17.0	16.0	94.1	0.5

* The retention times have changed and Chloromethane eluted before scan start delay began. Vinylchloride and Bromomethane's baseline detection is poor due to new column bleed.

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Lab Number: WP017C1 HALO
Sample Designation: C3823
Date Analyzed: 8/3/87
Matrix: Water

VOLATILE ORGANICS	TRUE VALUE (ug/L)	CONC. FOUND (ug/L)	DETECTION LIMIT (ug/L)	% RECOVERY
CHLOROMETHANE	BDL	BDL	10	
VINYL CHLORIDE	BDL	BDL	10	
CHLOROETHANE	BDL	BDL	5	
BROMOMETHANE	BDL	BDL	5	
METHYLENE CHLORIDE	98.0	65.9	5	67
1,1-DICHLOROETHYLENE	BDL	BDL	5	
1,1-DICHLOROETHANE	BDL	BDL	5	
1,2-trans-DICHLOROETHYLENE	BDL	BDL	5	
CHLOROFORM	60.4	39.3	5	65
1,2-DICHLOROETHANE	90.2	85.0	5	94
1,1,1-TRICHLOROETHANE	73.8	25.4	5	34
CARBON TETRACHLORIDE	92.7	22.8	5	24
BROMODICHLOROMETHANE	84.5	77.7	5	92
1,2-DICHLOROPROPANE	BDL	BDL	5	
1,3-trans-DICHLOROPROPENE	BDL	BDL	5	
TRICHLOROETHYLENE	55.1	22.3	5	40
BENZENE	BDL	BDL	5	
1,3-cis-DICHLOROPROPENE	BDL	BDL	5	
1,1,2-TRICHLOROETHANE	BDL	BDL	5	
2-CHLOROETHYL VINYL ETHER	BDL	BDL	5	
DIBROMOCHLOROMETHANE	71.7	89.0	5	124
BROMOFORM	97.8	122	5	125
TETRACHLOROETHYLENE	48.0	19.0	5	39
1,1,2,2-TETRACHLOROETHANE	BDL	BDL	5	
TOLUENE	BDL	BDL	5	
CHLOROBENZENE	79.1	55.6	5	70
ETHYLBENZENE	BDL	BDL	5	
ACETONE	BDL	BDL	25	
CARBON DISULFIDE	BDL	BDL	5	
THF	BDL	BDL	25	
MEK	BDL	BDL	25	
VINYL ACETATE	BDL	BDL	10	
MIBK	BDL	BDL	25	
2-HEXANONE	BDL	BDL	25	
STYRENE	BDL	BDL	5	
XYLENES	BDL	BDL	5	

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	100	70 - 121
d8-TOLUENE	106	81 - 117
BROMOFLUOROBENZENE	102	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Resource Analysts, Incorporated

Lab Number:	Blank
Sample Designation:	C3816
Date Analyzed:	8/3/87
Matrix:	Water

VOLATILE ORGANICS	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
CHLOROMETHANE	BDL	10
VINYL CHLORIDE	BDL	10
CHLOROETHANE	BDL	5
BROMOMETHANE	BDL	5
METHYLENE CHLORIDE	3	5
1,1-DICHLOROETHYLENE	BDL	5
1,1-DICHLOROETHANE	BDL	5
1,2-trans-DICHLOROETHYLENE	BDL	5
CHLOROFORM	BDL	5
1,2-DICHLOROETHANE	BDL	5
1,1,1-TRICHLOROETHANE	BDL	5
CARBON TETRACHLORIDE	BDL	5
BROMODICHLOROMETHANE	BDL	5
1,2-DICHLOROPROPANE	BDL	5
1,3-trans-DICHLOROPROPENE	BDL	5
TRICHLOROETHYLENE	BDL	5
BENZENE	BDL	5
1,3-cis-DICHLOROPROPENE	BDL	5
1,1,2-TRICHLOROETHANE	BDL	5
2-CHLOROETHYL VINYL ETHER	BDL	5
DIBROMOCHLOROMETHANE	BDL	5
BROMOFORM	BDL	5
TETRACHLOROETHYLENE	BDL	5
1,1,2,2-TETRACHLOROETHANE	BDL	5
TOLUENE	1.6	5
CHLOROBENZENE	BDL	5
ETHYLBENZENE	BDL	5
ACETONE	BDL	25
CARBON DISULFIDE	BDL	5
THF	BDL	25
MEK	BDL	25
VINYL ACETATE	BDL	10
MIBK	BDL	25
2-HEXANONE	BDL	25
STYRENE	BDL	5
XYLENES	BDL	5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	90	76 - 114
d8-TOLUENE	94	88 - 110
BROMOFLUOROBENZENE	102	86 - 115

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Lab Number:	MeOH Blank 7/29
Sample Designation:	C3839
Date Analyzed:	8/3/87
Matrix:	Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	1.4	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
2-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	1.0	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	83	70 - 121
d8-TOLUENE	98	81 - 117
BROMOFLUOROBENZENE	96	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Lab Number: 10,429-1
Sample Designation: 2332-320 Fort Totten Soil #1
Date Analyzed: 8/3/87
Matrix: Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	BDL	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
2-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	BDL	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	90	70 - 121
d8-TOLUENE	111	81 - 117
BROMOFLUOROBENZENE	102	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

ACID/BASE/NEUTRAL MATRIX SPIKE RECOVERY

Laboratory Number: 10,429-2
Sample Designation: 2332-320 Fort Totten Soil #1
Date Analyzed: 8/12/87
Matrix: Solid

COMPOUND	SAMPLE CONC. (ug/g)	CONC. SPIKE ADDED (ug/g)	CONC. SPIKE FOUND (ug/g)	% RECOVERY
1,4-DICHLOROBENZENE	0	3.3	0.3	9.090
ACENAPTHENE	0	3.3	2	60.60
2,4-DINITROTOLUENE	0	3.2	2.4	75
N-NITROSO-DI-N PROPYLAMINE	0	3.5	2.3	65.71
PYRENE	0	3.5	1.8	51.42
PHENOL	0	6.8	3.1	45.58
2-CHLOROPHENOL	0	9.5	3.4	35.78
4-CL-3-METHYLPHENOL	0	6.7	8.4	125.3
4-NITROPHENOL	0	6.7	1.7	25
PENTACHLOROPHENOL	0	6.5	4.3	66

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 3550/8270

Lab Number: 10,429-4
Sample Designation: 2332-321 Fort Totten Soil #2
Date Analyzed: 8/3/87
Matrix: Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	BDL	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
2-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	BDL	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	90	70 - 121
d8-TOLUENE	101	81 - 117
BROMOFLUOROBENZENE	101	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Resource Analysts, Incorporated

ACID/BASE/NEUTRAL EXTRACTABLE ORGANIC COMPOUNDS

Laboratory Number: 10,429-5
Sample Designation: 2332-331 Fort Totten Soil #2
Date Extracted: 7/30/87
Date Analyzed: 8/3/87
Matrix: Soil

Results expressed on a dry (103 degrees C) basis.
Moisture Content: 9.7%

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
N-NITROSODIMETHYLAMINE	BDL	0.8
PHENOL	BDL	0.3
Bis (2-CHLOROETHYL ETHER)	BDL	0.3
2-CHLOROPHENOL	BDL	0.3
1,3-DICHLOROBENZENE	BDL	0.3
1,4-DICHLOROBENZENE	BDL	0.3
BENZYL ALCOHOL	BDL	0.3
1,2-DICHLOROBENZENE	BDL	0.3
2-METHYLPHENOL	BDL	0.3
Bis (2-CHLOROISOPROPYL) ETHER	BDL	0.3
4-METHYLPHENOL	BDL	0.3
HEXACHLOROETHANE	BDL	0.3
N-NITROSODI-N-PROPYLAMINE	BDL	0.3
NITROBENZENE	BDL	0.3
ISOPHORONE	BDL	0.3
2-NITROPHENOL	BDL	0.3
2,4-DIMETHYLPHENOL	BDL	0.3
BENZOIC ACID	BDL	1
Bis (2-CHLOROETHOXY) METHANE	BDL	0.3
2,4-DICHLOROPHENOL	BDL	0.3
1,2,4-TRICHLOROBENZENE	BDL	0.3
NAPHTHALENE	BDL	0.3
4-CHLOROANILINE	BDL	0.3
HEXACHLOROBUTADIENE	BDL	0.3
4-CHLORO-3-METHYLPHENOL	BDL	0.3
2-METHYLNAPHTHALENE	BDL	0.3
HEXACHLOROCYCLOPENTADIENE	BDL	0.3
2,4,6-TRICHLOROPHENOL	BDL	0.3
2,4,5-TRICHLOROPHENOL	BDL	1
2-CHLORONAPHTHALENE	BDL	0.3
2-NITROANILINE	BDL	1
DIMETHYLPHTHALATE	BDL	0.3
ACENAPHTHYLENE	BDL	0.3
2,6-DINITROTOLUENE	BDL	0.3
3-NITROANILINE	BDL	1
ACENAPHTHENE	BDL	0.3
2,4-DINITROPHENOL	BDL	1
4-NITROPHENOL	BDL	1
DIBENZOFURAN	BDL	0.3
2,4-DINITROTOLUENE	BDL	0.3
DIETHYLPHTHALATE	BDL	0.3
4-CHLOROPHENYL-PHENYLETHER	BDL	0.3
FLUORENE	BDL	0.3

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
4-NITROANILINE	BDL	1
4,6-DINITRO-2-METHYLPHENOL	BDL	1
N-NITROSODIPHENYLAMINE (1)	BDL	0.3
4-BROMOPHENYL-PHENYLETHER	BDL	0.3
HEXACHLOROBENZENE	BDL	0.3
PENTACHLOROPHENOL	BDL	1
PHENANTHRENE	BDL	0.3
ANTHRACENE	BDL	0.3
DI-N-BUTYLPHTHALATE	BDL	0.3
FLUORANTHENE	2	0.3
BENZIDENE	BDL	2
PYRENE	1.7	0.3
BUTYLBENZYLPHTHALATE	BDL	0.3
3,3'-DICHLOROBENZIDINE	BDL	0.7
BENZO(a)ANTHRACENE	1.3	0.3
CHRYSENE	1	0.3
Bis(2-ETHYLHEXYL)PHTHALATE	0.7	0.3
DI-N-OCTYLPHTHALATE	BDL	0.3
BENZO(b)FLUORANTHENE	2.1	0.3
BENZO(k)FLUORANTHENE	BDL	0.3
BENZO(a)PYRENE	1.4	0.3
IDENO(1,2,3-c,d)PYRENE	0.6	0.3
DIBENZO(a,h)ANTHRACENE	BDL	0.3
BENZO(g,h,i)PERYLENE	0.7	0.3

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
2-FL-PHENOL	14	21 - 100
d6-PHENOL	15	10 - 94
NITROBENZENE-d5	19	35 - 114
2-FL-BIPHENYL	27	43 - 116
TRIBROMOPHENOL	29	10 - 123
TERPHENYL-d14	45	33 - 141

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846. 2ND EDITION
METHOD 3550/8270

Resource Analysts, Incorporated

Lab Number: 10,429-7
Sample Designation: 2332-322 Fort Totten Soil #3
Date Analyzed: 8/3/87
Matrix: Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	BDL	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
2-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	BDL	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	66	70 - 121
d8-TOLUENE	90	81 - 117
BROMOFLUOROBENZENE	76	74 - 121

ACID/BASE/NEUTRAL EXTRACTABLE ORGANIC COMPOUNDS

Laboratory Number:	10,429-E
Sample Designation:	2332-322 Fort Totten Soil #3
Date Extracted:	7/30/87
Date Analyzed:	8/3/87
Matrix:	Soil -

Results expressed on a dry (103 degrees C) basis.
Moisture Content: 18.6%

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
N-NITROSODIMETHYLAMINE	BDL	0.9
PHENOL	BDL	0.3
Bis (2-CHLOROETHYL ETHER)	BDL	0.3
2-CHLOROPHENOL	BDL	0.3
1,3-DICHLOROBENZENE	BDL	0.3
1,4-DICHLOROBENZENE	BDL	0.3
BENZYL ALCOHOL	BDL	0.3
1,2-DICHLOROBENZENE	BDL	0.3
2-METHYLPHENOL	BDL	0.3
Bis (2-CHLOROISOPROPYL) ETHER	BDL	0.3
4-METHYLPHENOL	BDL	0.3
HEXACHLOROETHANE	BDL	0.3
N-NITROSODI-N-PROPYLAMINE	BDL	0.3
NITROBENZENE	BDL	0.3
ISOPHORONE	BDL	0.3
2-NITROPHENOL	BDL	0.3
2,4-DIMETHYLPHENOL	BDL	0.3
BENZOIC ACID	BDL	1
Bis (2-CHLOROETHOXY) METHANE	BDL	0.3
2,4-DICHLOROPHENOL	BDL	0.3
1,2,4-TRICHLOROBENZENE	BDL	0.3
NAPHTHALENE	BDL	0.3
4-CHLOROANILINE	BDL	0.3
HEXACHLOROBUTADIENE	BDL	0.3
4-CHLORO-3-METHYLPHENOL	BDL	0.3
2-METHYLNAPHTHALENE	BDL	0.3
HEXACHLOROCYCLOPENTADIENE	BDL	0.3
2,4,6-TRICHLOROPHENOL	BDL	0.3
2,4,5-TRICHLOROPHENOL	BDL	1
2-CHLORONAPHTHALENE	BDL	0.3
2-NITROANILINE	BDL	1
DIMETHYLPHTHALATE	BDL	0.3
ACENAPHTHYLENE	BDL	0.3
2,6-DINITROTOLUENE	BDL	0.3
3-NITROANILINE	BDL	1
ACENAPHTHENE	BDL	0.3
2,4-DINITROPHENOL	BDL	1
4-NITROPHENOL	BDL	1
DIBENZOFURAN	BDL	0.3
2,4-DINITROTOLUENE	BDL	0.3
DIETHYLPHTHALATE	BDL	0.3
4-CHLOROPHENYL-PHENYLETHER	BDL	0.3
FLUORENE	BDL	0.3

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
4-NITROANILINE	BDL	1
4,6-DINITRO-2-METHYLPHENOL	BDL	1
N-NITROSODIPHENYLAMINE (1)	BDL	0.3
4-BROMOPHENYL-PHENYLETHER	BDL	0.3
HEXACHLOROBENZENE	BDL	0.3
PENTACHLOROPHENOL	BDL	1
PHENANTHRENE	BDL	0.3
ANTHRACENE	BDL	0.3
DI-N-BUTYLPHTHALATE	BDL	0.3
FLUORANTHENE	Trace	0.3
BENZIDENE	BDL	3
PYRENE	Trace	0.3
BUTYLBENZYLPHTHALATE	BDL	0.3
3,3'-DICHLOROBENZIDINE	BDL	0.7
BENZO(a)ANTHRACENE	BDL	0.3
CHRYSENE	BDL	0.3
Bis(2-ETHYLHEXYL)PHTHALATE	1.5	0.3
DI-N-OCTYLPHTHALATE	BDL	0.3
BENZO(b)FLUORANTHENE	BDL	0.3
BENZO(k)FLUORANTHENE	BDL	0.3
BENZO(a)PYRENE	BDL	0.3
IDENO(1,2,3-c,d)PYRENE	BDL	0.3
DIBENZO(a,h)ANTHRACENE	BDL	0.3
BENZO(g,h,i)PERYLENE	BDL	0.3

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
2-FL-PHENOL	21	21 - 100
d6-PHENOL	33	10 - 94
NITROBENZENE-d5	17	35 - 114
2-FL-BIPHENYL	20	43 - 116
TRIBROMOPHENOL	30	10 - 123
TERPHENYL-d14	70	33 - 141

'Trace' denotes probable presence below listed detection limit.

