Joe Pane

WORKPLAN FOR A SUPPLEMENTAL REMEDIAL INVESTIGATION/FEASIBILITY STUDY AT THE DEKNATEL FACILITY QUEENS VILLAGE, LONG ISLAND, NEW YORK

ON BEHALF OF:

DEKNATEL, INC.

RECRA ENVIRONMENTAL, INC.

Chemical Waste Analysis, Prevention and Control

1/12266C

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ON BEHALF OF:

DEKNATEL, INC.
96-14 222nd Street
Queens Village, New York

PREPARED FOR:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
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Albany, NY 12233-0001
Thomas C. Jorling, Commissioner

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August, 1989

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1.0 OVERVIEW

This document is a Remedial Action Master Plan (RAMP) for the Deknatel site in Queens Village, New York. This RAMP is a plan for undertaking a Supplemental Remedial Investigation/Feasibility Study and potential Remedial Actions in response to a hazardous substance release, or a substantial threat of release, into the environment. It is based on the National Oil and Hazardous Substances Contingency Plan as promulgated by the United States Environmental Protection Agency (EPA).

The Deknatel site contains elevated concentrations of chromium at two inactive waste disposal areas and within some parts of the underlying soils. The Deknatel facility manufactured costume jewelry and surgical needles. During a recent audit of the facility, certain past waste disposal practices were discovered that involved disposal of metals containing chromic and phosphoric acid solutions, of chromium on the property. Total and hexavalent chromium, lead and phosphorous were found in the soils at or near an area referred to as Disposal Point 2 (DP-2) at elevated concentrations. Elevated lead concentrations were found only in the surface and near surface depths; whereas, elevated total and hexavalent chromium and phosphorous concentrations extended to greater depths. The concentrations of all contaminants were highest near the surface and closest to the disposal point and decreased with increasing horizontal and vertical distance from DP-2.

Total and hexavalent chromium, lead and phosphorus were found also in the soils at Disposal Point 1 (DP-1); however, the recorded levels were considerably lower than those found at and near DP-2. The majority of the above mentioned constituents at both DP-1 and DP-2 are found within the upper twenty feet of the soil column. Three monitoring wells were installed on-site to determine the impact of past waste disposal activities on the underlying groundwater. Analytical results on water samples from these wells show detectable total chromium concentrations in groundwater beneath the site. The supplemental remedial investigation will further investigate the question of groundwater quality.

Elevated total and hexavalent chromium and phosphorus concentrations were found in groundwater samples obtained from the monitoring well (MW-2) located 18.5 feet downgradient from DP-2. Of the three waste related substances found in the groundwater, New York State has established a water quality standard for only one, hexavalent chromium. To date, groundwater at the site has been sampled on three occasions. The average hexavalent chromium concentration found was below the New York State Water Quality Standard (50 ppb); however, on one of the three sampling occasions, its concentration did exceed the standard. Additional sampling and analysis efforts relative to the monitoring of the existing groundwater wells are being undertaken and results will be provided to the NYSDEC.

One aspect of the supplemental remedial investigation is to determine the spatial distribution of the contaminants on-site. If the soils or groundwater are contaminated, the extent of contamination and rate of migration will be determined. Modifications, if necessary, to the sampling and/or analytical plans as the field investigation proceeds can be made but will be done so only with the approval of the NYSDEC. Soils will be sampled from all borings at various intervals from the surface to approximately 70 feet.

The feasibility study will develop and evaluate remedial alternatives. Initial screening of alternatives will be based upon environmental effects, acceptable engineering practices, and cost to narrow the list of potential remedial actions for further detailed analysis. Final evaluation of alternatives will be based upon reliability of technologies, ease of implementation and constructability, the extent to which the alternative mitigates and minimizes adverse effects to public health and the environment, and detailed cost comparisons. The recommended alternatives will be the most environmentally sound and responsive remedial action plan and yet will also be the most cost effective action plan.

Potential remedial actions include: containment, groundwater recovery, treatment, removal, disposal, monitoring and the no action alternatives as well as combinations of one or more of these types of action either in whole or in part.

Given the nature of the activities to be performed during the Supplemental Remedial Investigation/Feasibility Study, the community relations plan measures to be undertaken during this phase of the work at the property are believed to be minimal. The NYSDEC and Deknatel will both play active roles in implementing community relations measures should such activities be required. Communications with the Jamaica Water Supply Company, the potable water supplier in the vicinity of the Deknatel property will continue throughout the completion of the Supplemental Remedial Investigation/Feasibility Study.

2.0 DATA EVALUATION

2.1 Site Background

2.1.1 Setting

The Deknatel site is located at 96-14 222nd Street, Queens Village, New York. Queens Village is in the easternmost portion of Queens County. Queens County is in the western part of Long Island. The county includes about 113 square miles of land and is made up of numerous urban and suburban communities. The site is within a residential/light industrial part of the county. Queens county is bounded by the East River on the north, by Jamaica Bay and the Atlantic Ocean on the south, by Nassau County on the east, and by Kings County and the East River on the west.

The northern part of Queens County consists of low rolling hills. A narrow ridge trends east-northeast across the central part of the county north of and parallel to Jamaica Avenue. The south portion of the county consists of a relatively flat glacial outwash plain which has a gentle southward slope.

2.1.2 History of Operations

The facility where Deknatel is located was constructed about 1925. From that time until about 1956 costume jewelery, specifically artificial pearls, were manufactured at the facility. The manufacturing process involved placing small globules of molten glass on thin copper wires to form the cores of the artificial pearls. The glass beads were placed in a lacquer bath until layers of lacquer had built up on the glass beads to give the appearance of pearls. The copper wire was dissolved in a nitric-sulfuric acid bath. The nitric-sulfuric baths accumulated copper salts and were discarded when they were spent.

About 1956, Deknatel changed product lines and began manufacturing its present line of surgical needles. These items are manufactured from stainless steel wire using various metal forming operations such as cutting, stamping, and grinding. Some of the raw stainless steel wire used has a thin copper coating which acts as a lubricant for the tools used in the various metal forming operations. Once the wire has been formed into the desired shape and size, the copper coating is removed by immersing the parts in a chromic-sulfuric acid bath which dissolves the copper coating. This bath accumulated copper salts, became spent and was removed from service. The parts were then deburred and polished by tumbling with powdered alumina. Finally, the parts were electropolished in a bath containing chromic and phosphoric acids, which removed a thin layer of the metal. This bath eventually accumulated salts of the metals comprising the stainless steel alloy used for making the needles, was depleted of chromic acid, became spent and was again removed from service.

2.1.3 Disposal Practices

The spent nitric-sulfuric acid baths containing copper salts generated by the imitation pearl manufacturing process (from about 1925 to about 1956) were reportedly disposed of through a sink in the laboratory. The sink was piped to a trap containing marble chips that would neutralize the acid, then to Disposal Point One (DP-1), which is located at the southwest corner of the 96-14 222nd Street property. Liquids placed there seeped directly into the ground. This waste stream has not been produced at the Deknatel facility since about 1956 when the imitation pearl manufacturing process was discontinued. A site map depicting the location of DP-1 and other site characteristics is presented as Figure 2-1.

From about 1956 to about 1960, the spent chromic-sulfuric acid baths containing copper salts generated by the surgical needle manufacturing process were reportedly disposed of in the same laboratory sink. After about 1960, the sink drain was allowed to be discharged to the New York City sanitary sewer, and DP-1 was abandoned.

The spent electropolishing baths containing chromic and phosphoric acids and metal salts derived from the stainless steel used to make the surgical needles were reportedly disposed of in Disposal Point Two (DP-2) for its period of use, which spanned an approximate twenty year time frame beginning in 1956. DP-2 is located (see Figure 2-1) immediately adjacent to the west side of the main building, 5 to 10 feet north of the laboratory. Like DP-1, it has no direct outlet, and liquids placed there would have seeped into the ground.