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 3550/8270

Lab Number: 10,429-10
Sample Designation: 2332-323 Fort Totten Soil #4
Date Analyzed: 8/3/87
Matrix: Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	BDL	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
2-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	BDL	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	100	70 - 121
d8-TOLUENE	105	81 - 117
BROMOFLUOROBENZENE	103	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

ACID/BASE/NEUTRAL EXTRACTABLE ORGANIC COMPOUNDS

ratory Number:	10.429-11
le Designation:	2332-323 Fort Totten Soil #4
ate Extracted:	7/30/97
ate Analyzed:	8/3/27
Matrix:	Soil

esults expressed on a dry (100 degrees C) basis.
oisture content: 5.6%

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
N-NITROSODIMETHYLAMINE	BDL	0.8
HENOL	BDL	0.3
is (2-CHLOROETHYL ETHER)	BDL	0.3
-CHLOROPHENOL	BDL	0.3
,3-DICHLOROBENZENE	BDL	0.3
,4-DICHLOROBENZENE	BDL	0.3
ENZYL ALCOHOL	BDL	0.3
1,2-DICHLOROBENZENE	BDL	0.3
-METHYLPHENOL	BDL	0.3
is (2-CHLOROISOPROPYL) ETHER	BDL	0.3
4-METHYLPHENOL	BDL	0.3
EXACHLOROETHANE	BDL	0.3
-NITROSODI-N-PROPYLAMINE	BDL	0.3
ITROBENZENE	BDL	0.3
SOPHORONE	BDL	0.3
TROPHENOL	BDL	0.3
,4-DIMETHYLPHENOL	BDL	0.3
ENZOIC ACID	BDL	1
is (2-CHLOROETHOXY) METHANE	BDL	0.3
,4-DICHLOROPHENOL	BDL	0.3
1,2,4-TRICHLOROBENZENE	BDL	0.3
APHTHALENE	BDL	0.3
4-CHLOROANILINE	BDL	0.3
EXACHLOROBUTADIENE	BDL	0.3
4-CHLORO-3-METHYLPHENOL	BDL	0.3
-METHYLNAPHTHALENE	BDL	0.3
EXACHLOROCYCLOPENTADIENE	BDL	0.3
2,4,6-TRICHLOROPHENOL	BDL	0.3
2,4,5-TRICHLOROPHENOL	BDL	1
-CHLORONAPHTHALENE	BDL	0.3
2-NITROANILINE	BDL	1
IMETHYLPHTHALATE	BDL	0.3
CENAPHTHYLENE	BDL	0.3
,6-DINITROTOLUENE	BDL	0.3
3-NITROANILINE	BDL	1
ACENAPHTHENE	BDL	0.3
,4-DINITROPHENOL	BDL	1
4-NITROPHENOL	BDL	1
DIBENZOFURAN	BDL	0.3
,4-DINITROTOLUENE	BDL	0.3
IETHYLPHTHALATE	BDL	0.3
HLOROPHENYL-PHENYLETHER	BDL	0.3
LUORENE	BDL	0.3

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
-NITROANILINE	BDL	1
,6-DINITRO-2-METHYLPHENOL	BDL	1
N-NITROSODIPHENYLAMINE (1)	BDL	0.3
4-BROMOPHENYL-PHENYLETHER	BDL	0.3
EXACHLOROBENZENE	BDL	0.3
ENTACHLOROPHENOL	BDL	1
HENANTHRENE	BDL	0.3
NTHRACENE	BDL	0.3
DI-N-BUTYLPHTHALATE	BDL	0.3
LUORANTHENE	BDL	0.3
ENZIDENE	BDL	2
YRENE	BDL	0.3
BUTYLBENZYLPHTHALATE	BDL	0.3
,3'-DICHLOROBENZIDINE	BDL	0.7
ENZO(a)ANTHRACENE	BDL	0.3
HRYSENE	BDL	0.3
IS(2-ETHYLHEXYL)PHTHALATE	1.4	0.3
DI-N-OCTYLPHTHALATE	BDL	0.3
ENZO(b)FLUORANTHENE	Trace	0.3
ENZO(k)FLUORANTHENE	BDL	0.3
ENZO(a)PYRENE	BDL	0.3
DENO(1,2,3-c,d)PYRENE	BDL	0.3
IBENZO(a,h)ANTHRACENE	BDL	0.3
ENZO(g,h,i)PERYLENE	BDL	0.3

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
2-FLUOROPHENOL	34	21 - 100
d5-PHENOL	46	10 - 94
NITROBENZENE-d5	63	35 - 114
2-FLUOROBIPHENYL	52	43 - 116
TRIBROMOPHENOL	59	10 - 123
TERPHENYL-d14	80	33 - 141

"Trace" denotes probable presence below listed detection limit.

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 3550/8270

Resource Analysts, Incorporated

Lab Number: 10,429-13
Sample Designation: 2332-324 Fort Totten Soil #5
Date Analyzed: 8/3/87
Matrix: Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	BDL	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
2-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	BDL	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	98	70 - 121
d8-TOLUENE	107	81 - 117
BROMOFLUOROBENZENE	105	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Resource Analysts, Incorporated

ACID/BASE/NEUTRAL EXTRACTABLE ORGANIC COMPOUNDS

Laboratory Number: 10,624-14
Sample Designation: 2332-324 Fort Totten Soil #3
Date Extracted: 7/30/87
Date Analyzed: 8/3/87
Matrix: Soil

Results expressed on a dry 103 degrees C basis.
Moisture content: 5.4%

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
N-NITROSODIMETHYLAMINE	BDL	0.3
PHENOL	BDL	0.3
Bis (2-CHLOROETHYL ETHER)	BDL	0.3
2-CHLOROPHENOL	BDL	0.3
1,3-DICHLOROBENZENE	BDL	0.3
1,4-DICHLOROBENZENE	BDL	0.3
BENZYL ALCOHOL	BDL	0.3
1,2-DICHLOROBENZENE	BDL	0.3
2-METHYLPHENOL	BDL	0.3
Bis (2-CHLOROISOPROPYL) ETHER	BDL	0.3
4-METHYLPHENOL	BDL	0.3
HEXACHLOROETHANE	BDL	0.3
N-NITROSODI-N-PROPYLAMINE	BDL	0.3
NITROBENZENE	BDL	0.3
ISOPHORONE	BDL	0.3
2-NITROPHENOL	BDL	0.3
2,4-DIMETHYLPHENOL	BDL	0.3
BENZOIC ACID	BDL	1
Bis (2-CHLOROETHOXY) METHANE	BDL	0.3
2,4-DICHLOROPHENOL	BDL	0.3
1,2,4-TRICHLOROBENZENE	BDL	0.3
NAPHTHALENE	BDL	0.3
4-CHLOROANILINE	BDL	0.3
HEXACHLOROBUTADIENE	BDL	0.3
4-CHLORO-3-METHYLPHENOL	BDL	0.3
2-METHYLNAPHTHALENE	BDL	0.3
HEXACHLOROCYCLOPENTADIENE	BDL	0.3
2,4,6-TRICHLOROPHENOL	BDL	0.3
2,4,5-TRICHLOROPHENOL	BDL	1
2-CHLORONAPHTHALENE	BDL	0.3
2-NITROANILINE	BDL	1
DIMETHYLPHTHALATE	BDL	0.3
ACENAPHTHYLENE	BDL	0.3
2,6-DINITROTOLUENE	BDL	0.3
3-NITROANILINE	BDL	1
ACENAPHTHENE	BDL	0.3
2,4-DINITROPHENOL	BDL	1
4-NITROPHENOL	BDL	1
DIBENZOFURAN	BDL	0.3
2,4-DINITROTOLUENE	BDL	0.3
DIETHYLPHTHALATE	BDL	0.3
4-CHLOROPHENYL-PHENYLETHER	BDL	0.3
FLUORENE	BDL	0.3

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
4-NITROANILINE	BDL	1
4,6-DINITRO-2-METHYLPHENOL	BDL	1
N-NITROSODIPHENYLAMINE (1)	BDL	0.3
4-BROMOPHENYL-PHENYLETHER	BDL	0.3
HEXACHLOROBENZENE	BDL	0.3
PENTACHLOROPHENOL	BDL	1
PHENANTHRENE	BDL	0.3
ANTHRACENE	BDL	0.3
DI-N-BUTYLPHTHALATE	BDL	0.3
FLUORANTHENE	Trace	0.3
BENZIDENE	BDL	1
PYRENE	BDL	0.3
BUTYLBENZYLPHTHALATE	BDL	0.3
3,3'-DICHLOROBENZIDINE	BDL	0.3
BENZO(a)ANTHRACENE	BDL	0.3
CHRYSENE	BDL	0.3
BIS(2-ETHYLHEXYL)PHTHALATE	1.7	0.3
DI-N-OCTYLPHTHALATE	BDL	0.3
BENZO(b)FLUORANTHENE	Trace	0.3
BENZO(k)FLUORANTHENE	BDL	0.3
BENZO(a)PYRENE	BDL	0.3
INDENO(1,2,3-c,d)PYRENE	BDL	0.3
DIBENZO(a,h)ANTHRACENE	BDL	0.3
BENZO(g,h,i)PERYLENE	BDL	0.3

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
2-FLUOROPHENOL	17	21 - 100
PHENOL-d6	25	10 - 94
NITROBENZENE-d5	49	35 - 114
2-FLUOROBIPHENYL	43	43 - 116
TRIBROMOPHENOL	51	10 - 123
TERPHENYL-d14	67	33 - 141

"Trace" denotes probable presence below listed detection limit.

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 3550/8270

Resource Analysts, Incorporated

Lab Number: 10,429-16
Sample Designation: 2332-325 Fort Totten Soil #6
Date Analyzed: 8/3/87
atrix: Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	BDL	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
?-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	BDL	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	90	70 - 121
d8-TOLUENE	101	81 - 117
BROMOFLUOROBENZENE	100	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Resource Analysts, Incorporated

ACID/BASE/NEUTRAL EXTRACTABLE ORGANIC COMPOUNDS

Laboratory Number: 10,424-17 -
Sample Designation: 2332-335 Fort Totten Soil #6
Date Extracted: 7/30/87
Date Analyzed: 8/3/87
Matrix: Soil

Results expressed on a dry (100 degrees C) basis.
Moisture content: 9.2%

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
N-NITROSODIMETHYLAMINE	BDL	0.8
PHENOL	BDL	0.3
Bis (2-CHLOROETHYL ETHER	BDL	0.3
2-CHLOROPHENOL	BDL	0.3
1,3-DICHLOROBENZENE	BDL	0.3
1,4-DICHLOROBENZENE	BDL	0.3
BENZYL ALCOHOL	BDL	0.3
1,2-DICHLOROBENZENE	BDL	0.3
2-METHYLPHENOL	BDL	0.3
Bis (2-CHLOROISOPROPYL ETHER	BDL	0.3
4-METHYLPHENOL	BDL	0.3
HEXACHLOROETHANE	BDL	0.3
N-NITROSODI-N-PROPYLAMINE	BDL	0.3
NITROBENZENE	BDL	0.3
ISOPHORONE	BDL	0.3
2-NITROPHENOL	BDL	0.3
2,4-DIMETHYLPHENOL	BDL	0.3
BENZOIC ACID	BDL	1
Bis (2-CHLOROETHOXY) METHANE	BDL	0.3
2,4-DICHLOROPHENOL	BDL	0.3
1,2,4-TRICHLOROBENZENE	BDL	0.3
NAPHTHALENE	BDL	0.3
4-CHLOROANILINE	BDL	0.3
HEXACHLOROBUTADIENE	BDL	0.3
4-CHLORO-3-METHYLPHENOL	BDL	0.3
2-METHYLNAPHTHALENE	BDL	0.3
HEXACHLOROCYCLOPENTADIENE	BDL	0.3
2,4,6-TRICHLOROPHENOL	BDL	0.3
2,4,5-TRICHLOROPHENOL	BDL	1
2-CHLORONAPHTHALENE	BDL	0.3
2-NITROANILINE	BDL	1
DIMETHYLPHTHALATE	BDL	0.3
ACENAPHTHYLENE	BDL	0.3
2,6-DINITROTOLUENE	BDL	0.3
3-NITROANILINE	BDL	1
ACENAPHTHENE	BDL	0.3
2,4-DINITROPHENOL	BDL	1
4-NITROPHENOL	BDL	1
DIBENZOFURAN	BDL	0.3
2,4-DINITROTOLUENE	BDL	0.3
DIETHYLPHTHALATE	BDL	0.3
4-CHLOROPHENYL-PHENYLETHER	BDL	0.3
FLUORENE	BDL	0.3

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
4-NITROANILINE	BDL	1
4,6-DINITRO-2-METHYLPHENOL	BDL	1
N-NITROSODIPHENYLAMINE (1)	BDL	0.3
4-BROMOPHENYL-PHENYLETHER	BDL	0.3
HEXACHLOROBENZENE	BDL	0.3
PENTACHLOROPHENOL	BDL	1
PHENANTHRENE	BDL	0.3
ANTHRACENE	BDL	0.3
DI-N-BUTYLPHTHALATE	BDL	0.3
FLUORANTHENE	0.7	0.3
BENZIDENE	BDL	1
PYRENE	0.6	0.3
BUTYLBENZYLPHTHALATE	BDL	0.3
3,3'-DICHLOROBENZIDINE	BDL	0.3
BENZO(a)ANTHRACENE	Trace	0.3
CHRYSENE	Trace	0.3
Bis(2-ETHYLHEXYL)PHTHALATE	1.0	0.3
DI-N-OCTYLPHTHALATE	BDL	0.3
BENZO(b)FLUORANTHENE	0.7	0.3
BENZO(k)FLUORANTHENE	BDL	0.3
BENZO(a)PYRENE	0.7	0.3
INDENO(1,2,3-c,d)PYRENE	BDL	0.3
DIBENZO(a,h)ANTHRACENE	BDL	0.3
BENZO(g,h,i)PERYLENE	BDL	0.3

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
2-FL-PHENOL	35	21 - 100
d5-PHENOL	42	10 - 94
NITROBENZENE-d5	61	35 - 114
2-FL-BIPHENYL	58	43 - 116
TRIBROMOPHENOL	70	10 - 123
TERPHENYL-d14	64	33 - 141

"Trace" denotes probable presence below listed detection limit.

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 3550/8270

Lab Number: 10,429-19
Sample Designation: 2332-326 Fort Totten Soil #7
Date Analyzed: 8/3/87
Matrix: Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	BDL	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
2-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	BDL	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	88	70 - 121
d8-TOLUENE	100	81 - 117
BROMOFLUOROBENZENE	100	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

ACID/BASE/NEUTRAL EXTRACTABLE ORGANIC COMPOUNDS

Laboratory Number:	10,429-02
Sample Designation:	2202-02c Fort Totten Soil #7
Date Extracted:	7/30/87
Date Analyzed:	7/31/87
Matrix:	Soil

Results expressed on a dry (103 degrees C) basis.
Moisture content: 16%

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
N-NITROSODIMETHYLAMINE	BDL	0.3
PHENOL	BDL	0.3
Bis (2-CHLOROETHYL ETHER	BDL	0.3
2-CHLOROPHENOL	BDL	0.3
1,3-DICHLOROBENZENE	BDL	0.3
1,4-DICHLOROBENZENE	BDL	0.3
BENZYL ALCOHOL	BDL	0.3
1,2-DICHLOROBENZENE	BDL	0.3
2-METHYLPHENOL	BDL	0.3
Bis (2-CHLOROISOPROPYL ETHER	BDL	0.3
4-METHYLPHENOL	BDL	0.3
HEXACHLOROETHANE	BDL	0.3
N-NITROSODI-N-PROPYLAMINE	BDL	0.3
NITROBENZENE	BDL	0.3
ISOPHORONE	BDL	0.3
2-NITROPHENOL	BDL	0.3
2,4-DIMETHYLPHENOL	BDL	0.3
BENZOIC ACID	BDL	1
Bis (2-CHLOROETHOXY) METHANE	BDL	0.3
2,4-DICHLOROPHENOL	BDL	0.3
1,2,4-TRICHLOROBENZENE	BDL	0.3
NAPHTHALENE	BDL	0.3
4-CHLOROANILINE	BDL	0.3
HEXACHLOROBUTADIENE	BDL	0.3
4-CHLORO-3-METHYLPHENOL	BDL	0.3
2-METHYLNAPHTHALENE	BDL	0.3
HEXACHLOROCYCLOPENTADIENE	BDL	0.3
2,4,6-TRICHLOROPHENOL	BDL	0.3
2,4,5-TRICHLOROPHENOL	BDL	1
2-CHLORONAPHTHALENE	BDL	0.3
2-NITROANILINE	BDL	1
DIMETHYLPHTHALATE	BDL	0.3
ACENAPHTHYLENE	BDL	0.3
2,6-DINITROTOLUENE	BDL	0.3
3-NITROANILINE	BDL	1
ACENAPHTHENE	BDL	0.3
2,4-DINITROPHENOL	BDL	1
4-NITROPHENOL	BDL	1
DIBENZOFURAN	BDL	0.3
2,4-DINITROTOLUENE	BDL	0.3
DIETHYLPHTHALATE	BDL	0.3
4-CHLOROPHENYL-PHENYLETHER	BDL	0.3
FLUORENE	BDL	0.3

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
4-NITROANILINE	BDL	1
4,6-DINITRO-2-METHYLPHENOL	BDL	1
N-NITROSODIPHENYLAMINE (1)	BDL	0.3
4-BROMOPHENYL-PHENYLETHER	BDL	0.3
HEXACHLOROBENZENE	BDL	0.3
PENTACHLOROPHENOL	BDL	1
PHENANTHRENE	BDL	0.3
ANTHRACENE	BDL	0.3
DI-N-BUTYLPHTHALATE	BDL	0.3
FLUORANTHENE	BDL	0.3
BENZIDENE	BDL	1
PYRENE	BDL	0.3
BUTYLBENZYLPHTHALATE	BDL	0.3
3,3'-DICHLOROBENZIDINE	BDL	0.7
BENZO(a)ANTHRACENE	BDL	0.3
CHRYSENE	BDL	0.3
Bis(2-ETHYLHEXYL)PHTHALATE	1.5	1.3
DI-N-OCTYLPHTHALATE	BDL	0.3
BENZO(b)FLUORANTHENE	BDL	0.3
BENZO(k)FLUORANTHENE	BDL	0.3
BENZO(a)PYRENE	BDL	0.3
INDENO(1,2,3-c,d)PYRENE	BDL	0.3
DIBENZO (a,h)ANTHRACENE	BDL	0.3
BENZO(g,h,i)PERYLENE	BDL	0.3

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
2-FL-PHENOL	37	21 - 100
d6-PHENOL	35	10 - 94
NITROBENZENE-d5	23	35 - 114
2-FL-BIPHENYL	28	43 - 116
TRIBROMOPHENOL	33	10 - 123
TERPHENYL-d14	67	33 - 141

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 3550/8270

Lab Number: 10,429-22
Sample Designation: 2332-327 Fort Totten Soil #8
Date Analyzed: 8/3/87
Matrix: Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	BDL	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
2-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	BDL	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	88	70 - 121
d8-TOLUENE	(94)	81 - 117
BROMOFLUOROBENZENE	101	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Resource Analysts, Incorporated

ACID/BASE/NEUTRAL EXTRACTABLE ORGANIC COMPOUNDS

oratory Number: 10,429-23
Sample Designation: 2332-327 Fort Totten Soil 88
Date Extracted: 7/30/87
Date Analyzed: 7/31/87
Matrix: Solid

Results expressed on a dry (103 degrees C) basis.
Moisture content: 21%

	CONCENTRATION REP 1. (ug/g)	CONCENTRATION REP 2 (ug/g)	DETECTION LIMIT (ug/g)
N-NITROSODIMETHYLAMINE	BDL	BDL	0.8
PHENOL	BDL	BDL	0.3
Bis (2-CHLOROETHYL ETHER)	BDL	BDL	0.3
2-CHLOROPHENOL	BDL	BDL	0.3
1,3-DICHLOROBENZENE	BDL	BDL	0.3
1,4-DICHLOROBENZENE	BDL	BDL	0.3
BENZYL ALCOHOL	BDL	BDL	0.3
1,2-DICHLOROBENZENE	BDL	BDL	0.3
2-METHYLPHENOL	BDL	BDL	0.3
Bis (2-CHLOROISOPROPYL) ETHER	BDL	BDL	0.3
4-METHYLPHENOL	BDL	BDL	0.3
HEXACHLOROETHANE	BDL	BDL	0.3
N-NITROSODI-N-PROPYLAMINE	BDL	BDL	0.3
TROBENZENE	BDL	BDL	0.3
OPHORONE	BDL	BDL	0.3
2-NITROPHENOL	BDL	BDL	0.3
2,4-DIMETHYLPHENOL	BDL	BDL	0.3
BENZOIC ACID	BDL	BDL	1
Bis (2-CHLOROETHOXY) METHANE	BDL	BDL	0.3
2,4-DICHLOROPHENOL	BDL	BDL	0.3
1,2,4-TRICHLOROBENZENE	BDL	BDL	0.3
NAPHTHALENE	BDL	BDL	0.3
4-CHLOROANILINE	BDL	BDL	0.3
HEXACHLOROBUTADIENE	BDL	BDL	0.3
4-CHLORO-3-METHYLPHENOL	BDL	BDL	0.3
2-METHYLNAPHTHALENE	BDL	BDL	0.3
HEXACHLOROCYCLOPENTADIENE	BDL	BDL	0.3
2,4,6-TRICHLOROPHENOL	BDL	BDL	0.3
2,4,5-TRICHLOROPHENOL	BDL	BDL	1
2-CHLORONAPHTHALENE	BDL	BDL	0.3
2-NITROANILINE	BDL	BDL	1
DIMETHYLPHTHALATE	BDL	BDL	0.3
ACENAPHTHYLENE	BDL	BDL	0.3
2,6-DINITROTOLUENE	BDL	BDL	0.3
3-NITROANILINE	BDL	BDL	1
ACENAPHTHENE	BDL	BDL	0.3
2,4-DINITROPHENOL	BDL	BDL	1
4-NITROPHENOL	BDL	BDL	1
DIBENZOFURAN	BDL	BDL	0.3
,6-DINITROTOLUENE	BDL	BDL	0.3
IETHYLPHTHALATE	BDL	BDL	0.3
4-CHLOROPHENYL-PHENYLETHER	BDL	BDL	0.3
FLUORENE	BDL	BDL	0.3

	CONCENTRATION REP 1 (ug/g)	CONCENTRATION REP 2 (ug/g)	DETECTION LIMI (ug/g)
4-NITROANILINE	BDL	BDL	1
4,6-DINITRO-2-METHYLPHENOL	BDL	BLD	1
N-NITROSODIPHENYLAMINE (1)	BDL	BDL	0.3
1,2-DIPHENYLHYDRAZINE (AZOBENZENE)	BDL	BDL	0.3
4-BROMOPHENYL-PHENYLETHER	BDL	BDL	0.3
HEXACHLOROBENZENE	BDL	BDL	0.3
PENTACHLOROPHENOL	BDL	BDL	1
PHENANTHRENE	BDL	Trace	0.3
ANTHRACENE	BDL	1.0	0.3
DI-N-BUTYLPHTHALATE	BDL	BDL	0.3
FLUORANTHENE	0.6	1.9	0.3
BENZIDENE	BDL	BDL	2
PYRENE	Trace	1.2	0.3
BUTYLBENZYLPHTHALATE	BDL	BDL	0.3
3,3'-DICHLOROBENZIDINE	BDL	BDL	0.7
BENZO(a)ANTHRACENE	BDL	0.6	0.3
CHRYSENE	BDL	0.5	0.3
Bis(2-ETHYLHEXYL)PHTHALATE	1.0	0.6	0.3
DI-N-OCTYLPHTHALATE	BDL	BDL	0.3
BENZO(b)FLUORANTHENE	BDL	0.9	0.3
BENZO(k)FLUORANTHENE	BDL	BDL	0.3
BENZO(a)PYRENE	BDL	0.5	0.3
IDENO(1,2,3-c,d)PYRENE	BDL	BDL	0.3
DIBENZO(a,h)ANTHRACENE	BDL	BDL	0.3
BENZO(g,h,i)PERYLENE	BDL	BDL	0.3

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)		ACCEPTANCE LIMI (%)
2-FL-PHENOL	9	11	21 - 100
d6-PHENOL	20	26	10 - 94
NITROBENZENE-d5	1	5	23 - 120
2-FL-BIPHENYL	14	14	30 - 115
TRIBROMOPHENOL	26	16	10 - 123
TERPHENYL-d14	12	18	18 - 137

'Trace' denotes probable presence below listed detection limit.

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 3550/8270

Lab Number: 10,429-25
Sample Designation: 2332-328 Fort Totten Soil #9
Date Analyzed: 8/3/87
Matrix: Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	BDL	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
2-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	BDL	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	92	70 - 121
d8-TOLUENE	105	81 - 117
BROMOFLUOROBENZENE	103	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

ACID/BASE/NEUTRAL EXTRACTABLE ORGANIC COMPOUNDS

Laboratory Number:	10,429-2e
Sample Designation:	2332-328 Fort Totten Soil #9
Date Extracted:	7/30/97
Date Analyzed:	7/31/97
Matrix:	Solid

Results expressed on a dry 103 degrees C basis.
Moisture content: 13%

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
N-NITROSODIMETHYLAMINE	BDL	0.5
PHENOL	BDL	0.3
Bis (2-CHLOROETHYL) ETHER	BDL	0.3
2-CHLOROPHENOL	BDL	0.3
1,3-DICHLOROBENZENE	BDL	0.3
1,4-DICHLOROBENZENE	BDL	0.3
BENZYL ALCOHOL	BDL	0.3
1,2-DICHLOROBENZENE	BDL	0.3
2-METHYLPHENOL	BDL	0.3
Bis (2-CHLOROISOPROPYL) ETHER	BDL	0.3
4-METHYLPHENOL	BDL	0.3
HEXACHLOROETHANE	BDL	0.3
N-NITROSODI-N-PROPYLAMINE	BDL	0.3
NITROBENZENE	BDL	0.3
ISOPHORONE	BDL	0.3
2-NITROPHENOL	BDL	0.3
2,4-DIMETHYLPHENOL	BDL	0.3
BENZOIC ACID	BDL	1
Bis (2-CHLOROETHOXY) METHANE	BDL	0.3
2,4-DICHLOROPHENOL	BDL	0.3
1,2,4-TRICHLOROBENZENE	BDL	0.3
NAPHTHALENE	BDL	0.3
4-CHLOROANILINE	BDL	0.3
HEXACHLOROBUTADIENE	BDL	0.3
4-CHLORO-3-METHYLPHENOL	BDL	0.3
2-METHYLNAPHTHALENE	BDL	0.3
HEXACHLOROCYCLOPENTADIENE	BDL	0.3
2,4,6-TRICHLOROPHENOL	BDL	0.3
2,4,5-TRICHLOROPHENOL	BDL	1
2-CHLORONAPHTHALENE	BDL	0.3
2-NITROANILINE	BDL	1
DIMETHYLPHTHALATE	BDL	0.3
ACENAPHTHYLENE	BDL	0.3
2,6-DINITROTOLUENE	BDL	0.3
3-NITROANILINE	BDL	1
ACENAPHTHENE	BDL	0.3
2,4-DINITROPHENOL	BDL	1
4-NITROPHENOL	BDL	1
DIBENZOFURAN	BDL	0.3
2,4-DINITROTOLUENE	BDL	0.3
DIETHYLPHTHALATE	BDL	0.3
4-CHLOROPHENYL-PHENYLETHER	BDL	0.3
FLUORENE	BDL	0.3

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
4-NITROANILINE	BDL	1
4,6-DINITRO-2-METHYLPHENOL	BDL	1
N-NITROSODIPHENYLAMINE (1)	BDL	0.3
4-BROMOPHENYL-PHENYLETHER	BDL	0.3
HEXACHLOROBENZENE	BDL	0.3
PENTACHLOROPHENOL	BDL	1
PHENANTHRENE	BDL	0.3
ANTHRACENE	BDL	0.3
DI-N-BUTYLPHTHALATE	BDL	0.3
FLUORANTHENE	BDL	0.3
BENZIDENE	BDL	1
PYRENE	BDL	0.3
BUTYLBENZYLPHTHALATE	BDL	0.3
3,3'-DICHLOROBENZIDINE	BDL	0.3
BENZO(a)ANTHRACENE	BDL	0.3
CHRYSENE	BDL	0.3
Bis (2-ETHYLHEXYL)PHTHALATE	1.1	0.3
DI-N-OCTYLPHTHALATE	BDL	0.3
BENZO(b)FLUORANTHENE	BDL	0.3
BENZO(k)FLUORANTHENE	BDL	0.3
BENZO a)PYRENE	BDL	0.3
INDENO(1,2,3-c,d)PYRENE	BDL	0.3
DIBENZO(a,h)ANTHRACENE	BDL	0.3
BENZO(g,h,i)PERYLENE	BDL	0.3

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
2-FL-PHENOL	13	21 - 100
d6-PHENOL	21	10 - 94
NITROBENZENE-d5	8	35 - 114
2-FL-BIPHENYL	17	43 - 116
TRIBROMOPHENOL	16	10 - 123
TERPHENYL-d14	54	33 - 141

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 3550/3270

aboratory Number: 10,429-28
Sample Designation: 2332-330 Fort Totten Soil #11
Date Analyzed: 8/18/87
Matrix: Solid

PCB'S	CONCENTRATION REP 1 (ug/g)	CONCENTRATION REP 2 (ug/g)	DETECTION LIMIT (ug/g)
PCB-1242	BDL	BDL	0.08
PCB-1254	BDL	BDL	0.16
PCB-1221	BDL	BDL	0.08
PCB-1232	BDL	BDL	0.08
PCB-1248	BDL	BDL	0.08
PCB-1260	BDL	BDL	0.16
PCB-1016	BDL	BDL	0.08

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHODS 3540 AND 8080

Laboratory Number: 10,429-29
Sample Designation: 232-331 Fort Totten Soil #12
Date Analyzed: 8/01/87
Matrix: Solid

PCB'S	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
PCB-1242	BDL	0.08
PCB-1254	BDL	0.16
PCB-1221	BDL	0.08
PCB-1232	BDL	0.08
PCB-1248	BDL	0.08
PCB-1260	BDL	0.16
PCB-1016	BDL	0.08

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHODS 3540 AND 8080

Lab Number: 10,429-31
Sample Designation: 2332-333 Ft Soil Sam Blk #1
Date Analyzed: 8/3/87
Matrix: Water

VOLATILE ORGANICS	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
CHLOROMETHANE	BDL	10
VINYL CHLORIDE	BDL	10
CHLOROETHANE	BDL	5
BROMOMETHANE	BDL	5
METHYLENE CHLORIDE	31	5
1,1-DICHLOROETHYLENE	BDL	5
1,1-DICHLOROETHANE	BDL	5
1,2-trans-DICHLOROETHYLENE	BDL	5
CHLOROFORM	BDL	5
1,2-DICHLOROETHANE	BDL	5
1,1,1-TRICHLOROETHANE	BDL	5
CARBON TETRACHLORIDE	BDL	5
BROMODICHLOROMETHANE	BDL	5
1,2-DICHLOROPROPANE	BDL	5
1,3-trans-DICHLOROPROPENE	BDL	5
TRICHLOROETHYLENE	BDL	5
BENZENE	BDL	5
1,3-cis-DICHLOROPROPENE	BDL	5
1,1,2-TRICHLOROETHANE	BDL	5
2-CHLOROETHYL VINYL ETHER	BDL	5
DIBROMOCHLOROMETHANE	BDL	5
BROMOFORM	BDL	5
TETRACHLOROETHYLENE	BDL	5
1,1,2,2-TETRACHLOROETHANE	BDL	5
TOLUENE	5	5
CHLOROBENZENE	BDL	5
ETHYLBENZENE	BDL	5
ACETONE	BDL	25
CARBON DISULFIDE	BDL	5
THF	BDL	25
MEK	BDL	25
VINYL ACETATE	BDL	10
MIBK	BDL	25
2-HEXANONE	BDL	25
STYRENE	BDL	5
XYLENES	BDL	5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	84	76 - 114
d8-TOLUENE	100	88 - 110
BROMOFLUOROBENZENE	93	86 - 115

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

ACID/BASE/NEUTRAL EXTRACTABLE ORGANIC COMPOUNDS

Laboratory Number: 10,429-32
Sample Designation: 2332-332 Ft Totten Base [illegible]
Date Extracted: 7/29/87
Date Analyzed: 7/31/87
Matrix: Water

	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
N-NITROSODIMETHYLAMINE	BDL	25
PHENOL	BDL	10
Bis (2-CHLOROETHYL ETHER	BDL	10
2-CHLOROPHENOL	BDL	10
1,3-DICHLOROBENZENE	BDL	10
1,4-DICHLOROBENZENE	BDL	10
BENZYL ALCOHOL	BDL	10
1,2-DICHLOROBENZENE	BDL	10
2-METHYLPHENOL	BDL	10
Bis (2-CHLOROISOPROPYL) ETHER	BDL	10
4-METHYLPHENOL	BDL	10
HEXACHLOROETHANE	BDL	25
N-NITROSODI-N-PROPYLAMINE	BDL	10
NITROBENZENE	BDL	10
ISOPHORONE	BDL	10
2-NITROPHENOL	BDL	10
2,4-DIMETHYLPHENOL	BDL	10
BENZOIC ACID	BDL	50
Bis (2-CHLOROETHOXY) METHANE	BDL	10
2,4-DICHLOROPHENOL	BDL	10
1,2,4-TRICHLOROBENZENE	BDL	10
NAPHTHALENE	BDL	10
4-CHLOROANILINE	BDL	10
HEXACHLOROBUTADIENE	BDL	10
4-CHLORO-3-METHYLPHENOL	BDL	10
2-METHYLNAPHTHALENE	BDL	10
HEXACHLOROCYCLOPENTADIENE	BDL	10
2,4,6-TRICHLOROPHENOL	BDL	10
2,4,5-TRICHLOROPHENOL	BDL	50
2-CHLORONAPHTHALENE	BDL	10
2-NITROANILINE	BDL	50
DIMETHYLPHTHALATE	BDL	10
ACENAPHTHYLENE	BDL	10
2,6-DINITROTOLUENE	BDL	25
3-NITROANILINE	BDL	50
ACENAPHTHENE	BDL	10
2,4-DINITROPHENOL	BDL	50
4-NITROPHENOL	BDL	50
DIBENZOFURAN	BDL	10
2,4-DINITROTOLUENE	BDL	25
DIETHYLPHTHALATE	BDL	10
4-CHLOROPHENYL-PHENYLETHER	BDL	10
FLUORENE	BDL	10