2.2 HAZARDOUS MATERIALS CHARACTERIZATION

2.2.1 Quantitative Waste Disposal Estimates

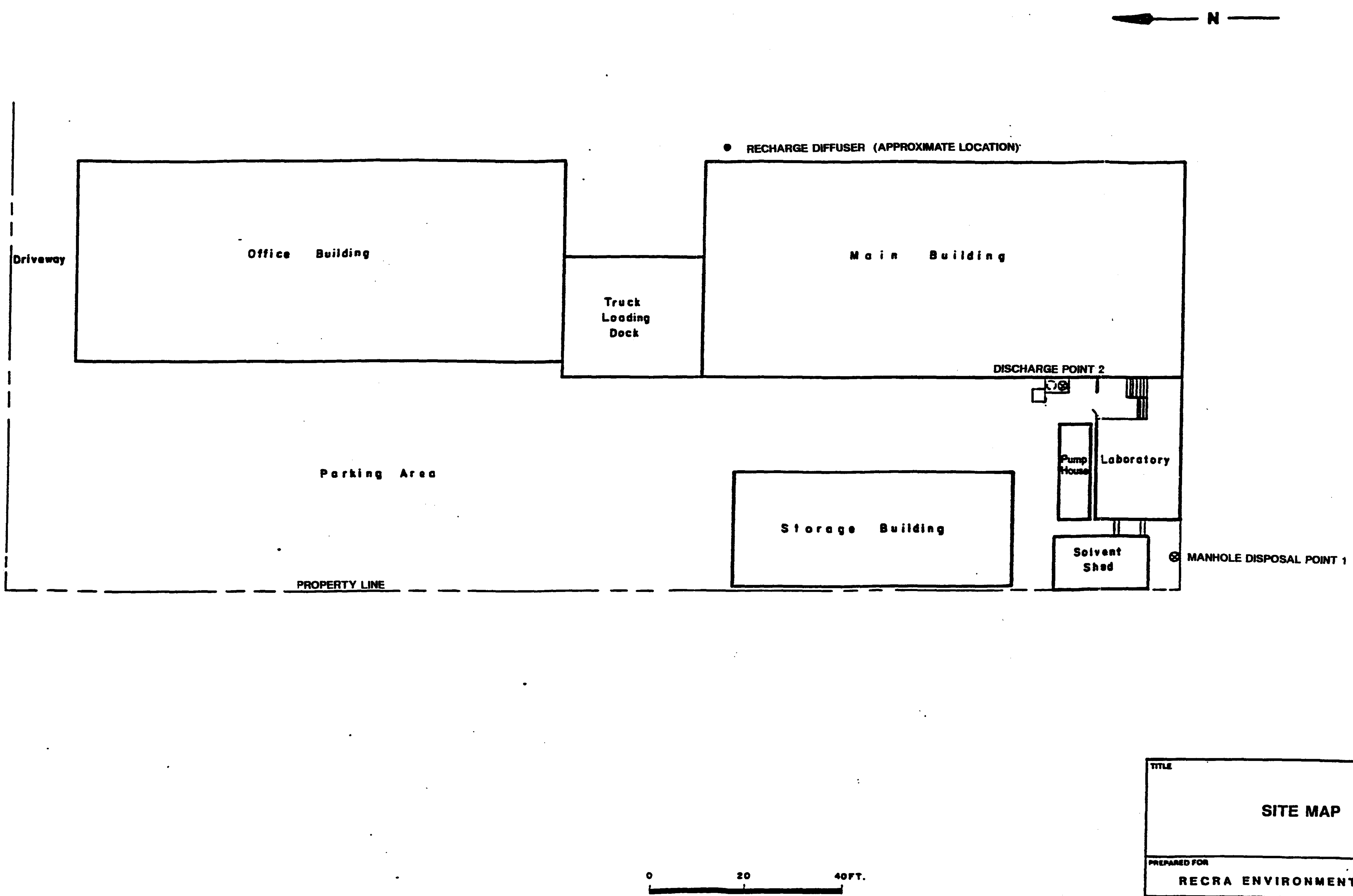
2.2.1.1 Disposal Point 1 (DP-1)

Nitric-sulfuric acid baths containing copper salts were disposed in DP-1 from about 1925 to about 1956. Because of the complete absence of any records or employee recollections going back to this time period, it has proven impossible to make any quantitative estimate of the amount of this material that may have been disposed.

Spent chromic-sulfuric acid baths containing copper salts were disposed in DP-1 from about 1956 to about 1960. This material is believed to be the same material that is in use today for stripping the copper sheathing from the surgical needle after they have been formed. A material safety data sheet (MSDS) describing this material and the calculations by which the following estimates were made are included in Appendix A. The best available estimates indicate that about 480 gallons of this material, which, based upon materials used today, would have contained about 700 pounds of chromium, 180 pounds of sulfuric acid, and an unknown but small amount of copper, were disposed at DP-1.

2.2.1.2 Disposal Point 2 (DP-2)

Spent chromic-phosphoric acid electropolishing baths were disposed in DP-2 over its period of use. The material of this description, which was disposed in DP-2, is also believed to be



TITLE

SITE MAP

PREPARED FOR

RECRA ENVIRONMENTAL, INC.

ROUX Consulting Ground-Water Geologists ROUX ASSOCIATES INC

SCALE	FIGURE
SHOWN	2-1
DATE 3/88	

the same material that is in use today and which is currently disposed off-site as a hazardous waste. A material safety data sheet which describes this material as a raw material and a typical analysis of it when it is disposed today as a waste material are included in Appendix A, along with the calculations by which the following estimates were obtained. The best available estimates indicate that about 1,500 gallons of this material, which (based upon materials used today) would have contained about 1,700 pounds of chromium and about 13,000 pounds of phosphoric acid (4,213 pounds phosphorus), were disposed at DP-2.

2.2.1.3 Other Waste Materials Potentially Disposed on Site

A number of other materials were believed to have been used in Deknatel's costume jewelry manufacturing process and a possibility exists that miscellaneous quantities of some of these materials if used at the facility, may have been disposed on site from time to time between about 1926 and about 1956. However, most of these materials, such as a nitrocellulosic lacquer and some nonhalogenated organic solvents including mineral spirits, acetone, hexane, kerosene, monoethyl ether derivatives of amyl acetate and cellosolve acetate, and ethylene glycol, that may have been used in jewelery manufacturing would normally be consumed in the manufacturing process by incorporation into the product (such as lacquer) or would be lost due to evaporation (solvents). Since these items are costly raw materials and costume jewelry manufacturing was a low budget operation, it is likely that every effort was made to use these materials up completely and discard as little as possible. There is no evidence that any of these materials were even periodically disposed of in any systematic way however, occasional disposal of small quantities cannot be ruled out. Due to the uncertain nature of any disposal of these materials that may have occurred and the time period (about 1926 to about 1956) during which such disposal may have occurred, no estimate of the identity or quantity of these materials that may have been disposed can be made.

A small amount of acetone is used today in the surgical needle manufacturing process and is washed with copious quantities of water into the sink in the laboratory, which leads to the sanitary sewer system. It is unknown whether or how much acetone may have been used during the years from 1956 to 1960 when needle manufacturing was in progress and the laboratory sink led to the cistern at DP-1. It is also unknown whether acetone that may have been used during that period was disposed in the sink in the laboratory. A possiblility exists, then, that some small quantity of acetone may have gone to the cistern at DP-1 between 1956 and 1960, but it is not possible to make any meaningful estimate of the quantity involved, if any. If disposal occurred, it is equally likely to assume that, like the chromium disposed of in DP-1, the acetone has been flushed from the soil column beneath this disposal area.