	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
4-NITROANILINE	BDL	50
4,6-DINITRO-2-METHYLPHENOL	BDL	50
N-NITROSODIPHENYLAMINE (1)	BDL	10
4-BROMOPHENYL-PHENYLETHER	BDL	10
HEXACHLOROBENZENE	BDL	10
PENTACHLOROPHENOL	BDL	10
PHENANTHRENE	BDL	10
ANTHRACENE	BDL	10
DI-N-BUTYLPHTHALATE	BDL	10
FLUORANTHENE	BDL	10
BENZIDENE	BDL	100
PYRENE	BDL	10
BUTYLBENZYLPHTHALATE	BDL	10
3,3'-DICHLOROBENZIDINE	BDL	20
BENZO(a)ANTHRACENE	BDL	10
CHRYSENE	BDL	10
Bis(2-ETHYLHEXYL)PHTHALATE	53	10
DI-N-OCTYLPHTHALATE	BDL	10
BENZO(b)FLUORANTHENE	BDL	10
BENZO(k)FLUORANTHENE	BDL	10
BENZO(a)PYRENE	BDL	10
INDENO(1,2,3-cd)PYRENE	BDL	10
DIBENZO(a,h)ANTHRACENE	BDL	10
BENZO(g,h,i)PERYLENE	BDL	10

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMIT (%)
2-FLUOROPHENOL	59	21 - 100
d5-PHENOL	62	10 - 94
NITROBENZENE-d5	100	35 - 114
2-FLUOROBIPHENYL	94	43 - 116
TRIBROMOPHENOL	91	10 - 123
TERPHENYL-d14	96	33 - 141

BDL = BELOW DETECTION LIMIT

METHOD REFERENCE: 40 CFR PART 136, FRIDAY, OCTOBER 26, 1984. METHOD 625

Lab Number: 10,429-34
Sample Designation: 2332-335 Ft Soil Trav Blk #1
ate Analyzed: 8/3/87
Matrix: Water

VOLATILE ORGANICS	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
CHLOROMETHANE	BDL	10
VINYL CHLORIDE	BDL	10
CHLOROETHANE	BDL	5
BROMOMETHANE	BDL	5
METHYLENE CHLORIDE	12	5
1,1-DICHLOROETHYLENE	BDL	5
1,1-DICHLOROETHANE	BDL	5
1,2-trans-DICHLOROETHYLENE	BDL	5
CHLOROFORM	BDL	5
1,2-DICHLOROETHANE	BDL	5
1,1,1-TRICHLOROETHANE	BDL	5
CARBON TETRACHLORIDE	BDL	5
BROMODICHLOROMETHANE	BDL	5
1,2-DICHLOROPROPANE	BDL	5
1,3-trans-DICHLOROPROPENE	BDL	5
TRICHLOROETHYLENE	BDL	5
BENZENE	BDL	5
1,3-cis-DICHLOROPROPENE	BDL	5
1,1,2-TRICHLOROETHANE	BDL	5
2-CHLOROETHYL VINYL ETHER	BDL	5
DIBROMOCHLOROMETHANE	BDL	5
BROMOFORM	BDL	5
TETRACHLOROETHYLENE	BDL	5
1,1,2,2-TETRACHLOROETHANE	BDL	5
TOLUENE	6	5
CHLOROBENZENE	BDL	5
ETHYLBENZENE	BDL	5
ACETONE	BDL	25
CARBON DISULFIDE	BDL	5
THF	BDL	25
MEK	BDL	25
VINYL ACETATE	BDL	10
MIBK	BDL	25
2-HEXANONE	BDL	25
STYRENE	BDL	5
XYLENES	BDL	5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	86	76 - 114
d8-TOLUENE	100	88 - 110
BROMOFLUOROBENZENE	94	86 - 115

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

MATRIX SPIKE DUPLICATE RECOVERY

Laboratory Number: 10,429-34
Sample Designation: 2332-335 Ft Soil Trv Blk #1
Date Analyzed: 8/3/87
Matrix: Solid

			REPLICATE 1	
COMPOUND	ug/g IN SAMPLE	ug/g SPIKE	ug/g FOUND	%REC-OVERY
1,1-DICHLOROETHENE	0	54	62	115
TRICHLOROETHYLENE	0	67	70	104
BENZENE	0	52	57	110
TOLUENE	6	54	61	102
CHLOROBENZENE	0	58	65	112

METHOD REFERENCE: EPA SW 846, 2ND EDITION METHOD 8240

ACID/BASE/NEUTRAL EXTRACTABLE ORGANIC COMPOUNDS

Laboratory Number: B-A10L
Sample Designation: Blk
Date Extracted: 7/30/87
Date Analyzed: 7/31/87
Matrix: Solid

Results expressed on a dry 100 degrees C basis.
Moisture content: -

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)		CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
N-NITROSODIMETHYLAMINE	BDL	0.8	4-NITROANILINE	BDL	1
PHENOL	BDL	0.3	4,6-DINITRO-2-METHYLPHENOL	BDL	1
Bis (2-CHLOROETHYL ETHER	BDL	0.3	N-NITROSODIPHENYLAMINE (1)	BDL	0.3
2-CHLOROPHENOL	BDL	0.3	4-BROMOPHENYL-PHENYLETHER	BDL	0.3
1,3-DICHLOROBENZENE	BDL	0.3	HEXACHLOROBENZENE	BDL	0.3
1,4-DICHLOROBENZENE	BDL	0.3	PENTACHLOROPHENOL	BDL	1
BENZYL ALCOHOL	BDL	0.3	PHENANTHRENE	BDL	0.3
1,2-DICHLOROBENZENE	BDL	0.3	ANTHRACENE	BDL	0.3
2-METHYLPHENOL	BDL	0.3	DI-N-BUTYLPHTHALATE	BDL	0.3
Bis (2-CHLOROISOPROPYL) ETHER	BDL	0.3	FLUORANTHENE	BDL	0.3
4-METHYLPHENOL	BDL	0.3	BENZIDENE	BDL	1
HEXACHLOROETHANE	BDL	0.3	PYRENE	BDL	0.3
N-NITROSODI-N-PROPYLAMINE	BDL	0.3	BUTYLBENZYLPHTHALATE	BDL	0.3
NITROBENZENE	BDL	0.3	3,3'-DICHLOROBENZIDINE	BDL	0.7
ISOPHORONE	BDL	0.3	BENZO(a)ANTHRACENE	BDL	0.3
2-NITROPHENOL	BDL	0.3	CHRYSENE	BDL	0.3
2,4-DIMETHYLPHENOL	BDL	0.3	Bis(2-ETHYLHEXYL)PHTHALATE	0.7	0.3
BENZOIC ACID	BDL	1	DI-N-OCTYLPHTHALATE	BDL	0.3
Bis (2-CHLOROETHOXY) METHANE	BDL	0.3	BENZO(b)FLUORANTHENE	BDL	0.3
2,4-DICHLOROPHENOL	BDL	0.3	BENZO(k)FLUORANTHENE	BDL	1
1,2,4-TRICHLOROBENZENE	BDL	0.3	BENZO(a)PYRENE	BDL	0.3
NAPHTHALENE	BDL	0.3	INDENO(1,2,3-c,d)PYRENE	BDL	0.3
4-CHLOROANILINE	BDL	0.3	DIBENZO(a,h) ANTHRACENE	BDL	0.3
HEXACHLOROBUTADIENE	BDL	0.3	BENZO(g,h,i) PERYLENE	BDL	0.3
4-CHLORO-3-METHYLPHENOL	BDL	0.3			
2-METHYLNAPHTHALENE	BDL	0.3	SURROGATE STANDARDS RECOVERY		
HEXACHLOROCYCLOPENTADIENE	BDL	0.3		RECOVERY %	ACCEPTANCE LIMITS %
2,4,6-TRICHLOROPHENOL	BDL	0.3			
2,4,5-TRICHLOROPHENOL	BDL	1	2-FL-PHENOL	15	21 - 100
2-CHLORONAPHTHALENE	BDL	0.3	d6-PHENOL	24	10 - 94
2-NITROANILINE	BDL	1	NITROBENZENE-d5	9	35 - 114
DIMETHYLPHTHALATE	BDL	0.3	2-FL-BIPHENYL	21	43 - 116
ACENAPHTHYLENE	BDL	0.3	TRIBROMOPHENOL	34	10 - 123
2,6-DINITROTOLUENE	BDL	0.3	TERPHENYL-d14	51	33 - 141
3-NITROANILINE	BDL	1			
ACENAPHTHENE	BDL	0.3			
2,4-DINITROPHENOL	BDL	1			
4-NITROPHENOL	BDL	1			
DIBENZOFURAN	BDL	0.3			
2,4-DINITROTOLUENE	BDL	0.3			
DIETHYLPHTHALATE	BDL	0.3	BDL = BELOW DETECTION LIMIT		
4-CHLOROPHENYL-PHENYLETHER	BDL	0.3	METHOD REFERENCE: EPA SW 846, 2ND EDITION		
FLUORENE	BDL	0.3	METHOD 3550/8270		

Laboratory Number: B-P102
Sample Designation: Blank
Date Analyzed: 8/13/87
Matrix: Solid

PCB'S	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
PCB-1242	BDL	0.08
PCB-1254	BDL	0.16
PCB-1221	BDL	0.08
PCB-1232	BDL	0.08
PCB-1248	BDL	0.08
PCB-1260	BDL	0.16
PCB-1016	BDL	0.08

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHODS 3540 AND 8080

SOIL MATRIX SPIKE

Date: 8/13/87

Sample Number: S-P102
(10,429-28 PCB Solid)

PCB SMO SAMPLE NO.	CONC. SPIKE ADDED (ug/g)	SAMPLE RESULTS (ug/g)	CONC. MS. (ug/g)	% REC.
PCB 1254	1.3	.47	.60	48

Resource Analysts, Incorporated

RESOURCE ANALYSTS, INC.
LABORATORY CONTROL SPIKE

LAB NUMBER 10429 DATE 8/12/87 SAMPLE DESIGNATION WP780

COMPOUND	TRUE VALUE	ACCEPTANCE GUIDELINES	ACTUAL RECOVERY
Bis (2-Chloroisopropyl) ether	55	12.0 - 84.8	40
Bis (2-Chlororthyl) ether	20	4.3 - 29.1	9
Bis (2-chloroethoxy) methane	35	8.4 - 41.6	50
4-chlorophenyl-phenylether	40	5.2 - 64.4	23
4-Bromophenyl-phenylether	75	3.3 - 129	48

SOIL MATRIX SPIKE

DATE 8/13/87 SAMPLE NUMBER S-P102 (10,429-28)
PCB SOLID

PCB SMO SAMPLE NO.	CONC. SPIKE ADDED (ug/g)	SAMPLE RESULT ug/g.	CONC. MS. ug/g.	% REC.
PCB 1254	1.3	.47	.60	46

Resource Analysts, Incorporated

RESOURCE ANALYSTS, INC.
LABORATORY CONTROL SPIKE

LAB NUMBER S-P103 DATE 8/13/87 SAMPLE DESIGNATION 10,429-29 PCB Soil 0
WP-783 conc. 17

COMPOUND	TRUE VALUE	ACCEPTANCE GUIDELINES	ACTUAL RECOVERY
Aroclor 1254	.18 ug/g.	.07 - .24 ug/g.	.19 ug/g.

ACIDS
50 STD.
CONTINUING
CALIBRATION
CHECK
7-31-87

Library used: SY:ACIDS
Data file name: SY:JL731H1
Injection time: 31-JUL-87 08:52:58
Comments:
ACID/SURR 50 STD.
Dilution factor: 1.00

Library entries as follows:

Standards:
1S 1,4-DICHLOROBENZENE-D4
2S NAPHTHALENE-D8
3S ACENAPHTHENE-D10
4S PHENANTHRENE D10
5S CHRYSENE D12

Targets:
1T PHENOL
2T 2-CHLOROPHENOL
3T 2-METHYLPHENOL
4T 4-METHYLPHENOL
5T 2,4-DIMETHYLPHENOL
6T 2-NITROPHENOL
7T BENZOIC ACID
8T 2,4-DICHLOROPHENOL
9T 4-CHLORO-3-METHYLPHENOL
10T 2,4,6-TRICHLOROPHENOL
11T 2,4,5-TRICHLOROPHENOL
12T 2,4-DINITROPHENOL
13T 4-NITROPHENOL
14T 4,6-DINITRO-2-METHYLPHENOL
15T PENTACHLOROPHENOL

No.	Time	Scan	Tmass/Smass	Tarea/Sarea	Ref	Fit	Conc	Units
1S	8.10	285			STD	1.00	40.0	UG/L
2S	11.10	534			STD	0.76	40.0	UG/L
3S	15.58	906			STD	1.00	40.0	UG/L
4S	19.35	1219			STD	0.85	40.0	UG/L
5S	26.32	1796			STD	0.74	40.0	UG/L
1T	7.55	240	94. / 152.	42652. / 18539.	1	0.93	50.9	UG/L
2T	7.72	254	128. / 152.	31483. / 18539.	1	0.96	48.4	UG/L
3T	8.82	345	108. / 152.	28389. / 18539.	1	1.00	47.4	UG/L
4T	9.18	375	107. / 152.	36655. / 18539.	1	1.00	48.2	UG/L
5T	10.42	478	107. / 136.	28926. / 70413.	2	1.00	51.1	UG/L
6T	10.23	463	139. / 136.	11342. / 70413.	2	1.00	38.9	UG/L
7T	11.05	530	122. / 136.	11588. / 70413.	2	0.94	43.4	UG/L
8T	10.82	511	63. / 136.	13623. / 70413.	2	0.67	48.2	UG/L
9T	12.67	664	107. / 136.	20061. / 70413.	2	1.00	37.2	UG/L
10T	13.70	750	198. / 164.	10099. / 28946.	3	1.00	43.2	UG/L
11T	13.82	759	198. / 164.	10263. / 28946.	3	0.93	44.9	UG/L
12T	15.90	933	184. / 164.	559. / 28946.	3	0.77	6.8	UG/L
13T	16.10	899	65. / 164.	3341. / 28946.	3	0.00	18.0	UG/L
14T	17.28	1047	198. / 188.	1861. / 41381.	4	0.63	20.0	UG/L
15T	19.10	1198	266. / 188.	3533. / 41381.	4	0.77	26.8	UG/L

39T	25.05	1692	149. / 240.	26836. /	52368.	5	0.96	34.6	UG/L
40T	26.30	1795	228. / 240.	31931. /	52368.	5	0.96	33.0	UG/L
41T	26.40	1804	228. / 240.	72047. /	52368.	5	0.93	53.0	UG/L
?T	26.60	1821	149. / 240.	45427. /	52368.	5	0.96	44.5	UG/L
,3T	28.18	2068	149. / 264.	47261. /	20734.	6	0.85	31.0	UG/L
44T	29.03	2068	252. / 264.	66526. /	20734.	6	0.00	107.6	UG/L
45T	29.25	2068	252. / 264.	66526. /	20734.	6	1.00	100.4	UG/L
46T	30.02	2068	252. / 264.	21749. /	20734.	6	0.00	56.3	UG/L
47T	34.35	2068	276. / 264.	8305. /	20734.	6	0.00	26.5	UG/L
48T	34.48	2068	278. / 264.	4732. /	20734.	6	0.00	16.0	UG/L
49T	35.47	2068	276. / 264.	6350. /	20734.	6	0.28	28.1	UG/L
50T	26.28	1745	252. / 240.	3446. /	52368.	5	0.00	17.2	UG/L
51T	23.00	1472	184. / 188.	104. /	96320.	4	0.00	1.1	UG/L

BASE/NEUT.
SD SPD.
CONTINUING
CALIBRATION
CHECK

8-3-87

MATRIX SPIKE DUPLICATE RECOVERY

Laboratory Number: 10,429-1
Sample Designation: 2332-320 Fort Totten Soil #1
Date Analyzed: 8/3/87
Matrix: Soil

COMPOUND	ug/g IN SAMPLE	ug/g SPIKE	REPLICATE 1 ug/g FOUND	REPLICATE 1 %REC-OVERY	REPLICATE 2 ug/g FOUND	REPLICATE 2 % REC-OVERY	RELATIV RANGE %
1,1-DICHLOROETHENE	0	7	8	122	8	112	9
TRICHLOROETHYLENE	0	8	10	119	10	115	3
BENZENE	0	7	8	122	8	115	5
TOLUENE	0	7	8	121	8	124	2
CHLOROBENZENE	0	7	9	131	9	124	5

METHOD REFERENCE: EPA SW 846, 2ND EDITION METHOD 8240

ACID/BASE/NEUTRAL EXTRACTABLE ORGANIC COMPOUNDS

Laboratory Number:	10,429-2
Sample Designation:	2332-330 Fort Totten Soil #1
Date Extracted:	7/30/87
Date Analyzed:	8/3/87
Matrix:	Soil

Results expressed on a dry (103 degrees C) basis.
Moisture Content: 13.2%

	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)		CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
N-NITROSODIMETHYLAMINE	BDL	0.8	4-NITROANILINE	BDL	1
PHENOL	BDL	0.3	4,6-DINITRO-2-METHYLPHENOL	BDL	1
Bis (2-CHLOROETHYL ETHER)	BDL	0.3	N-NITROSODIPHENYLAMINE (1)	BDL	0.3
2-CHLOROPHENOL	BDL	0.3	4-BROMOPHENYL-PHENYLETHER	BDL	0.3
1,3-DICHLOROBENZENE	BDL	0.3	HEXACHLOROBENZENE	BDL	0.3
1,4-DICHLOROBENZENE	BDL	0.3	PENTACHLOROPHENOL	BDL	1
BENZYL ALCOHOL	BDL	0.3	PHENANTHRENE	BDL	0.3
1,2-DICHLOROBENZENE	BDL	0.3	ANTHRACENE	BDL	0.3
2-METHYLPHENOL	BDL	0.3	DI-N-BUTYLPHTHALATE	BDL	0.3
Bis (2-CHLOROISOPROPYL) ETHER	BDL	0.3	FLUORANTHENE	BDL	0.3
4-METHYLPHENOL	BDL	0.3	BENZIDENE	BDL	2
HEXACHLOROETHANE	BDL	0.3	PYRENE	BDL	0.3
N-NITROSODI-N-PROPYLAMINE	BDL	0.3	BUTYLBENZYLPHTHALATE	BDL	0.3
NITROBENZENE	BDL	0.3	3,3'-DICHLOROBENZIDINE	BDL	0.7
ISOPHORONE	BDL	0.3	BENZO(a)ANTHRACENE	BDL	0.3
2-NITROPHENOL	BDL	0.3	CHRYSENE	BDL	0.3
2,4-DIMETHYLPHENOL	BDL	0.3	Bis(2-ETHYLHEXYL)PHTHALATE	0.7	0.3
BENZOIC ACID	BDL	1	DI-N-OCTYLPHTHALATE	BDL	0.3
Bis (2-CHLOROETHOXY) METHANE	BDL	0.3	BENZO(b)FLUORANTHENE	BDL	0.3
2,4-DICHLOROPHENOL	BDL	0.3	BENZO(k)FLUORANTHENE	BDL	0.3
1,2,4-TRICHLOROBENZENE	BDL	0.3	BENZO(a)PYRENE	BDL	0.3
NAPHTHALENE	BDL	0.3	IDENO(1,2,3-c,d)PYRENE	BDL	0.3
4-CHLOROANILINE	BDL	0.3	DIBENZO(a,h)ANTHRACENE	BDL	0.3
HEXACHLOROBUTADIENE	BDL	0.3	BENZO(g,h,i)PERYLENE	BDL	0.3
4-CHLORO-3-METHYLPHENOL	BDL	0.3			
2-METHYLNAPHTHALENE	BDL	0.3	SURROGATE STANDARDS RECOVERY		
HEXACHLOROCYCLOPENTADIENE	BDL	0.3		RECOVERY (%)	ACCEPTANCE LIMI (%)
2,4,6-TRICHLOROPHENOL	BDL	0.3			
2,4,5-TRICHLOROPHENOL	BDL	1	2-FL-PHENOL	12	21 - 100
2-CHLORONAPHTHALENE	BDL	0.3	d6-PHENOL	13	10 - 94
2-NITROANILINE	BDL	1	NITROBENZENE-d5	1[illegible]	35 - 114
DIMETHYLPHTHALATE	BDL	0.3	2-FL-BIPHENYL	28	43 - 116
ACENAPHTHYLENE	BDL	0.3	TRIBROMOPHENOL	33	10 - 123
2,6-DINITROTOLUENE	BDL	0.3	TERPHENYL-d14	41	33 - 141
3-NITROANILINE	BDL	1			
ACENAPHTHENE	BDL	0.3			
2,4-DINITROPHENOL	BDL	1			
4-NITROPHENOL	BDL	1			
DIBENZOFURAN	BDL	0.3			
2,4-DINITROTOLUENE	BDL	0.3			
DIETHYLPHTHALATE	BDL	0.3	BDL = BELOW DETECTION LIMIT		
4-CHLOROPHENYL-PHENYLETHER	BDL	0.3	METHOD REFERENCE: EPA SW 846, 2ND EDITION		
FLUORENE	BDL	0.3	METHOD 3550/8270		

Resource Analysts, Incorporated

ield Identification: 2332-341 FT Sediment #1 Matrix: Solid
-boratory Number: 10,430-2

arameter	Date Analyzed	Method/Reference	Concentration
ilver, recoverable (ug/g)	7/29/87	6010/1	<1
rsenic, recoverable (ug/g)	8/12/87	7060/1	4.9
Barium, recoverable (ug/g)	7/29/87	6010/1	<10
admium, recoverable (ug/g)	7/29/87	6010/1	<0.5
hromium, recoverable (ug/g)	7/29/87	6010/1	13
ercury, recoverable (ug/g)	7/29/87	7471/1	0.27
Lead, recoverable (ug/g)	7/29/87	6010/1	210
elenium, recoverable (ug/g)	8/14/87	7740/1	<1

ield Identification: 2332-342 FT Sediment #2 Matrix: Solid
aboratory Number: 10,430-5

arameter	Date Analyzed	Method/Reference	Concentration
Silver, recoverable (ug/g)	7/29/87	6010/1	<1
rsenic, recoverable (ug/g)	8/12/87	7060/1	5.0
arium, recoverable (ug/g)	7/29/87	6010/1	18
Cadmium, recoverable (ug/g)	7/29/87	6010/1	<0.5
Chromium, recoverable (ug/g)	7/29/87	6010/1	19
ercury, recoverable (ug/g)	7/29/87	7471/1	0.20
ad, recoverable (ug/g)	7/29/87	6010/1	225
Selenium, recoverable (ug/g)	8/14/87	7740/1	<1

Field Identification: 2332-343 FT Sediment #3 Matrix: Solid
Laboratory Number: 10,430-8

Parameter	Date Analyzed	Method/Reference	Concentration
Silver, recoverable (ug/g)	7/29/87	6010/1	<1
Arsenic, recoverable (ug/g)	8/12/87	7060/1	2.8
Barium, recoverable (ug/g)	7/29/87	6010/1	<10
Cadmium, recoverable (ug/g)	7/29/87	6010/1	<0.5
Chromium, recoverable (ug/g)	7/29/87	6010/1	12
Mercury, recoverable (ug/g)	7/29/87	7471/1	0.15
Lead, recoverable (ug/g)	7/29/87	6010/1	270
Selenium, recoverable (ug/g)	8/14/87	7740/1	<1

Field Identification: 2332-344 FT Sediment #4 Matrix: Solid
Laboratory Number: 10,430-11

Parameter	Date Analyzed	Method/Reference	Concentration
Silver, recoverable (ug/g)	7/29/87	6010/1	<2
Arsenic, recoverable (ug/g)	8/12/87	7060/1	4.6
Barium, recoverable (ug/g)	7/29/87	6010/1	27
Cadmium, recoverable (ug/g)	7/29/87	6010/1	<0.6
Chromium, recoverable (ug/g)	7/29/87	6010/1	14
Mercury, recoverable (ug/g)	7/29/87	7471/1	0.28
Lead, recoverable (ug/g)	7/29/87	6010/1	190
Selenium, recoverable (ug/g)	8/14/87	7740/1	<1

Field Identification: 2332-346 FT Sed Samp Blk Matrix: Water
Laboratory Number: 10,430-13

Parameter	Date Analyzed	Method/Reference	Concentration
Silver, recoverable (mg/L)	7/29/87	6010/1	<0.01
Arsenic, recoverable (mg/L)	8/12/87	7060/1	<0.01
Barium, recoverable (mg/L)	7/29/87	6010/1	<0.1
Cadmium, recoverable (mg/L)	7/29/87	6010/1	<0.005
Chromium, recoverable (mg/L)	7/29/87	6010/1	<0.01
Mercury, recoverable (mg/L)	7/29/87	7470/1	<0.0005
Lead, recoverable (mg/L)	7/29/87	7421/1	<0.005
elenium, recoverable (mg/L)	8/14/87	7740/1	<0.01

References: 1) EPA SW 846, 2nd Edition

CALIBRATION VERIFICATION

Lab Number: 10430

Site: Fort Totten
Units: mg/L

METALS:

	True Value	Found	%R	Method
Arsenic	0.050	0.048	96	7060
Barium	20.0	20.0	100	7080
Cadmium	0.50	0.492	98	7130
Chromium	1.0	0.985	98.5	7190
Lead	10.0	10.0	100	7420
Mercury	0.0050	0.00515	103	7470
Selenium	0.050	0.049	99	7740
Silver	1.0	0.998	99.8	7760

1) Control Limits: Mercury and Tin 80-120; Other Metals 90-110
2) Indicate Analytical Method Used: P-ICP; A-Flame AA; F-Furnace AA

CALIBRATION VERIFICATION SOURCES

Dilution of Commercial AA Standard unless otherwise specified.

QUALITY ASSURANCE/QUALITY CONTROL

MERCURY

1. Blank Data

Blank Number	Results (ug/g)
HgB 68	<0.05

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10430-8	2332-343	0.15	0.99	1.18	104

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10430-8	2332-343	0.14	0.16	0.15	13

SILVER

1. Blank Data

Blank Number	Results (ug/g)
MB 366	<0.5

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-3	2332-320	<1	7.2	7.0	97
10429-21	2332-326	<1	6.0	5.8	97

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-3	2332-320	<1	<1	<1	NC
10429-21	2332-326	<1	<1	<1	NC

ARSENIC

1. Blank Data

Blank Number	Results (ug/g)
MB 366	<1

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-3	2332-320	19	7.2	22.5	49
10429-21	2332-326	20	6.0	22.8	47

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-3	2332-320	20	18	19	10.5
10429-21	2332-326	21	19	20	10

BARIUM

1. Blank Data

Blank Number	Results (ug/g)
MB 366	<10

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-3	2332-320	94	724	757	91
10429-21	2332-326	5	602	617	102

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-3	2332-320	93	95	94	2
10429-21	2332 326	58	56	57	3.5

CADMIUM

1. Blank Data

Blank Number	Results (ug/g)
MB 366	<0.5

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-3	2332-320	0.72	72	71	98
10429-21	2332-326	<0.6	60.2	55	90

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-3	2332-320	0.69	0.74	0.72	6.9
10429-21	2332-326	<0.6	<0.6	<0.6	NC

CHROMIUM

1. Blank Data

Blank Number	Results (ug/g)
MB 366	<1

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-3	2332-320	39	725	796	104
10429-21	2332-326	27	602	640	102

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-3	2332-320	38	39	39	2.6
10429-21	2332-326	26	27	27	3.7

BARIUM

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.1

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	0.2	5.0	4.94	95

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	0.1	0.2	0.2	50

CHROMIUM

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.01

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	0.031	5.0	5.4	107

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	0.032	0.029	0.031	9.7

LEAD

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.1

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	<0.1	5.0	4.97	99

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	<0.1	<0.1	<0.1	NC

NC = not calculable due to results below detection limit.

SELENIUM

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.01

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	<0.01	0.05	0.0111	22

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	<0.01	<0.01	<0.01	NC

NC = not calculable due to results below detection limit.

SILVER

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.02

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	<0.01	0.05	0.053	106

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	<0.01	<0.01	<0.01	NC

CADMIUM

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.005

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	<0.005	0.5	0.477	94

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	<0.005	<0.005	<0.005	NC

NC = Not calculable due to result below detection limit.

SELENIUM

1. Blank Data

Blank Number	Results (ug/g)
MB 366	<1

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-3	2332-320	<1	7.2	4.1	57
10429-21	2332-326	<1	6.0	2.6	43

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-3	2332-320	<1	<1	<1	NC
10429-21	2332-326	<1	<1	<1	NC

NC = Not calculable due to result below detection limit.

LEAD

1. Blank Data

Blank Number	Results (ug/g)
MB 366	<1

2. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10429-3	2332-320	40	724	684	89
10429-21	2332-326	45	602	578	89

3. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
10429-3	2332-320	40	40	40	0
10429-21	2332-326	47	43	45	8.9

ARSENIC

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.01

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	<0.1	0.05	0.0427	85

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	<0.01	<0.01	<0.01	NC

NC = Not calculable due to result below detection limit.

MERCURY

1. Blank Data

Blank Number	Results (mg/L)
MB 367	<0.0005

2. Accuracy

Sample	Field I.D.	Original Concentration (mg/L)	Spike Level (mg/L)	Total Concentration Found (mg/L)	% Recovery
10465-3	2332-301	<0.0005	0.01	0.00755	76

3. Precision

Sample	Field I.D.	Replicate 1 (mg/L)	Replicate 2 (mg/L)	Average (mg/L)	% Relative Range
10465-3	2332-301	<0.0005	<0.0005	<0.0005	NC

NC = Not calculated due to result below detection limit.

QC DATA FOR PESTICIDES

1. Laboratory Control Sample

I. D.	True Value (ug/g)		Found (ug/g)	Recovery %	Acceptance Limits %
S-P105	Lindane	0.2	0.12	61	56 - 123
	Heptachlor	0.2	0.096	48	40 - 131
	Aldrin	0.2	0.11	57	40 - 120
	Dieldrin	0.5	0.27	54	52 - 126
	Endrin	0.5	0.26	51	56 - 121
	DDT	0.5	0.14	27	32 - 127

2. Blank

Blank Number

B 107
No compounds detected.

3. Mid-Range Calibration - Check

Standard Compound	(True) Calibration Value 8-5-87 (ug/mL)	Calibration Value 8-6-87 (ug/mL)	% Recovery
Lindane	0.025	0.020	79
Heptachlor	.050	.034	68
Aldrin	.050	.041	82
Heptachlor epoxide	.050	.041	82
Endosulfan 1	.10	.075	75
Dieldrin	.050	.040	80
Endosulfan 2	.050	.038	76
Endrin Aldehyde	.125	.089	71
DDT	.10	.028	(100)
Methoxychlor	.50	.19	38
alpha BHC	.025	.023	92
beta BHC	.050	.043	86
delta BHC	.050	.044	88
aldrin	.050	.041	82
DDE	.050	.041	82
endrin	.050	.041	82
DDD	.10	.081	81
endosulfan sulfate	.10	.080	80
endrin ketone	.10	.073	73

4. Precision

Wipes were unable to be subsampled for precision assesment.

. Accuracy

Wipes were unable to be subsampled for accuracy assesment.