2.2.2 SOURCE INVESTIGATION STUDY

The disposal activities at DP-1 and DP-2 referenced in the previous sections of this document were initially investigated during an internal environmental audit of this Deknatel facility. Immediately upon such discovery of these past practices, investigative activities ultimately resulting in the source investigation study were undertaken by Deknatel as was a notification of the Region 2 Office of the NYSDEC.

2.2.2.1 Overview

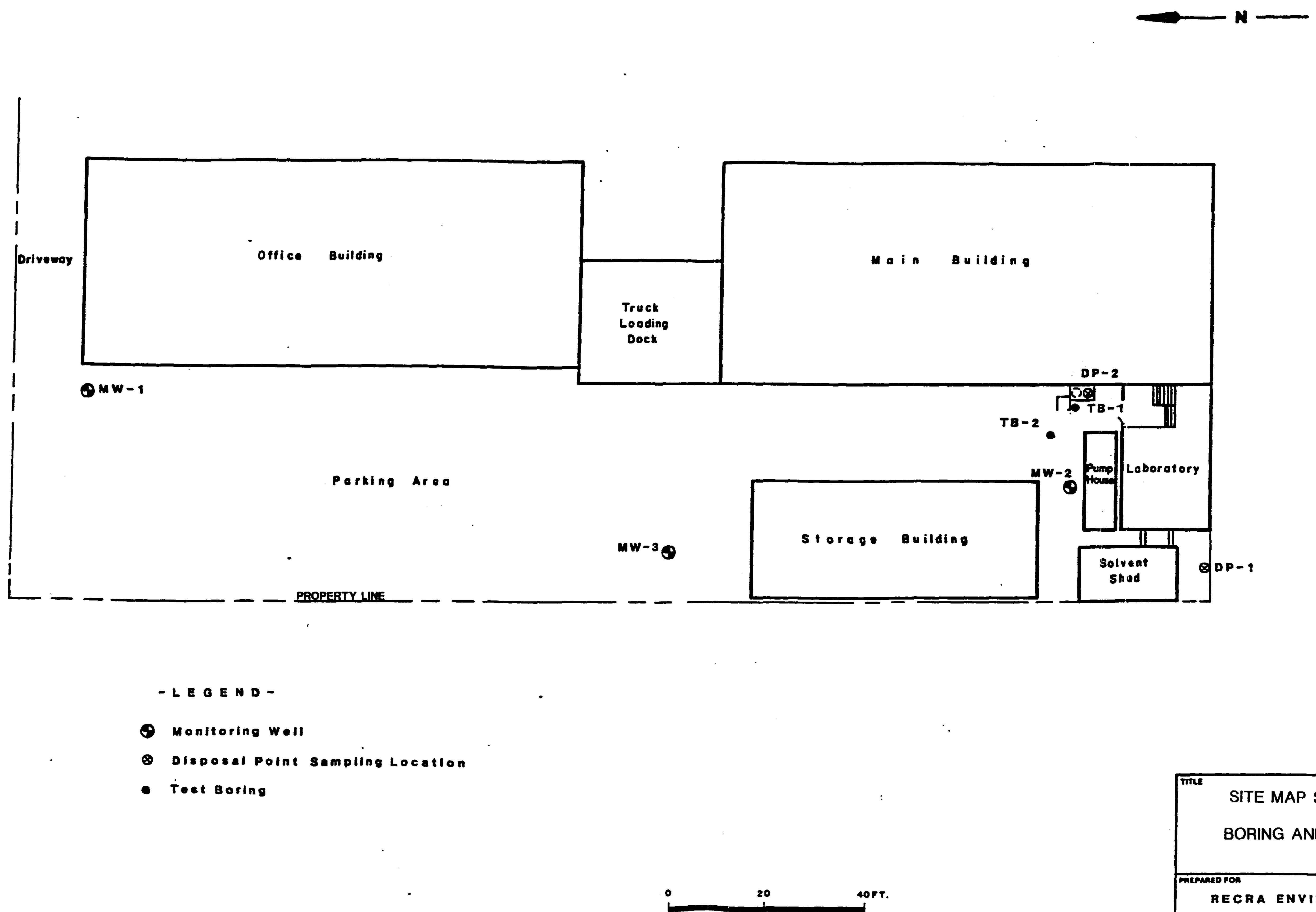
Recra Environmental, Inc., on behalf of Deknatel, Inc., proposed a source investation study with the following objectives:

- o determine whether and to what extent waste materials released at two disposal points as a result of past disposal practices have remained at the Deknatel site,
- o determine the location and distribution of any waste materials that have remained at the site,
- o determine whether waste materials have been or are affecting groundwater,
- o develop information on the geology and hydrogeology at the Deknatel site, and
- o provide data which could serve as a basis for developing a remedial action should source remediation prove necessary.

The proposed study involved advancing seven (7) test borings at various locations on the Deknatel property in order to collect soil samples from the surface to a depth of approximately 10 feet below the water table. The core samples obtained were to be used both to assess the geology of the site and to provide subsurface soil samples for chemical analysis. Two (2) of the test borings were to be converted to monitoring wells in order to obtain hydrogeological information on the site and groundwater samples for analysis. One of the borings to be converted to a monitoring well (MW-1) was placed at a location expected to provide information on background soil and groundwater conditions in the area. Four (4) test borings, including the other boring to be converted to a monitoring well, were to be placed at intervals downgradient (relative to the expected water table) from Disposal Point Two (DP-2) and the final two (2) borings were to be placed near Disposal Point One (DP-1). Permeability testing of the monitoring wells was proposed in order to assess some of the hydrogeological properties of the water table aquifer at the site. The soil and groundwater samples collected were to be analyzed for a range of metals and inorganic substances which seemed likely to have been constituents of the waste materials disposed at the two disposal points.

2.2.2.2 Source Investigation Activities

Four (4) test borings have been completed, two of which have been converted to monitoring wells. The locations of these borings are shown in Figure 2-2. Several of the borings were relocated slightly from the proposed locations for the following reasons. MW-1 was moved from a location very close to the northern property line to a location off the northwest corner of the main building which was somewhat better protected from traffic using the driveway along the northern property line to enter and leave the parking lot behind the main building. TB-1 was offset slightly



TITLE	SITE MAP SHOWING ACTUAL BORING AND WELL LOCATIONS
PREPARED FOR	RECRA ENVIRONMENTAL, INC.

ROUX Consulting Ground-Water Geologists ROUX ASSOCIATES INC | SCALE SHOWN | DATE 3/88 | FIGURE 2-2 from DP-2 and TB-2 was offset from the pump house because it proved impossible to position the drilling rig any closer to the adjacent buildings. A hand auger was used to collect shallow soil samples directly in and below DP-2 to supplement the core samples obtained from TB-1. It also proved impossible to get the drilling rig around the corner of the storage building and down the passageway between the storage building and the pump house to the proposed location of the second monitoring well near the western property line between the storage building and the solvent shed. Therefore, as an alternative, it was decided to convert the test boring south of the southeast corner of the storage building to a monitoring well (MW-2) and dispense with plans for the test boring near the western property line.

While work was in progress on the source investigation study being described, a third monitoring well (MW-3) was installed near the western property line north of the storage building (Figure 2-2). Installation of MW-3 was, for reasons unrelated to the source investigation study, installed during the time frame concurrent with the source investigation. Since it was completed as a 4-inch well (MW-1 and MW-2 are 2-inch wells), it was utilized in this investigation to further define the hydrogeology of the site and as a means of conducting a pump test instead of performing less rigorous surge tests in MW-1 and MW-2, as was originally planned.

The two test borings planned for the southwest corner of the site near DP-1 could not be completed because of the difficulties in identifying and locating drilling equipment capable of advancing borings in compliance with NYSDEC technical requirements (dry hollow stem augering) that is also small and portable enough to gain access to the drilling location through the narrow passage-ways between the buildings.

Alternatively, a portable tripod drilling rig has been used to collect split spoon soil samples through the floor of the cistern at DP-1 to a depth of greater than 30 feet below ground surface in order to determine the nature, extent, and concentration of waste materials that are present at this location.

2.2.3 Overview of Laboratory Studies

The soil and groundwater samples collected from the test borings and monitoring wells were analyzed for a range of metals, inorganic and selected organic substances listed in Table 2-1 which seemed likely to have been constituents of the waste materials disposed at the two disposal points.

The rationale for parameter selection was as follows. Total and hexavalent chromium were constituents of the spent chromic acid solutions used. Copper was the principal constituent of the wire used in the costume jewelry operation and was used as a protective coating on stainless steel wire stock used in the surgical needle manufacturing operation. In both operations, the copper was dissolved in acid solutions. Lead may have leached into the chromic acid solutions from the lead lining of vats used to hold the solutions. The other metals analyzed (cadmium, iron, nickel, selenium and zinc) were potential constituents of the stainless steel wire and small amounts could have been released to the chromic acid bath in the electropolishing process which electrolytically dissolves a thin layer of metal from the surface of the needles. The inorganic anions analyzed, nitrate, sulfate and phosphate (as phosphorous), correspond to nitric, sulfuric and phosphoric acids which were constituents of the chromic acid baths, either in the costume jewelry or the surgical needle manufacturing processes. Volatile organic compounds including acetone, were measured in samples from DP-1 because acetone, used in needle manufacturing, may have been disposed there.

pH was measured because of the acidity of the waste materials involved. The dry weight of the soils was determined in order to express the analytical results on a dry weight basis. The EP toxicity test was performed on some of the soils to assess the leachability of metals present and to determine whether the potentially contaminated soils were characteristic hazardous wastes.

TABLE 2-1

ANALYTICAL PARAMETERS FOR SOIL AND GROUNDWATER SAMPLES

PARAMETER	SOIL SAMPLES	GROUNDWATER SAMPLES
METALS		
Cadmium	•	
Chromium, total	•	•
Chromium, hexavalent	•	•
Copper	•	•
Iron	•	
Nickel	•	
Selenium	•	
Zinc	•	
INORGANICS		
Nitrate	•	•
Phosphorus	•	•
Sulfate	•	•
ORGANICS		
Volatile Organics Including Acetone	•	
MISCELLANEOUS		
pH (field determined)	•	•
Dry Weight (total solids)	•	
EP Toxicity (metals only)	•	

Details of the sample collection, preservation and shipment procedures, along with a listing of the standard USEPA methodologies used in analyzing the samples, can be found in Appendix D.

2.2.4 Waste Material Distribution in the Subsurface

Of the eleven substances potentially present in the waste materials disposed at the Deknatel facility, only seven were found in the soil and/or groundwater near DP-2 at concentrations substantially higher than those found at the background location. These were total and hexavalent chromium, copper, iron, lead, nitrate and phosphorus. The results of the groundwater analyses are given in Table 2-2 and the soil analyses are presented in Tables 2-3 through 2-15. These results are discussed in detail within the Source Investigation Study report previously submitted to the NYSDEC.

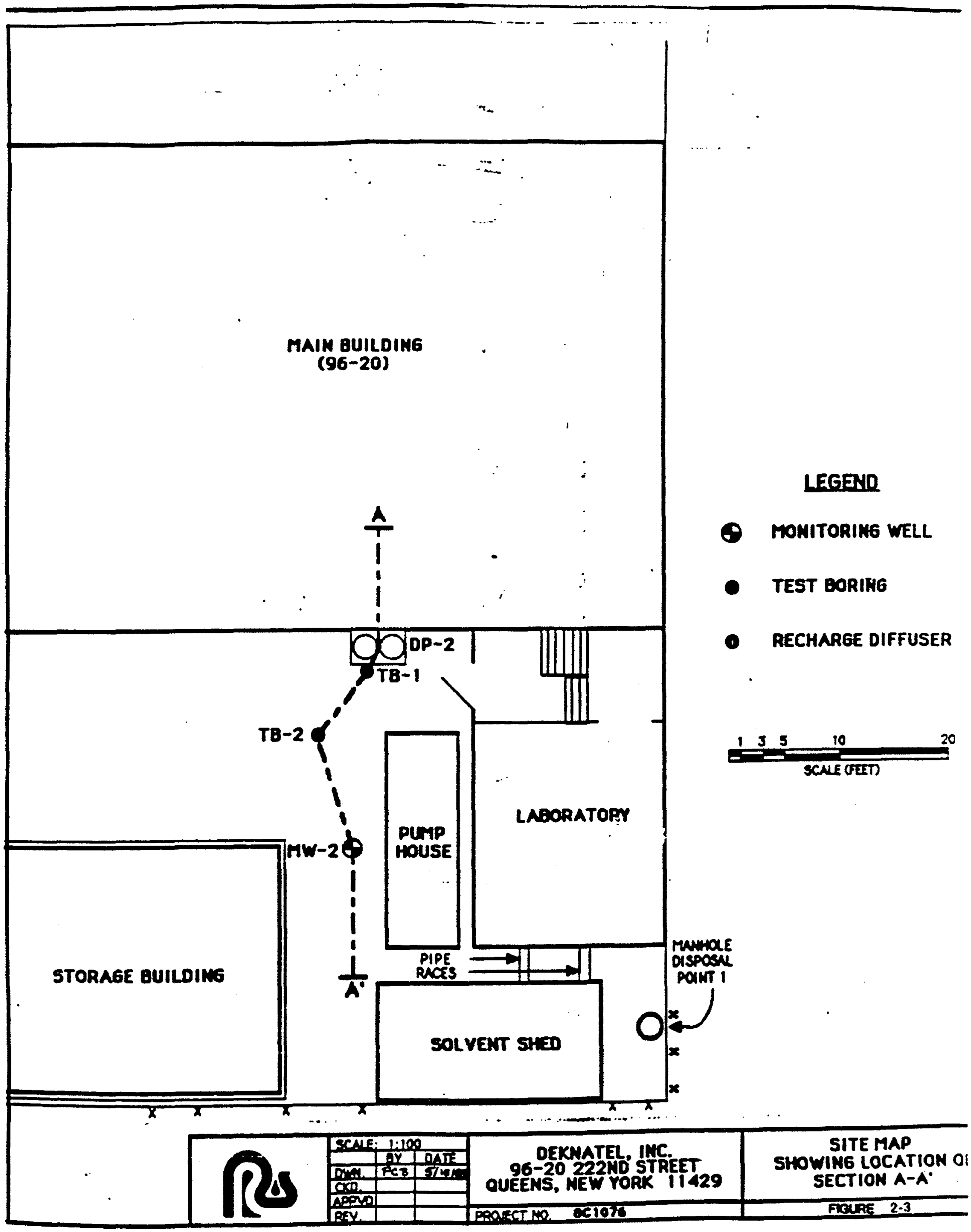
Soil samples taken directly from the disposal points themselves were analyzed for the waste materials disposed there and the analytical results are presented in Table 2-16. The depths of the soil samples are limited due to the type of sampling equipment which could be utilized at these locations (DP-1 and DP-2). Elevated levels of total and hexavalent chromium, iron, lead, phosphorous and, to a lesser extent, copper, zinc and sulfate were found.

The laboratory reports containing the analytical results discussed in this section are included in Appendix D.