QC DATA FOR PETROLEUM HYDROCARBONS

1. Laboratory Control Sample

I. D.	True Value (mg/L)	Found (mg/L)	Recovery %
S-15	5.04	5.0	99
SD-13	5.04	5.4	107

2. Mid Range Calibration Check Sample

True Value (mg/L)	Found (mg/L)	Recovery (%)
50	53	106

3. Blank

Blank Number	Results
261	<60 ug/g
260	<1 mg/L

4. Precision

Sample	Field I.D.	Replicate 1 (ug/g)	Replicate 2 (ug/g)	Average (ug/g)	% Relative Range
.0439-9	2332-343	190	150	170	24

5. Accuracy

Sample	Field I.D.	Original Concentration (ug/g)	Spike Level (ug/g)	Total Concentration Found (ug/g)	% Recovery
10430-3	2332-341	220	320	710	156
10430-11	2332-344	280	630	660	60

Analysis: Petroleum Hydrocarbons (ug/g) Matrix: Solid
Method/Reference: 503B,D,E/Standard Methods, 16th Edition
Date Analyzed: August 4, 1987

Field Identification	Lab. No.	Concentration
2332-341 FT Sediment #1	10,430-3	220
2332-342 FT Sediment #2	10,430-6	280
2332-343 FT Sediment #3	10,438-9	150
2332-344 FT Sediment #4	10,430-11	280

Analysis: Petroleum Hydrocarbons (ug/g) Matrix: Water
Method/Reference: 503B,D,E/Standard Methods, 16th Edition
Date Analyzed: August 4, 1987

Field Identification	Lab. No.	Concentration
2332-346 FT Sed Sam Blk	10,430-14	<1.0

Lab Number: 10,430-1
Sample Designation: 2332-341 FT Sediment #1
Date Analyzed: 8/04/87
Matrix: Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	BDL	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
2-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	BDL	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	87	70 - 121
d8-TOLUENE	89	81 - 117
BROMOFLUOROBENZENE	81	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Resource Analysts, Incorporated

Lab Number: 10,430-4
Sample Designation: 2332-342 FT Sediment #2
Date Analyzed: 8/04/87
Matrix: Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	BDL	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
2-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	BDL	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	84	70 - 121
d8-TOLUENE	84	81 - 117
BROMOFLUOROBENZENE	83	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Resource Analysts, Incorporated

Lab Number: 10,430-7
Sample Designation: 2332-343 FT Sediment #3
Date Analyzed: 8/04/87
Matrix: Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	BDL	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
2-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	BDL	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	86	70 - 121
d8-TOLUENE	90	81 - 117
BROMOFLUOROBENZENE	80	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Resource Analysts, Incorporated

Lab Number: 10,430-10
Sample Designation: 2332-344 FT Sediment #4
Date Analyzed: 8/04/87
Matrix: Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	BDL	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
2-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	BDL	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	98	70 - 121
d8-TOLUENE	90	81 - 117
BROMOFLUOROBENZENE	78	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Resource Analysts, Incorporated

Lab Number: 10,430-12
Sample Designation: 2332-346 FT Sed Sam Blk
Date Analyzed: 8/04/87
Matrix: Water

VOLATILE ORGANICS	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
CHLOROMETHANE	BDL	10
VINYL CHLORIDE	BDL	10
CHLOROETHANE	BDL	5
BROMOMETHANE	BDL	5
METHYLENE CHLORIDE	BDL	5
1,1-DICHLOROETHYLENE	BDL	5
1,1-DICHLOROETHANE	BDL	5
1,2-trans-DICHLOROETHYLENE	BDL	5
CHLOROFORM	BDL	5
1,2-DICHLOROETHANE	BDL	5
1,1,1-TRICHLOROETHANE	BDL	5
CARBON TETRACHLORIDE	BDL	5
BROMODICHLOROMETHANE	BDL	5
1,2-DICHLOROPROPANE	BDL	5
1,3-trans-DICHLOROPROPENE	BDL	5
TRICHLOROETHYLENE	BDL	5
BENZENE	BDL	5
1,3-cis-DICHLOROPROPENE	BDL	5
1,1,2-TRICHLOROETHANE	BDL	5
2-CHLOROETHYL VINYL ETHER	BDL	5
DIBROMOCHLOROMETHANE	BDL	5
BROMOFORM	BDL	5
TETRACHLOROETHYLENE	BDL	5
1,1,2,2-TETRACHLOROETHANE	BDL	5
TOLUENE	BDL	5
CHLOROBENZENE	BDL	5
ETHYLBENZENE	BDL	5
ACETONE	BDL	25
CARBON DISULFIDE	BDL	5
THF	BDL	25
MEK	BDL	25
VINYL ACETATE	BDL	10
MIBK	BDL	25
2-HEXANONE	BDL	25
STYRENE	BDL	5
XYLENES	BDL	5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	90	76 - 114
d8-TOLUENE	100	88 - 110
BROMOFLUOROBENZENE	83	86 - 115

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Lab Number: 10,430-15
Sample Designation: 2332-348 FT Sed Trav Blk
Date Analyzed: 8/04/87
Matrix: Water

VOLATILE ORGANICS	CONCENTRATION REP. 1 (ug/L)	REP. 2 (ug/L)	DETECTION LIMIT (ug/L)
CHLOROMETHANE	BDL	BDL	10
VINYL CHLORIDE	BDL	BDL	10
CHLOROETHANE	BDL	BDL	5
BROMOMETHANE	BDL	BDL	5
METHYLENE CHLORIDE	BDL	BDL	5
1,1-DICHLOROETHYLENE	BDL	BDL	5
1,1-DICHLOROETHANE	BDL	BDL	5
1,2-trans-DICHLOROETHYLENE	BDL	BDL	5
CHLOROFORM	BDL	BDL	5
1,2-DICHLOROETHANE	BDL	BDL	5
1,1,1-TRICHLOROETHANE	BDL	BDL	5
CARBON TETRACHLORIDE	BDL	BDL	5
BROMODICHLOROMETHANE	BDL	BDL	5
1,2-DICHLOROPROPANE	BDL	BDL	5
1,3-trans-DICHLOROPROPENE	BDL	BDL	5
TRICHLOROETHYLENE	BDL	BDL	5
BENZENE	BDL	BDL	5
1,3-cis-DICHLOROPROPENE	BDL	BDL	5
1,1,2-TRICHLOROETHANE	BDL	BDL	5
2-CHLOROETHYL VINYL ETHER	BDL	BDL	5
DIBROMOCHLOROMETHANE	BDL	BDL	5
BROMOFORM	BDL	BDL	5
TETRACHLOROETHYLENE	BDL	BDL	5
1,1,2,2-TETRACHLOROETHANE	BDL	BDL	5
TOLUENE	BDL	BDL	5
CHLOROBENZENE	BDL	BDL	5
ETHYLBENZENE	BDL	BDL	5
ACETONE	BDL	BDL	25
CARBON DISULFIDE	BDL	BDL	5
THF	BDL	BDL	25
MEK	BDL	BDL	25
VINYL ACETATE	BDL	BDL	10
MIBK	BDL	BDL	25
2-HEXANONE	BDL	BDL	25
STYRENE	BDL	BDL	5
XYLENES	BDL	BDL	5

SURROGATE STANDARDS RECOVERY	REP. 1 (%)	REP. 2 (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	92	92	70 - 121
d8-TOLUENE	96	94	81 - 117
BROMOFLUOROBENZENE	85	83	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Resource Analysts, Incorporated

Laboratory Number: 10,430-16
Sample Designation: 2332-350 Fort Totten Wipe #1
Date Analyzed: 8/07/87
Matrix: Solid

PESTICIDES	CONCENTRATION (ug/wipe)	DETECTION LIMIT (ug/wipe)
ALDRIN	BDL	0.005
ALPHA-BHC	BDL	0.005
BETA-BHC	BDL	0.005
GAMMA-BHC	BDL	0.005
DELTA-BHC	BDL	0.005
CHLORDANE	BDL	0.05
4,4'-DDT	4.2	0.01
4,4'-DDE	1.1	0.01
4,4'-DDD	0.69	0.01
DIELDRIN	BDL	0.01
ENDOSULFAN I	BDL	0.005
ENDOSULFAN II	BDL	0.01
ENDOSULFAN SULFATE	BDL	0.01
ENDRIN	BDL	0.01
ENDRIN ALDEHYDE	BDL	0.01
HEPTACHLOR	BDL	0.005
HEPTACHLOR EPOXIDE	BDL	0.005
TOXAPHENE	BDL	10
ENDRIN KETONE	BDL	0.01
METHOXYCHLOR	BDL	0.05

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: 40 CFR PART 136, FRIDAY, OCTOBER 26, 1984
METHOD 608

* Pesticide identification is tentative. GC confirmation is needed for positive identification.

Laboratory Number: 10,430-17
Sample Designation: 2332-351 Fort Totten Wipe #2
Date Analyzed: 8/07/87
Matrix: Solid

PESTICIDES	CONCENTRATION (ug/wipe)	DETECTION LIMIT (ug/wipe)
ALDRIN	BDL	0.005
ALPHA-BHC	BDL	0.005
BETA-BHC	BDL	0.005
GAMMA-BHC	BDL	0.005
DELTA-BHC	BDL	0.005
CHLORDANE	BDL	0.05
4,4'-DDT	1.7	0.01
4,4'-DDE	0.29	0.01
4,4'-DDD	0.42	0.01
DIELDRIN	BDL	0.01
ENDOSULFAN I	BDL	0.005
ENDOSULFAN II	BDL	0.01
ENDOSULFAN SULFATE	BDL	0.01
ENDRIN	BDL	0.01
ENDRIN ALDEHYDE	BDL	0.01
HEPTACHLOR	BDL	0.005
HEPTACHLOR EPOXIDE	BDL	0.005
TOXAPHENE	BDL	10
ENDRIN KETONE	BDL	0.01
METHOXYCHLOR	BDL	0.05

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: 40 CFR PART 136, FRIDAY, OCTOBER 26, 1984
METHOD 608

* Pesticide identification is tentative. GC confirmation is needed for positive identification.

Laboratory Number: 10,430-18
Sample Designation: 2332-352 Fort Totten Wipe #3
Date Analyzed: 8/07/87
Matrix: Solid

PESTICIDES	CONCENTRATION (ug/wipe)	DETECTION LIMIT (ug/wipe)
ALDRIN	BDL	0.005
ALPHA-BHC	BDL	0.005
BETA-BHC	BDL	0.005
GAMMA-BHC	BDL	0.005
DELTA-BHC	BDL	0.005
CHLORDANE	BDL	0.05
4,4'-DDT	3.2	0.01
4,4'-DDE	0.05	0.01
4,4'-DDD	0.53	0.01
DIELDRIN	BDL	0.01
ENDOSULFAN I	BDL	0.005
ENDOSULFAN II	BDL	0.01
ENDOSULFAN SULFATE	BDL	0.01
ENDRIN	BDL	0.01
ENDRIN ALDEHYDE	BDL	0.01
HEPTACHLOR	BDL	0.005
HEPTACHLOR EPOXIDE	BDL	0.005
TOXAPHENE	BDL	10
NDRIN KETONE	BDL	0.01
METHOXYCHLOR	BDL	0.05

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: 40 CFR PART 136, FRIDAY, OCTOBER 26, 1984
METHOD 608

* Pesticide identification is tentative. GC confirmation is needed for positive identification.

Laboratory Number: 10,430-19
Sample Designation: 2332-353 Fort Totten Wipe #4
Date Analyzed: 8/07/87
Matrix: Solid

PESTICIDES	CONCENTRATION (ug/wipe)	DETECTION LIMIT (ug/wipe)
ALDRIN	BDL	0.005
ALPHA-BHC	BDL	0.005
BETA-BHC	BDL	0.005
GAMMA-BHC	BDL	0.005
DELTA-BHC	BDL	0.005
CHLORDANE	BDL	0.05
4,4'-DDT	4.1	0.01
4,4'-DDE	0.2	0.01
4,4'-DDD	0.8	0.01
DIELDRIN	BDL	0.01
ENDOSULFAN I	BDL	0.005
ENDOSULFAN II	BDL	0.01
ENDOSULFAN SULFATE	BDL	0.01
ENDRIN	BDL	0.01
ENDRIN ALDEHYDE	BDL	0.01
HEPTACHLOR	BDL	0.005
HEPTACHLOR EPOXIDE	BDL	0.005
TOXAPHENE	BDL	10
ENDRIN KETONE	BDL	0.01
METHOXYCHLOR	BDL	0.05

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: 40 CFR PART 136, FRIDAY, OCTOBER 26, 1984
METHOD 608

* Pesticide identification is tentative. GC confirmation is needed for positive identification.

Laboratory Number: 10,430-20
Sample Designation: 2332-354 Fort Totten Wipe #5
Date Analyzed: 8/07/87
Matrix: Solid

PESTICIDES	CONCENTRATION (ug/wipe)	DETECTION LIMIT (ug/wipe)
ALDRIN	BDL	0.005
ALPHA-BHC	BDL	0.005
BETA-BHC	BDL	0.005
GAMMA-BHC	BDL	0.005
DELTA-BHC	BDL	0.005
CHLORDANE	BDL	0.05
4,4'-DDT	2.3	0.01
4,4'-DDE	.72	0.01
4,4'-DDD	.60	0.01
DIELDRIN	BDL	0.01
ENDOSULFAN I	BDL	0.005
ENDOSULFAN II	BDL	0.01
ENDOSULFAN SULFATE	BDL	0.01
ENDRIN	BDL	0.01
ENDRIN ALDEHYDE	BDL	0.01
HEPTACHLOR	BDL	0.005
HEPTACHLOR EPOXIDE	BDL	0.005
TOXAPHENE	BDL	10
NDRIN KETONE	BDL	0.01
METHOXYCHLOR	BDL	0.05

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: 40 CFR PART 136, FRIDAY, OCTOBER 26, 1984
METHOD 608

* Pesticide identification is tentative. GC confirmation is needed for positive identification.

Laboratory Number: 10,430-21
Sample Designation: 2332-356 FT Wipe Sam. Blk
Date Analyzed: 8/07/87
Matrix: Solid

PESTICIDES	REP 1 CONCENTRATION (ug/wipe)	REP 2 CONCENTRATION (ug/wipe)	DETECTION LIMIT (ug/wipe)
ALDRIN	BDL	BDL	0.005
ALPHA-BHC	BDL	BDL	0.005
BETA-BHC	BDL	BDL	0.005
GAMMA-BHC	BDL	BDL	0.005
DELTA-BHC	BDL	BDL	0.005
CHLORDANE	BDL	BDL	0.05
4,4'-DDT	BDL	BDL	0.01
4,4'-DDE	BDL	BDL	0.01
4,4'-DDD	BDL	BDL	0.01
DIELDRIN	BDL	BDL	0.01
ENDOSULFAN I	BDL	BDL	0.005
ENDOSULFAN II	BDL	BDL	0.01
ENDOSULFAN SULFATE	BDL	BDL	0.01
ENDRIN	BDL	BDL	0.01
ENDRIN ALDEHYDE	BDL	BDL	0.01
HEPTACHLOR	BDL	BDL	0.005
HEPTACHLOR EPOXIDE	BDL	BDL	0.005
OXAPHENE	BDL	BDL	10
ENDRIN KETONE	BDL	BDL	0.01
METHOXYCHLOR	BDL	BDL	0.05

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: 40 CFR PART 136, FRIDAY, OCTOBER 26, 1984
METHOD 608

Lab Number: Laboratory Control Sample
Sample Designation: C3823
Date Analyzed: 8/03/87
Matrix: Water

VOLATILE ORGANICS	TRUE VALUE (ug/L)	CONC. FOUND (ug/L)	DETECTION LIMIT (ug/L)	% RECOVERY
CHLOROMETHANE	BDL	BDL	10	
VINYL CHLORIDE	BDL	BDL	10	
CHLOROETHANE	BDL	BDL	5	
BROMOMETHANE	BDL	BDL	5	
METHYLENE CHLORIDE	98.0	65.9	5	67
1,1-DICHLOROETHYLENE	BDL	BDL	5	
1,1-DICHLOROETHANE	BDL	BDL	5	
1,2-trans-DICHLOROETHYLENE	BDL	BDL	5	
CHLOROFORM	60.4	39.3	5	65
1,2-DICHLOROETHANE	90.2	85.0	5	94
1,1,1-TRICHLOROETHANE	73.8	25.4	5	34
CARBON TETRACHLORIDE	92.7	22.8	5	24
BROMODICHLOROMETHANE	84.5	77.7	5	92
1,2-DICHLOROPROPANE	BDL	BDL	5	
1,3-trans-DICHLOROPROPENE	BDL	BDL	5	
TRICHLOROETHYLENE	55.1	22.3	5	40
BENZENE	BDL	BDL	5	
1,3-cis-DICHLOROPROPENE	BDL	BDL	5	
1,1,2-TRICHLOROETHANE	BDL	BDL	5	
2-CHLOROETHYL VINYL ETHER	BDL	BDL	5	
DIBROMOCHLOROMETHANE	71.7	89.0	5	124
BROMOFORM	97.8	122	5	125
TETRACHLOROETHYLENE	48.0	19.0	5	39
1,1,2,2-TETRACHLOROETHANE	BDL	BDL	5	
TOLUENE	BDL	BDL	5	
CHLOROBENZENE	79.1	55.6	5	70
ETHYLBENZENE	BDL	BDL	5	
ACETONE	BDL	BDL	25	
CARBON DISULFIDE	BDL	BDL	5	
THF	BDL	BDL	25	
MEK	BDL	BDL	25	
VINYL ACETATE	BDL	BDL	10	
MIBK	BDL	BDL	25	
2-HEXANONE	BDL	BDL	25	
STYRENE	BDL	BDL	5	
XYLENES	BDL	BDL	5	

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	100	76 - 114
d8-TOLUENE	106	88 - 110
BROMOFLUOROBENZENE	102	86 - 115

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION METHOD 8240

Resource Analysts, Incorporated

Lab Number: Calibration Verification
Sample Designation: C3849
Date Analyzed: 8/04/87
Matrix: Water