Concentration distribution profiles along the Section A to A' shown in Figure 2-3 were prepared for total and hexavalent chromium, lead and phosphorous and are presented in Figures 2-4 through 2-7. Profiles were not prepared for the other constituents since these substances were elevated at only a few sampling locations and their distribution patterns are readily apparent from the tables of analytical results.

Total and hexavalent chromium concentrations greater than background levels were found from directly within DP-1 to a depth of ten feet and in DP-2 to the extent of the collections (i.e., 75 feet). Greater than background concentrations of total and hexavalent chromium were found from the surface to 72 feet below the surface in TB-1, nearest to DP-2, and from the surface to 40-50 feet in MW-2, which was the boring furthest from DP-2. Elevated soil chromium concentrations (total and hexavalent) extended into the water table, which was found at about 61 feet, and were present in groundwater samples obtained from MW-2 located 18.5 feet downgradient from DP-2. The results of the groundwater analyses to date are presented in Table 2-2. On average, the chromium concentrations found in the groundwater did not exceed state and federal drinking water standards; however, hexavalent chromium exceeded the standards in one out of three sampling events (>0.05 mg/l). Additional sampling and analysis efforts relative to the monitoring of the existing groundwater wells are being undertaken and results will be provided to the NYSDEC.

Both total and hexavalent chromium concentrations in the soil are highest near the surface and decrease with increasing depth and


MAIN BUILDING
(96-20)
A
DP-2
TB-1
TB-2
MW-2
A'
PUMP HOUSE
LABORATORY
STORAGE BUILDING
PIPE RACES
SOLVENT SHED
MANHOLE DISPOSAL POINT 1
LEGEND
MONITORING WELL
TEST BORING
RECHARGE DIFFUSER
1 3 5 10 20
SCALE (FEET)
SCALE: 1:100
BY
DATE
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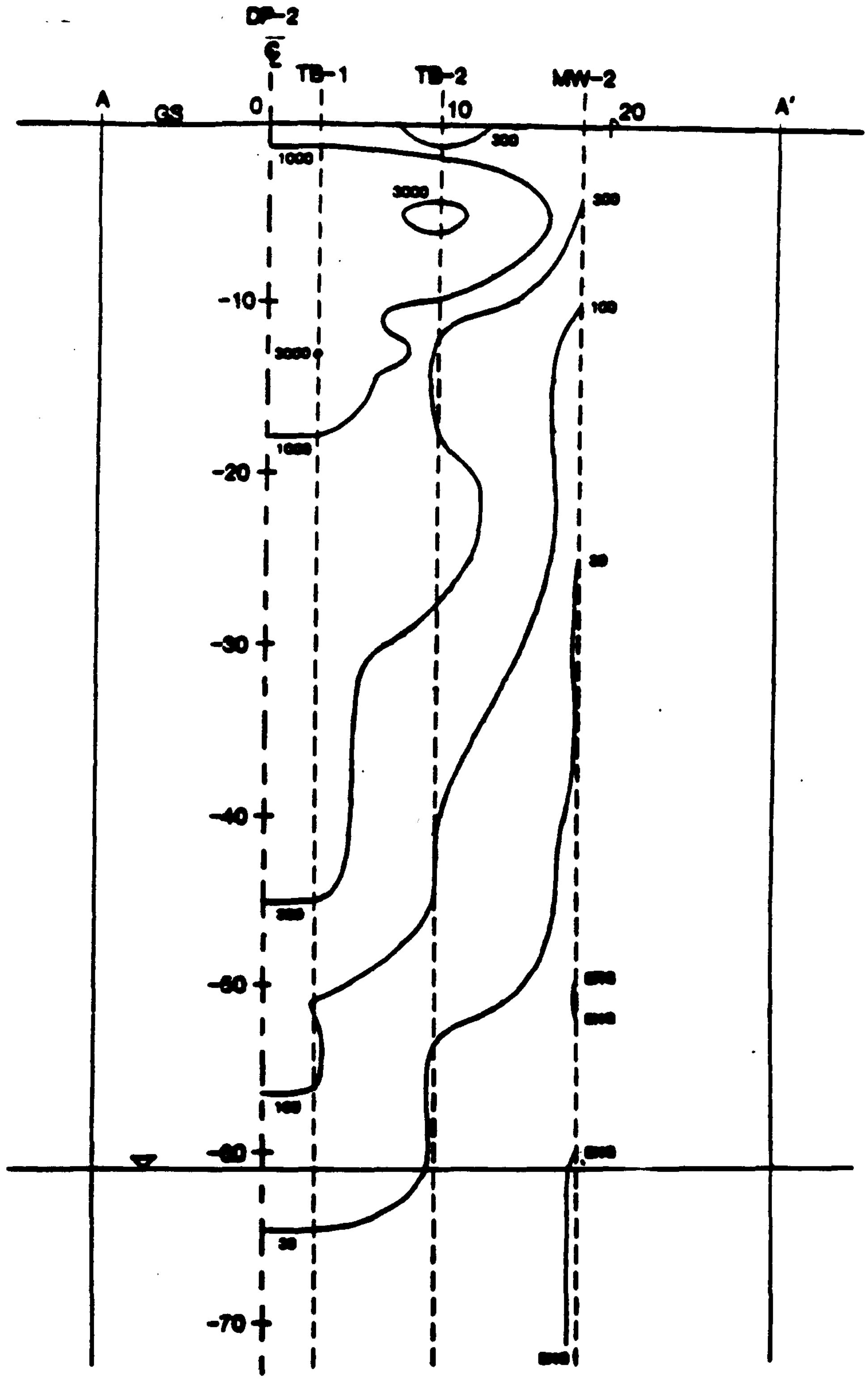
APPVD
REV.
DEKNATEL, INC.
96-20 222ND STREET
QUEENS, NEW YORK 11429
PROJECT NO. 8C1076
SITE MAP
SHOWING LOCATION O
SECTION A-A'
FIGURE 2-3