VOLATILE ORGANICS	CONC. OF STANDARD (ug/L)	CONC. FOUND (ug/L)	% RECOVERY	DETECTION LIMIT (ug/L)
CHLOROMETHANE	50	24	48	10
VINYL CHLORIDE	50	29	58	10
CHLOROETHANE	50	25	50	5
BROMOMETHANE	50	24	48	5
METHYLENE CHLORIDE	50	53	106	5
1,1-DICHLOROETHYLENE	50	50	100	5
1,1-DICHLOROETHANE	50	57	114	5
1,2-trans-DICHLOROETHYLENE	50	46	92	5
CHLOROFORM	50	42	84	5
1,2-DICHLOROETHANE	50	40	80	5
1,1,1-TRICHLOROETHANE	50	34	68	5
CARBON TETRACHLORIDE	50	32	64	5
BROMODICHLOROMETHANE	50	42	84	5
1,2-DICHLOROPROPANE	50	54	108	5
1,3-trans-DICHLOROPROPENE	38	40	105	5
TRICHLOROETHYLENE	50	37	74	5
BENZENE	50	49	98	5
1,3-cis-DICHLOROPROPENE	62	53	85	5
1,1,2-TRICHLOROETHANE	50	56	112	5
2-CHLOROETHYL VINYL ETHER	50	31	62	5
DIBROMOCHLOROMETHANE	50	40	80	5
BROMOFORM	50	45	90	5
TETRACHLOROETHYLENE	50	34	68	5
1,1,2,2-TETRACHLOROETHANE	50	57	114	5
TOLUENE	50	52	104	5
CHLOROBENZENE	50	42	84	5
ETHYLBENZENE	50	46	92	5
ACETONE	50	43	86	25
CARBON DISULFIDE	50	33	66	5
THF	50	76	152	25
MEK	50	72	144	25
VINYL ACETATE	50	58	116	10
MIBK	50	72	144	25
2-HEXANONE	50	71	142	25
STYRENE	50	46	92	5
XYLENES	134	130	97	5

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Resource Analysts, Incorporated

Lab Number: Blank
Sample Designation:
Date Analyzed: 8/04/87
Matrix: Water

VOLATILE ORGANICS	CONCENTRATION (ug/L)	DETECTION LIMIT (ug/L)
CHLOROMETHANE	BDL	10
VINYL CHLORIDE	BDL	10
CHLOROETHANE	BDL	5
BROMOMETHANE	BDL	5
METHYLENE CHLORIDE	13	5
1,1-DICHLOROETHYLENE	BDL	5
1,1-DICHLOROETHANE	BDL	5
1,2-trans-DICHLOROETHYLENE	BDL	5
CHLOROFORM	BDL	5
1,2-DICHLOROETHANE	BDL	5
1,1,1-TRICHLOROETHANE	BDL	5
CARBON TETRACHLORIDE	BDL	5
BROMODICHLOROMETHANE	BDL	5
1,2-DICHLOROPROPANE	BDL	5
1,3-trans-DICHLOROPROPENE	BDL	5
TRICHLOROETHYLENE	BDL	5
BENZENE	BDL	5
1,3-cis-DICHLOROPROPENE	BDL	5
1,1,2-TRICHLOROETHANE	BDL	5
2-CHLOROETHYL VINYL ETHER	BDL	5
DIBROMOCHLOROMETHANE	BDL	5
BROMOFORM	BDL	5
TETRACHLOROETHYLENE	BDL	5
1,1,2,2-TETRACHLOROETHANE	BDL	5
TOLUENE	BDL	5
CHLOROBENZENE	BDL	5
ETHYLBENZENE	BDL	5
ACETONE	BDL	25
CARBON DISULFIDE	BDL	5
THF	BDL	25
MEK	BDL	25
VINYL ACETATE	BDL	10
MIBK	BDL	25
2-HEXANONE	BDL	25
STYRENE	BDL	5
XYLENES	BDL	5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	90	76 - 114
d8-TOLUENE	101	88 - 110
BROMOFLUOROBENZENE	87	86 - 115

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Lab Number:	Blank 100 ME
Sample Designation:	C3847
Date Analyzed:	8/04/87
Matrix:	Solid

VOLATILE ORGANICS	CONCENTRATION (ug/g)	DETECTION LIMIT (ug/g)
CHLOROMETHANE	BDL	1
VINYL CHLORIDE	BDL	1
CHLOROETHANE	BDL	0.5
BROMOMETHANE	BDL	1
METHYLENE CHLORIDE	1.7	0.5
1,1-DICHLOROETHYLENE	BDL	0.5
1,1-DICHLOROETHANE	BDL	0.5
1,2-trans-DICHLOROETHYLENE	BDL	0.5
CHLOROFORM	BDL	0.5
1,2-DICHLOROETHANE	BDL	0.5
1,1,1-TRICHLOROETHANE	BDL	0.5
CARBON TETRACHLORIDE	BDL	0.5
BROMODICHLOROMETHANE	BDL	0.5
1,2-DICHLOROPROPANE	BDL	0.5
1,3-trans-DICHLOROPROPENE	BDL	0.5
TRICHLOROETHYLENE	BDL	0.5
BENZENE	BDL	0.5
1,3-cis-DICHLOROPROPENE	BDL	0.5
1,1,2-TRICHLOROETHANE	BDL	0.5
2-CHLOROETHYL VINYL ETHER	BDL	0.5
DIBROMOCHLOROMETHANE	BDL	0.5
BROMOFORM	BDL	0.5
TETRACHLOROETHYLENE	BDL	0.5
1,1,2,2-TETRACHLOROETHANE	BDL	0.5
TOLUENE	.7	0.5
CHLOROBENZENE	BDL	0.5
ETHYLBENZENE	BDL	0.5
ACETONE	BDL	2.5
CARBON DISULFIDE	BDL	0.5
THF	BDL	2.5
MEK	BDL	2.5
VINYL ACETATE	BDL	1
MIBK	BDL	2.5
2-HEXANONE	BDL	2.5
STYRENE	BDL	0.5
XYLENES	BDL	0.5

SURROGATE STANDARDS RECOVERY

	RECOVERY (%)	ACCEPTANCE LIMITS (%)
d4-DICHLOROETHANE	84	70 - 121
d8-TOLUENE	92	81 - 117
BROMOFLUOROBENZENE	81	74 - 121

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

MATRIX SPIKE DUPLICATE RECOVERY

Laboratory Number: 10,430-10
Sample Designation: 2332-344 FT Sediment #4
Date Analyzed: 8/04/87
Matrix: Water

COMPOUND	ug/L IN SAMPLE	ug/L SPIKE	REPLICATE 1 ug/L FOUND	REPLICATE 1 %REC-OVERY	REPLICATE 2 ug/L FOUND	REPLICATE 2 % REC-OVERY	RELATIV. RANGE %
1,1-DICHLOROETHENE	0	50	70	140	77	154	10
TRICHLOROETHYLENE	0	52	78	150	89	171	13
BENZENE	0	48	60	125	69	144	14
TOLUENE	9	48	63	113	72	131	13
CHLOROBENZENE	0	53	70	132	81	153	15

METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

MATRIX SPIKE DUPLICATE RECOVERY

Laboratory Number: 10,430-12
Sample Designation: 2332-346 FT Sed Sam Blk
Date Analyzed: 8/04/87
Matrix: Water

COMPOUND	ug/L IN SAMPLE	ug/L SPIKE	REPLICATE 1 ug/L FOUND	REPLICATE 1 %REC-OVERY	REPLICATE 2 ug/L FOUND	REPLICATE 2 % REC-OVERY	RELATIVE RANGE %
1,1-DICHLOROETHENE	0	50	79	158	82	164	4
TRICHLOROETHYLENE	0	52	89	171	87	167	2
BENZENE	0	48	67	140	66	138	2
TOLUENE	0	48	69	144	67	140	3
CHLOROBENZENE	0	53	79	149	77	145	3

METHOD REFERENCE: EPA SW 846, 2ND EDITION
METHOD 8240

Laboratory Number: B-M107
Sample Designation: Blank
ate Analyzed: 8/10/87
atrix: Solid

PESTICIDES	CONCENTRATION (ug/wipe)	DETECTION LIMIT (ug/wipe)
ALDRIN	BDL	0.005
ALPHA-BHC	BDL	0.005
BETA-BHC	BDL	0.005
GAMMA-BHC	BDL	0.005
DELTA-BHC	BDL	0.005
CHLORDANE	BDL	0.05
4,4'-DDT	BDL	0.01
4,4'-DDE	BDL	0.01
4,4'-DDD	BDL	0.01
DIELDRIN	BDL	0.01
ENDOSULFAN I	BDL	0.005
ENDOSULFAN II	BDL	0.01
ENDOSULFAN SULFATE	BDL	0.01
ENDRIN	BDL	0.01
ENDRIN ALDEHYDE	BDL	0.01
HEPTACHLOR	BDL	0.005
HEPTACHLOR EPOXIDE	BDL	0.005
TOXAPHENE	BDL	10
NDRIN KETONE	BDL	0.01
METHOXYCHLOR	BDL	0.05

BDL = BELOW DETECTION LIMIT
METHOD REFERENCE: 40 CFR PART 136, FRIDAY, OCTOBER 26, 1984
METHOD 608

* Pesticide identification is tentative. GC confirmation is needed for positive identification.

APPENDIX E

QUALITY CONTROL SAMPLE RESULTS

TABLE F.1 - FIELD DUPLICATE ANALYSIS

AQUEOUS SAMPLES		MW-2 2332-302 ug/L	MW-2 Field Duplicate 2332-306 ug/L	Relative Difference (%)	QAPP Objective (%)
Volatile Organics		ND	ND	--	<30
Extractable Organics					
Bis(2-ethylhexyl)phthalate		120,000	98,000	20	<30
Total Metals					
Silver	as Ag	<10	<10	0	<30
Arsenic	as As	16	18	12	<30
Barium	as Ba	230	190	19	<30
Cadmium	as Cd	<5	<5	0	<30
Chromium	as Cr	97	71	31	<30
Mercury	as Hg	<.5	<.5	0	<30
Lead	as Pb	<30	16	61	<30
Selenium	as Se	<10	<10	0	<30

SOIL SAMPLES	S-3 2332-322 ug/kg	S-3 Field Duplicate 2332-328 ug/kg	Relative Difference (%)	QAPP Objective (%)
Volatile Organics	ND	ND	--	<30
Extractable Organics				
Bis(2-ethylhexyl)phthalate	1,500	1,100	30	<30

TABLE F.1 - FIELD DUPLICATE ANALYSIS continued

SOIL SAMPLES

		S-3 2332-322	S-3 Field Duplicate 2332-328	Relative Difference (%)	QAPP Objective (%)
Total Metals		ug/kg*	ug/kg*		
Silver	as Ag	1,100	<2,000	58	<30
Arsenic	as As	15,000	16,000	6	<30
Barium	as Ba	76,000	100,000	27	<30
Cadmium	as Cd	530	<800	41	<30
Chromium	as Cr	32,000	42,000	27	<30
Mercury	as Hg	420	450	7	<30
Lead	as Pb	80,000	90,000	12	<30
Selenium	as Se	<1,000	<1,000	0	<30

SEDIMENT SAMPLES	Sed-3 2332-341 ug/kg	Sed-3 Field Duplicate 2332-344 ug/kg	Relative Difference (%)	QAPP Objective (%)
Volatile Organics	ND	ND	--	<30
Total Metals				
Silver	<1,000	<2,000	67	<30
Arsenic	4,900	4,600	6	<30
Barium	<10,000	27,000	92	<30
Cadmium	<500	<600	18	<30
Chromium	13,000	14,000	7	<30
Mercury	270	280	4	<30
Lead	210,000	190,000	15	<30
Selenium	<1,000	<1,000	0	<30

ND = Not Detected, all volatile organics compounds were below detection limits
* dry wt basis
Relative % difference = $\frac{\text{Range}}{\text{Mean}} \times 100$

TABLE F.2 - LABORATORY SAMPLE SPIKES

SOIL SAMPLE — S-1, Sample 2332-320

Compound	ug/kg* In Sample	ug/kg* Spike	Replicate 1 ug/kg* Found	Replicate 1 % Recovery	Replicate 2 ug/kg* Found	Replicate 2 % Recovery	Relative % Difference	QAPP Objective (%)
1,1 Dichloroethene	0	7,000	8,000	122	8,000	112	9	<30
Trichlorethylene	0	8,000	10,000	119	10,000	115	3	<30
Benzene	0	7,000	8,000	122	8,000	115	5	<30
Toluene	0	7,000	8,000	121	8,000	124	2	<30
Chlorobenzene	0	7,000	9,000	131	9,000	124	5	<30

*dry wt basis

$$\%\text{Recovery} = \frac{\text{Amount found - amount in sample}}{\text{amount spiked}} \times 100$$

$$\text{Relative Percent Difference} = \frac{\text{Range}}{\text{mean}} \times 100$$

AQUEOUS SAMPLE — MW-1, Sample 2332-301

Compound	ug/L In Sample	ug/L Spike	Replicate 1 ug/L Found	Replicate 1 % Recovery	Replicate 2 ug/L Found	Replicate 2 % Recovery	Relative % Difference	QAPP Objective (%)
1,1 Dichloroethene	0	54	68	126	55	102	21	<30
Trichlorethylene	0	67	67	100	59	88	13	<30
Benzene	0	52	58	112	53	102	9	<30
Toluene	0	54	54	100	48	89	12	<30
Chlorobenzene	0	58	61	105	56	97	9	<30

TABLE F.2-LABORATORY SAMPLE SPIKES continued

AQUEOUS SAMPLES

MW-1
Sample 2332-301

Total Metals		Original Concentration ug/L	Spike Level ug/L	Total Concentration Found ug/L	% Recovery	QAPP Objective (%)
Silver	as Ag	<10	50	53	106	70-130
Arsenic	as As	<10	50	42.7	85	70-130
Barium	as Ba	200	5,000	4,940	95	70-130
Cadmium	as Cd	<5	500	477	94	70-130
Chromium	as Cr	31	5,000	5,400	107	70-130
Mercury	as Hg	<0.5	10	7.6	76	70-130
Lead	as Pb	<100	5,000	4,970	99	70-130
Selenium	as Se	<10	50	11.1	22	70-130

SOIL SAMPLES

S-1
Sample 2332-320

Total Metals		Original Concentration ug/kg*	Spike Level ug/kg*	Total Concentration Found ug/kg*	% Recovery	QAPP Objective (%)
Silver	as Ag	<1,000	7,200	7,000	97	70-130
Arsenic	as As	<19,000	7,200	22,500	49	70-130
Barium	as Ba	94,000	724,000	757,000	91	70-130
Cadmium	as Cd	720	72,000	71,000	98	70-130
Chromium	as Cr	39,000	725,000	796,000	104	70-130
Lead	as Pb	40,000	724,000	684,000	89	70-130
Selenium	as Se	<1,000	7,200	4,100	57	70-130

S-7
Sample 2332-326

Total Metals		Original Concentration ug/kg*	Spike Level ug/kg*	Total Concentration Found ug/kg*	% Recovery	QAPP Objective (%)
Silver	as Ag	<1,000	6,000	5,800	97	70-130
Arsenic	as As	20,000	6,000	22,800	47	70-130
Barium	as Ba	5,000	602,000	617,000	102	70-130
Cadmium	as Cd	<600	60,200	55,000	90	70-130
Chromium	as Cr	27,000	602,000	640,000	102	70-130
Lead	as Pb	45,000	602,000	578,000	89	70-130
Selenium	as Se	<1,000	6,000	2,600	43	70-130

TABLE F.2 - LABORATORY SAMPLE SPIKES continued

SEDIMENT SAMPLES

Sed-1
Sample 2332-341

	Original Concentration ug/kg*	Spike Level ug/kg*	Total Concentration Found ug/kg*	% Recovery	QAPP Objective (%)
Petroleum Hydrocarbons	220,000	320,000	710,000	156	70-130

Sed-1
Field Duplicate
Sample 2332-344

	Original Concentration ug/kg*	Spike Level ug/kg*	Total Concentration Found ug/kg*	% Recovery	QAPP Objective (%)
Petroleum Hydrocarbons	280,000	630,000	660,000	60	70-130

Sed-3
Sample 2332-343

		Original Concentration ug/kg*	Spike Level ug/kg*	Total Concentration Found ug/kg*	% Recovery	QAPP Objective (%)
Total Metals						
Mercury	as Hg	150	990	1,180	104	70-130

% Recovery = amount found-amount in sample x 100
amount spiked

* dry wt. basis

TABLE F.3 - LABORATORY REPLICATES

AQUEOUS SAMPLES

Total Metals		MW-1 Sample 2332-301 Replicate 1 ug/L	Replicate 2 ug/L	Mean ug/L	Relative Difference (%)	QAPP Objectives (%)
Silver	as Ag	<10	<10	<10	0	<30
Arsenic	as As	<10	<10	<10	0	<30
Barium	as Ba	100	200	200	50	<30
Cadmium	as Cd	<5	<5	<5	0	<30
Chromium	as Cr	32	29	31	9.7	<30
Mercury	as Hg	<0.5	<0.5	<0.5	0	<30
Lead	as Pb	<100	<100	<100	0	<30
Selenium	as Se	<10	<10	<10	0	<30