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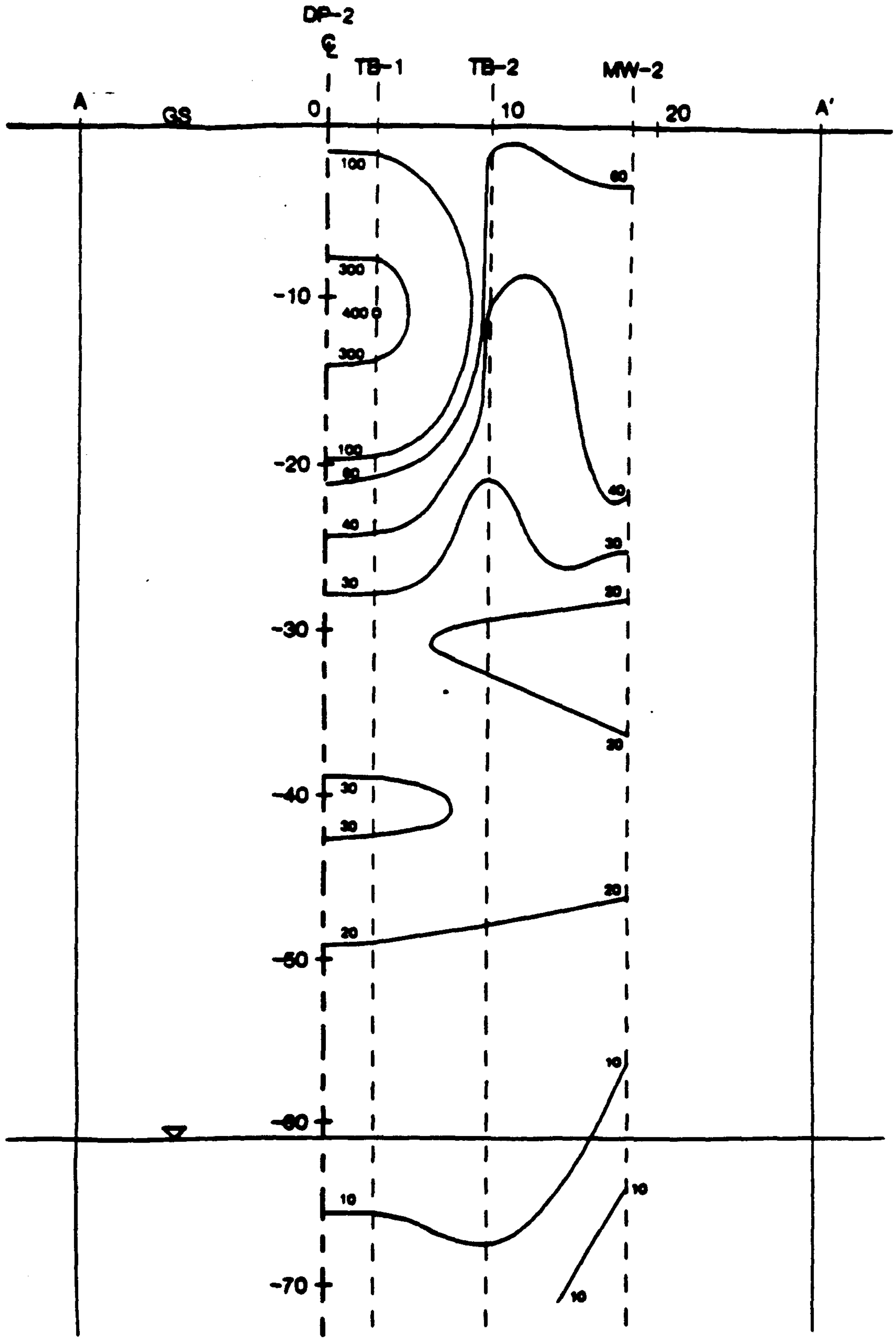
TOTAL CHROMIUM DISTRIBUTION (ug/g DRY)
SECTION A-A'
(distances in feet)

A | FIGURE 2-4



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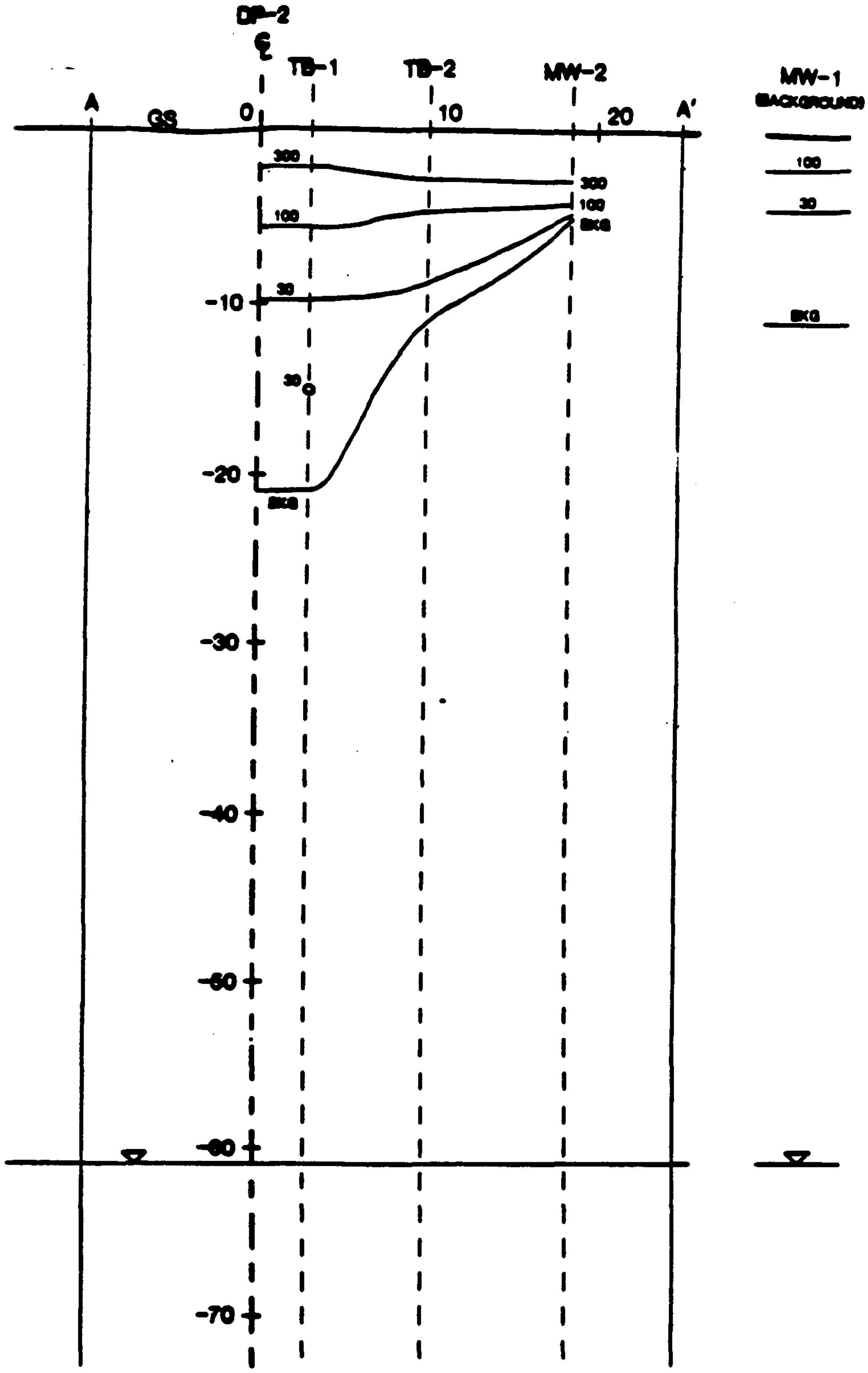
HEXAVALENT CHROMIUM DISTRIBUTION (ug/g DRY)
SECTION A-A'
(distances in feet)

A **FIGURE 2-5**



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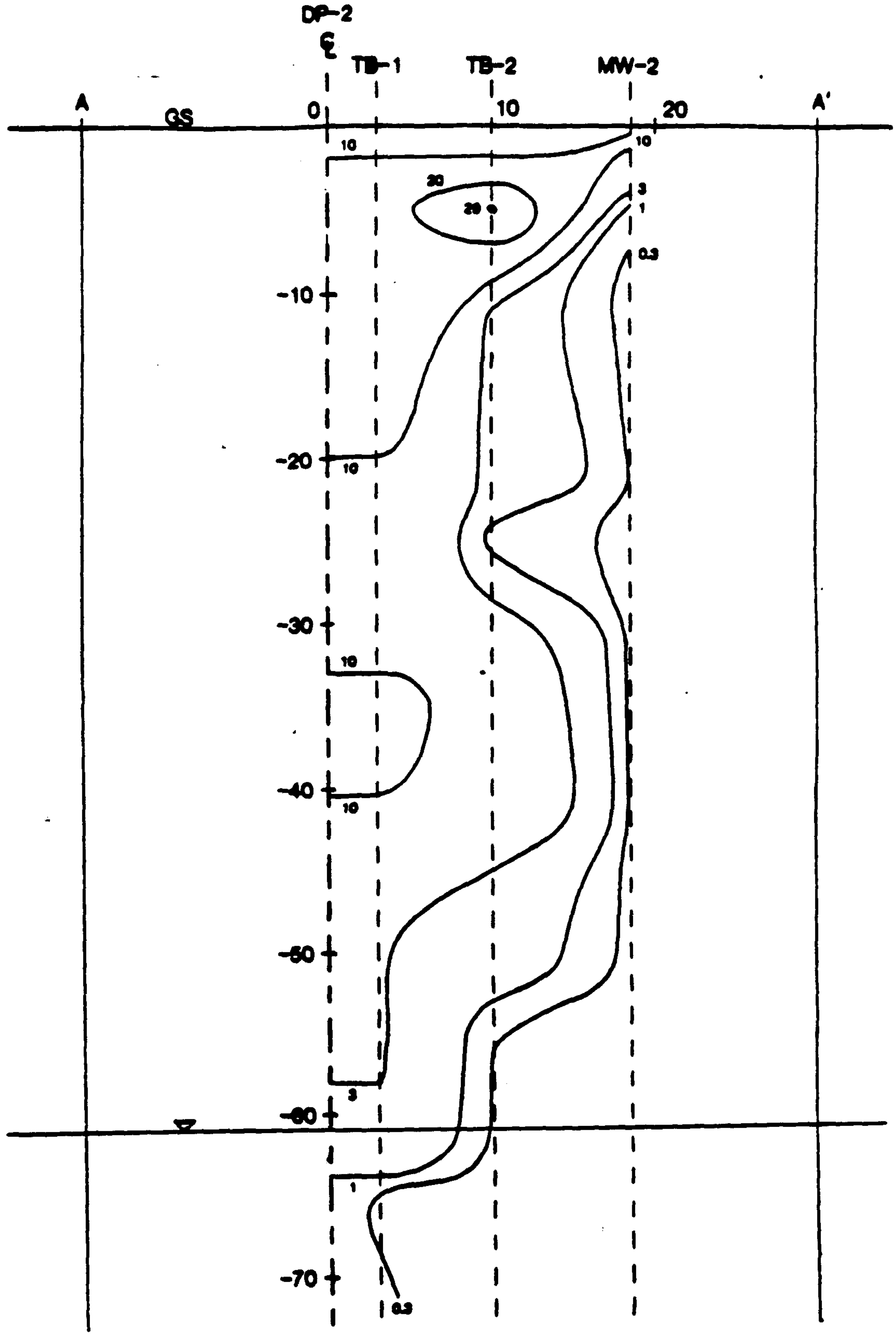
TOTAL LEAD DISTRIBUTION (ug/g DRY) SECTION A-A' (distances in feet)

A | FIGURE 2-6



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TOTAL PHOSPHORUS DISTRIBUTION (ug/g DRY)
SECTION A-A'
(distances in feet)

A FIGURE 2-7

horizontal distance from the disposal point. Approximately 90% of the total chromium and 55% of the hexavalent chromium present in the soil were found in the top twenty feet of the soil column.

Lead concentrations were elevated mainly at and near the surface in the soils and extend to a depth of <12 to <13 feet directly below the discharge points (DP-1, DP-2). Lead was also elevated at and near the surface at the background location relative to the deeper soils, and the maximum level recorded was 130 ug/g.

Leachable phosphorous concentrations were elevated throughout the soil column at all three sampling locations (TB-1, TB-2, and MW-2) near DP-2. Like the chromium concentrations, the phosphorous concentrations were highest at and near the surface, decreasing with both increasing depth and horizontal distance from DP-2, however, the rate of decrease was not nearly as great for phosphorous as for chromium. Leachable phosphorous concentrations remained substantially elevated in the soil samples furthest removed from the discharge point in both the horizontal and vertical directions. Soil phosphorous concentrations remained elevated into the water table and the groundwater samples obtained from MW-2 also had elevated total phosphorous concentrations.

Leachable phosphorus levels in the soil column at DP-1 also exceeded background levels to a depth of at least 35 feet. These levels, however, are substantially lower than those encountered downgradient from DP-2 and no value exceeds 10 ug/g (see Table 2-16).

The phosphorus detected in the soil and groundwater samples is presumed to be primarily in the form of ortho phosphate derived from phosphoric acid, which is a constituent of the waste materials disposed at the site. Phosphate and phosphoric acid in moderate amounts are generally regarded as safe for human consumption and are found in many foods and beverages. Consequently, no standards have been established for phosphate in drinking water.

Composites of the soil samples collected from each boring advanced at a potentially contaminated location (TB-1, TB-2 and MW-2) were tested by EP toxicity for leachable metals. Chromium and barium were the only metals detected in the leachates. The highest leachate chromium concentration was 0.064 mg/l, which is well below the criteria concentration for chromium of 5.0 mg/l. Barium was detected in the leachate from one composite at 0.22 mg/l, which is also well below its criterion of 100 mg/l. The soils in the vicinity of DP-2, therefore, are not characteristic hazardous wastes due to EP toxicity for metals. Samples from DP-1 were not analyzed for EP Toxicity because all metals detected were substantially lower than those detected in DP-2, and therefore, it was assumed the EP Toxicity results would be at levels similar to or less than those found from the DP-2 samples.

Composite soil samples from DP-1, analyzed for volatile organic constituents, illustrated the general absence of acetone from the soil column. Only at low levels (4.1 ug/g) in the 21-29' composite sample was acetone detected. The absence of acetone in the upper 21 feet of soil beneath DP-1 and only trace concentrations being found in the 21-29' fractions suggests that little, if any, acetone was disposed of at DP-1; or, if acetone was disposed of, it is of minor concern from an environmental standpoint.

2.2.5 Summary and Conclustions Regarding the Source Investigation Study

Total and hexavalent chromium, lead and phosphorus were found in the soils at or near DP-2 at elevated concentrations in comparison to the concentrations found at a background location at the Deknatel site. Elevated lead concentrations were found only in the surface and near surface soils; whereas, concentrations in excess of background for total and hexavalent chromium and phosphorus concentrations extended from the ground surface to 72 feet subsurface. The concentrations of all contaminants were highest near the surface and closest to the disposal point and decreased with increasing horizontal and vertical distance from the disposal point #2. Based on estimates of the amount of chromium disposed in DP-2 and the amount present in the soil around DP-2, it appears that the majority of the chromium disposed in DP-2 has remained in the adjacent soils and 90% of that chromium is in the top 20 feet of the soil column.

Total and hexavalent chromium, lead and phosphorus were found also in the soils at DP-1; however, the recorded levels were considerably less than those found at and near DP-2 (see Table 2-16). The majority of the above mentioned constituents are found within the upper twelve feet of the soil column. Of the estimated 699 pounds of chromium which was disposed of at DP-1, only 8.1 pounds of chromium are calculated as remaining in the underlying soils.

This is believed to be due to the method of disposal and the amount of dilution (water rinse) used at the time of disposal and the subsequent flushing of the chromium from the soil column beneath DP-1.

Elevated total and hexavalent chromium and phosphorus concentrations were also found in groundwater samples obtained from the monitoring well (MW-2) located 18.5 feet downgradient from DP-2. Of the three waste related substances found in the groundwater, New York State has established a water quality standard for only one, hexavalent chromium. To date, groundwater at the site has been sampled on three occasions. The average hexavalent chromium concentration found was below the New York State Water Quality standard (50 ppb); however, on one of the three sampling occasions, its concentration did exceed the standard. Additional sampling and analysis efforts relative to the monitoring of the existing groundwater wells are being undertaken and results will be provided to the NYSDEC. No elevated levels of total or hexavalent chromium or phosphorous were found in groundwater samples analyzed at the MW-1 or MW-3 locations.