SOIL SAMPLES

Total Metals		S-1 Sample 2332-320 Replicate 1 ug/kg*	Replicate 2 ug/kg*	Mean ug/kg*	Relative Difference (%)	QAPP Objectives (%)
Silver	as Ag	<1,000	<1,000	<1,000	0	<30
Arsenic	as As	20,000	18,000	19,000	10.5	<30
Barium	as Ba	93,000	95,000	94,000	2	<30
Cadmium	as Cd	690	740	720	6.9	<30
Chromium	as Cr	38,000	39,000	39,000	3	<30
Lead	as Pb	40,000	40,000	40,000	0	<30
Selenium	as Se	<1,000	<1,000	<1,000	0	<30

TABLE F.3 - LABORATORY REPLICATES continued

S-7
Sample 2332-326

Total Metals		Replicate 1 ug/kg*	Replicate 2 ug/kg*	Mean ug/kg*	Relative Difference (%)	QAPP Objectives (%)
Silver	as Ag	<1,000	<1,000	<1,000	0	<30
Arsenic	as As	21,000	19,000	20,000	10	<30
Barium	as Ba	58,000	56,000	57,000	3.5	<30
Cadmium	as Cd	<600	<600	<600	0	<30
Chromium	as Cr	26,000	27,000	27,000	3.7	<30
Lead	as Pb	47,000	43,000	45,000	8.9	<30
Selenium	as Se	<1,000	<1,000	<1,000	0	<30

S-8
Sample 2332-328

Total Metals		Replicate 1 ug/kg*	Replicate 2 ug/kg*	Mean ug/kg*	Relative Difference (%)	QAPP Objectives (%)
Mercury	as Hg	209	204	207	2.4	<30

SEDIMENT SAMPLES

Sed-3
Sample 2332-343

Total Metals		Replicate 1 ug/kg*	Replicate 2 ug/kg*	Mean ug/kg*	Relative Difference (%)	QAPP Objectives (%)
Mercury	as Hg	140	160	150	13	<30
Petroleum Hydrocarbons		190,000	150,000	170,000	24	<30

* Dry wt. basis

TABLE F.4 - SURROGATE STANDARD RECOVERIES--Volatile Compounds

Sample Description	Sample No.	D(4)-1-2-Dichloroethane		D8-Toluene		Bromofluorobenzene	
		% Recovery	Control Range	% Recovery	Control Range	% Recovery	Control Range
MW-1	2332-301	88	76-114	79	88-110	87	86-115
MW-2	2332-302	90	76-114	81	88-110 *	85	86-115 *
MW-2 Field Duplicate	2332-306	88	76-114	81	88-110 *	85	86-115 *
MW-3	2332-303	106	76-114	81	88-110 *	85	86-115 *
MW-4	2332-304	105	76-114	81	88-110 *	85	86-115 *
MW-5	2332-305 Lab Rep 1	96	70-121	81	81-117	85	74-121
MW-5	2332-305 Lab Rep 2	90	70-121	77	81-117 *	81	74-121
Well Sample Blk	2332-308	100	76-114	79	88-110 *	83	86-115 *
Well Travel Blk	2332-360	94	76-114	79	88-110 *	87	86-115
Lab Control	D0027	83	76-114	77	88-110 *	81	86-115 *
Lab Control	D0012	96	76-114	79	88-110 *	83	86-115 *
S-1	2332-320	90	70-121	111	81-117	102	74-121
S-2	2332-321	90	70-121	101	81-117	101	74-121
S-3	2332-322	66	70-121 *	90	81-117	76	74-121
S-3 Field Duplicate	2332-328	92	70-121	105	81-117	103	74-121
S-4	2332-323	100	70-121	105	81-117	103	74-121
S-5	2332-324	98	70-121	107	81-117	105	74-121
S-6	2332-325	90	70-121	101	81-117	100	74-121
S-7	2332-326	88	70-121	100	81-117	100	74-121
S-8	2332-327	88	70-121	94	81-117	101	74-121
Soil Sample Blk	2332-333	84	76-114	100	88-110	93	86-115
Soil Travel Blk	2332-335	86	76-114	100	88-110	94	86-115
Sed-1	2332-341	87	70-121	89	81-117	81	74-121
Sed-1 Field Duplicate	2332-344	98	70-121	90	81-117	78	74-121
Sed-2	2332-342	84	70-121	84	81-117	83	74-121
Sed-3	2332-343	86	70-121	90	81-117	80	74-121
Sed Sample Blk	2332-346	90	76-114	100	88-110	83	86-115
Sed Travel Blk	2332-348 Lab Rep 1	92	70-121	96	81-117	85	74-121
Sed Travel Blk	2332-348 Lab Rep 2	92	70-121	94	81-117	83	74-121
Lab Control	C3823	100	76-114	106	88-110	102	86-115

% Recovery = Amount found X 100, It is assumed that analyte in sample is negligible
Amount in spike

* % Recovery outside Control Range

TABLE F.5 - SURROGATE STANDARD RECOVERIES--Extractable Organics

Sample Description	Sample No.	2-Fl-Phenol		d6-Phenol		Nitrobenzene		2-Fl-Biphenyl		Tribromophenol		Terphenyl-d14	
		% Recovery	Control Range	% Recovery	Control Range	% Recovery	Control Range	% Recovery	Control Range	% Recovery	Control Range	% Recovery	Control Range
MW-1	2332-301	53	21-100	35	10-94	98	35-114	70	43-116	31	10-123	80	33-141
MW-1	2332-301-Lab Rep	39	21-100	29	10-94	97	35-114	71	43-116	30	10-123	78	33-141
MW-2	2332-302	63	21-100	42	10-94	91	35-114	76	43-116	48	10-123	72	33-141
MW-2 Field Duplicate	2332-306	60	21-100	39	10-94	107	35-114	86	43-116	50	10-123	100	33-141
MW-3	2332-303	32	21-100	24	10-94	103	35-114	81	43-116	38	10-123	105	33-141
MW-4	2332-304	62	21-100	42	10-94	100	35-114	84	43-116	38	10-123	66	33-141
MW-5	2332-305	63	21-100	41	10-94	96	35-114	82	43-116	45	10-123	97	33-141
Well Sample Blk	2332-308	66	21-100	39	10-94	85	35-114	69	43-116	47	10-123	101	33-141
S-1	2332-320	12	21-100	13	10-94	16	35-114 *	28	43-116 *	33	10-123	41	33-141
S-2	2332-321	14	21-100	15	10-94	19	35-114 *	27	43-116 *	29	10-123	49	33-141
S-3	2332-322	21	21-100	30	10-94	17	35-114 *	20	43-116 *	30	10-123	73	33-141
S-3 Field Duplicate	2332-328	12	21-100 *	21	10-94	8	35-114 *	17	43-116 *	16	10-123	54	33-141
S-4	2332-323	34	21-100	46	10-94	43	35-114	52	43-116	59	10-123	80	33-141
S-5	2332-324	17	21-100 *	25	10-94	49	35-114	43	43-116	51	10-123	67	33-141
S-6	2332-325	35	21-100	43	10-94	41	35-114	58	43-116	70	10-123	64	33-141
S-7	2332-326	27	21-100	35	10-94	23	35-114 *	28	43-116 *	33	10-123	67	33-141
S-8	2332-327	9	21-100 *	20	10-94	1	23-120 *	14	30-115 *	24	10-123	12	18-137 *
S-8 Lab Duplicate	2332-327	11	21-100 *	26	10-94	5	23-120 *	14	30-115 *	16	10-123	18	18-137
Soil Sample Blk	2332-333	69	21-100	42	10-94	100	35-114	84	43-116	51	10-123	96	33-141
Blank	B-A014	15	21-100 *	24	10-94	9	35-114 *	21	43-116 *	24	10-123	61	33-141
Blank	B-A105	37	21-100	24	10-94	100	35-114	79	43-116	50	10-123	91	33-141

% Recovery = $\frac{\text{Amount found}}{\text{Amount in spike}} \times 100$, if is assumed that analyte in sample is negligible

* % Recovery outside Control Range

APPENDIX F

NEW JERSEY SOIL CLEANUP APPROACHES

Attachment 6

Cleanup Approaches used by NJDEP

New Jersey Department of Environmental Protection

Summary of Approaches to Soil Cleanup Levels

(I) Discussion of Theoretical Approaches

NJDEP has investigated many theoretical approaches to establishing cleanup objectives for contaminated soil including cleanup to background, cleanup to the analytical detection limits and cleanup to a risk assessment derived number.

(A) Cleanup to Background has been considered for a number of compounds. Development of a cleanup objective based on background requires an extensive environmental data base. This approach can only be applied to compounds which are normally found in nature. If it is applied to anthropogenic compounds the cleanup level could become "zero" which equates to the current limit of detection of the analytical method in use. A cleanup objective based on background is determined by the range of concentrations observed on a specific site or based on literature values. This approach has been applied to inorganic compounds. For petroleum hydrocarbons, an "industrial" background is generalized as 100 ppm.

(B) Cleanup levels based on analytical detection limits have been considered. In reality, the cleanup objective becomes the limit of detection of the analytical method, thus the cleanup objective becomes non-detectable (cleanup to pristine conditions). This approach is undesirable by itself because the limit of detection of analytical methods is a moving target. Current trends in environmental analytical chemistry indicate that detection limits will continue to decrease to levels that are below those of environmental or public health concern. This approach is further complicated by the fact that in many instances the method detection limit is influenced by the nature of the matrix and the presence of other interfering compounds.

Developing a cleanup objective based on method detection limits can only be applied to anthropogenic compounds. If applied to compounds which occur naturally, the cleanup objective could be well below the levels normally found in the environment.

(C) Risk assessment methodology has been used to establish cleanup objectives. The use of risk assessment is common to standard and/or criteria setting. The Water Preliminary Protective Concentration Limits and Recommended Maximum Contaminant Levels are based on risk assessment methodologies which estimate the risks from carcinogens and noncarcinogens in drinking water. In the case of carcinogens, it is assumed that no threshold exists below which cancer does not develop. Thus, exposure to any dose regardless of how small, results in a cancer risk. For noncarcinogens, on the other hand, a threshold exists below which no response is observed. Thus a "safe" dose exists. The numbers developed for risk based standards/criteria range

from sub parts per billions (carcinogens) to hundreds of parts per million (non-carcinogens).

It must be noted that the use of the risk assessment approach requires that an exposure pathway be defined in terms of the frequency and duration of exposure and that a suitable toxicology database exists for the chemical of concern. In the absence of either of these, the risk assessment approach cannot be applied correctly. Where there is uncertainty regarding the route or extent of exposure, the risk assessment will reflect these uncertainties.

In general, conservati e worst case exposure scenarios are used in developing risk based standards or criteria. Unfortunately, real life exposures may be quite different than those used to develop the risk based number. Thus a risk based number may "overprotect" the individuals being exposed. This can be avoided by developing situation specific risk based cleanup criteria or by developing a range of exposure scenarios which can be selectively applied to specific situations. The most conservative approach (and the least time consuming) is to use reasonable worst case exposure scenarios to protect the most sensitive individual likely to be exposed.

(D) Chemical class cleanup objectives have been set for classes of compounds. Cleanup objectives which have been established for a class of compounds are used as a surrogate or action level to indicate if a closer look at the individual chemicals comprising the residue is warranted.

(II) Application of Cleanup Approaches in NJDEP Programs.

Soil cleanup levels have been developed based on anticipated background or risk assessment. In general, the Department attempts to establish a soil cleanup level that:

- protects human health from direct contact
- protects groundwater from degradation due to leaching
- protects surface water (in situations when migration of contaminated soil to surface water is a possibility).

The Department has also established surrogate or alarm levels for classes of compounds. These surrogates are usually conservatively set to serve as an indicator or "red flag" to point the need for further attention. This approach allows staff not trained in toxicology to determine when the assistance of a toxicologist/environmental chemist is needed. In general, surrogate levels are not cleanup numbers, but they could be in certain situations.

(A) Inorganic compounds - Cleanup levels for metals have been established based on expected background concentrations in New Jersey soils. The cleanup objectives are generally to 1 to 3 times background depending on the range of concentration observed and toxicity. Table 1 summarizes New Jersey background, United States background and soil cleanup objectives. Some of the cleanup objectives were proposed by

ECRA applicants and have been accepted by the Department in ECRA cleanups. The cleanup objectives applied at a specific site may be different than those listed in Table 1 depending on site specific factors. These exceptions normally allow higher levels to remain on site. These situations include (1) if information exists to indicate the soil background onsite is different than values listed in the Table, (2) contamination from other sources is suspected (especially lead on a site near highways), (3) a contamination problem is area wide and (4) encapsulation is included as part of the cleanup plan.

(B) Organic contaminants - Cleanup levels for individual organic compounds have been developed based on r sk assessment methodologies. A worst case soil ingestion model is used to calculate an acceptable soil contaminant level (ASCL) to protect individuals from direct contact and a simple transport to groundwater model is used to calculate an ASCL to protect groundwater quality. The ASCLs are then compared to analytical method detection limits to determine if the calculated concentration can be measured accurately. If the risk based criterion is below the method detection limit, the method detection limit becomes the cleanup objective.

This latter approach has been used by the New Jersey Division of Hazardous Site Mitigation (DHSM) to develop an acceptable soil contaminant level for PCBs based on direct contact. (Transport to groundwater was considered insignificant since PCBs bind strongly to soils.) A risk assessment utilizing a pica and inhalation of soil scenario indicated that individuals could be exposed to soils contaminated with 274 ppb of PCBs without exceeding a one-in-a-million lifetime cancer risk due to this exposure. The limit of detection of PCBs in soil using current analytical methods is 3.3 ppm. In reality 5 ppm or above can be detected with confidence. Thus the acceptable soil contaminant level (based on analytical methods) is 5 ppm. In situations where the potential for children to come in contact with soils is great (ie., parks, schoolyards, residential areas) 5 ppm is not adequate to protect health and a cleanup objective of 1 ppm should be considered, in spite of the inherent uncertainty with regard to quantitation.

This risk approach has been embodied in a document entitled Calculation of Cleanup Levels for Contaminated Soils, recently prepared by DHSM. The approach outlined in the document is composed of two steps (A) selection of chemicals of concern and (B) calculation of acceptable soil contaminant levels to protect individuals from direct contact and to protect groundwater and surface water quality. The approach has been used to rank and calculate acceptable soil contaminant levels for 21 compounds which include PCBs, chlorinated solvents, nonchlorinated solvents, phenols, polycylicaromatic hydrocarbons, and phthalates. This approach was developed in-house and has not gone through an external peer review. DHSM is finalizing a request for proposal to hire a consultant to review, critique and refine the approach developed by DHSM.

(C) Surrogate or action levels have been developed for volatile organics, base neutral extractables and petroleum hydrocarbons as shown below.

Volatile Organics	1 ppm
Base Neutrals	10 ppm
Petroleum Hydrocarbons	100 ppm

(D) Chemical Class Cleanup Objectives have been set for petroleum hydrocarbons at 100 ppm. (This was assumed to be "industrial background".) The actual soil cleanup number will vary depending on the chemical constituents present in the petroleum residue. Levels greater than 100 ppm may be acceptable if the residue is comprised mainly of toluene or xylenes while a level less than 100 ppm may be warranted if the residue is comprised mostly of benzene and/or the carcinogenic polynuclear aromatic hydrocarbons.

TABLE 1

Metal	N.J. Background[a]	U.S. Background	Cleanup Objective	Time above NJ Background
Arsenic	N.A.	1.1 - 16.7	20 ppm	N.A.
[illegible]	NA	10 - 1500 (2500)	400	NA
Cadmium	1.0 - 4.0	0.01 - 1.0ppm	3 ppm	1
Chromium	5.0 - 48	1 - 1,500	100 ppm	2
Copper	0.5 - 53.6	2 - 200	170	3
Cyanide	N.A.	0.09	12*	N.A.
Lead	1.0 - 180	2 - 200	250 - 1000*	1-2
Mercury	N.A.	0.01 - 4.6	1	N.A.
Nickel	11.1 - 86.5	8 - 550	100	1
Selenium	0.01 - 4[b]	0.01 - 5.0	4	1
Silver	N.A.	0.01 - 5	5	N.A.
Zinc	4.5 - 168	10 - 3000	350	2

a. Data from Stephen Toth or Harry Motto, Cook College, Rutgers University.

b. [illegible] in U[illegible] U.S. only - [illegible]

c. Agricultural soils in N.J.

* Suggested by a consultant on an ECRA case.

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