The results of the source investigation study clearly indicate that chromium disposed of as a consequence of past practices at Deknatel is present at the site and may represent a degree of environmental impact. Of all the other parameters tested for during the source investigation study, only lead and phosphorous (in addition to total and hexavalent chromium) were of significance in this investigation. Further, it was seen that lead contamination was limited in extent (both vertically and horizontally) and that phosphorous appears to present little threat of environmental impact. The supplemental RI/FS therefore will utilize as its operative paramaters total and hexavalent chromium for purposes of problem definition, remedial planning and remedial implementation.

TABLE 2-2

ANALYTICAL RESULTS FOR GROUNDWATER

PARAMETER	SAMPLE DATE	MW-1 (BACKGROUND)	MW-2 (DOWNGRADIENT)	MW-3 (CROSS GRADIENT)
Total Chromium (mg/l)	2-11-88	0.006	0.091	NA
	3-15-88	0.097	0.10	NA
	3-21-88	0.027	0.15	0.012
Hexavalent Chromium (mg/l)	2-11-88	<0.005	0.029	NA
	3-15-88	<0.003	0.090	NA
	3-21-88	<0.005	0.023	<0.005
Total Copper (mg/l)	2-11-88	<0.005	0.041	NA
	3-15-88	0.096	0.11	NA
	3-21-88	0.083	0.070	0.061
Nitrate (mg NO_3-N/l)	2-11-88	1.8	7.1	NA
	3-15-88	8.7	7.5	NA
	3-21-88	8.1	6.2	19
Total Phosphorus (mg/l)	2-11-88	<0.02	4.4	NA
	3-15-88	0.12	<0.02	NA
	3-21-88	3.6	6.2	1.6
Sulfate (mg/l)	2-11-88	53	56	NA
	3-15-88	67	42	NA
	3-21-88	55	36	37
pH (Standard Units)	2-11-88	6.23	6.79	NA
	3-15-88	NA	NA	NA
	3-21-88	NA	NA	NA

NA = Not Analyzed

TABLE 2-3

TOTAL CADMIUM
(ug/g Dry Weight)

SAMPLE DEPTH (ft)	BORING/MONITORING WELL			
	TB-1	TB-2	MW-2	MW-1
	DISTANCE FROM CENTER OF DP-2			
	3 ft.	10 ft.	18.5 ft.	BACKGROUND
0-2	<0.6	1.4	1.0	0.76
4-6	<0.5	<0.6	<0.5	<0.6
10-12	<0.5	<0.6	<0.5	<0.5
14-16	<0.5	<0.6	<0.5	<0.6
20-22	<0.5	<0.6	<0.5	<0.6
24-26	<0.5	<0.5	<0.5	<0.5
30-32	<0.5	<0.5	<0.5	<0.5
34-36	<0.5	<0.6	<0.5	<0.5
40-42	<0.5	<0.5	<0.5	<0.6
44-46	<0.5	<0.5	<0.5	<0.5
50-52	<0.5	<0.6	<0.5	<0.6
54-56	<0.5	<0.5	<0.6	<0.5
60-62	<0.6	<0.6	<0.6	<0.5
64-66	<0.6	<0.6	<0.6	<0.6
70-72	<0.6	<0.6	<0.6	<0.6

TABLE 2-4

TOTAL CHROMIUM
(ug/g Dry Weight)

SAMPLE DEPTH (ft)	BORING/MONITORING WELL TB-1	TB-2	MW-2	MW-1
	DISTANCE FROM CENTER OF DP-2 3 ft.	10 ft.	18.5 ft.	BACKGROUND
0-2	900	260	790	17
2-4	2,010			
4-6	1,220	3,580	200	11
6-8	1,770			
8-10	1,440			
10-12	1,760	340	86	7.0
12-14	3,050			
14-16	1,680	210	71	5.5
16-18	1,240			
18-20	710			
20-22	500	410	36	6.9
24-26	440	380	30	6.5
30-32	370	200	21	6.2
34-36	380	130	28	4.8
40-42	380	100	21	8.6
44-46	300	100	17	9.2
50-52	98	51	6.5	8.2
54-56	110	18	12	5.4
60-62	59	28	7.8	7.8
64-66	26	27	5.6	9.2
70-72	15	13	7.3	5.4

TABLE 2-5

HEXAVALENT CHROMIUM
(ug/g Dry Weight)

SAMPLE DEPTH (ft)	BORING/MONITORING WELL TB-1	TB-2	MW-2	MW-1
	DISTANCE FROM CENTER OF DP-2 3 ft.	10 ft.	18.5 ft.	BACKGROUND
0-2	8.2	4.3	11	<0.09
4-6	16	29	0.46	<0.09
10-12	19	2.0	0.095	<0.09
14-16	18	2.3	0.14	<0.09
20-22	7.9	2.4	0.31	<0.09
24-26	9.2	0.53	0.22	<0.09
30-32	7.0	4.7	0.15	<0.09
34-36	13	6.2	0.10	<0.09
40-42	9.6	6.8	0.17	<0.09
44-46	7.3	3.0	0.10	<0.09
50-52	3.1	1.7	<0.09	<0.09
54-56	3.2	0.32	0.12	<0.09
60-62	2.8	0.19	<0.09	0.32
64-66	0.26	0.19	<0.09	0.44
70-72	0.32	0.17	0.17	0.28

TABLE 2-6

TOTAL COPPER
(ug/g Dry Weight)

SAMPLE DEPTH (ft)	BORING/MONITORING WELL TB-1	TB-2	MW-2	MW-1
	DISTANCE FROM CENTER OF DP-2 3 ft.	10 ft.	18.5 ft.	BACKGROUND
0-2	12	120	120	97
4-6	7.2	14	8.3	9.6
10-12	8.8	5.4	5.5	7.0
14-16	7.1	5.9	14	7.4
20-22	5.8	7.6	21	5.9
24-26	5.2	5.9	17	9.6
30-32	12	10	7.9	9.1
34-36	10	18	11	6.9
40-42	6.7	8.8	10	6.8
44-46	7.6	12	12	8.6
50-52	4.9	5.9	4.0	7.9
54-56	6.2	4.3	5.1	3.8
60-62	5.7	6.3	4.5	5.9
64-66	4.4	7.1	3.6	4.5
70-72	4.2	6.7	4.2	3.3

TABLE 2-7

TOTAL IRON
(ug/g Dry Weight)

SAMPLE DEPTH (ft)	BORING/MONITORING WELL TB-1	TB-2	MW-2	MW-1
	DISTANCE FROM CENTER OF DP-2 3 ft.	10 ft.	18.5 ft.	BACKGROUND
0-2	6,140	12,700	13,400	8,710
4-6	6,600	18,900	8,420	7,840
10-12	12,600	5,560	4,470	4,350
14-16	9,050	4,080	7,510	5,960
20-22	5,860	6,810	7,610	3,890
24-26	4,720	5,360	5,110	6,360
30-32	8,790	8,110	6,560	7,180
34-36	9,140	8,650	7,910	6,380
40-42	10,400	10,700	9,000	7,410
44-46	9,090	10,800	12,200	7,440
50-52	4,340	5,540	4,940	6,320
54-56	6,380	4,410	5,850	5,530
60-62	3,930	4,940	5,220	8,000
64-66	3,090	5,210	4,440	4,960
70-72	2,810	3,580	3,930	3,460

TABLE 2-8

TOTAL LEAD
(ug/g Dry Weight)

SAMPLE DEPTH (ft)	BORING/MONITORING WELL TB-1	TB-2	MW-2	MW-1
	DISTANCE FROM CENTER OF DP-2 3 ft.	10 ft.	18.5 ft.	BACKGROUND
0-2	380	480	590	130
4-6	110	71	4.0	15
10-12	11	5.1	<4	<5
14-16	31	<6	<4	6.2
20-22	5.0	<6	<4	<6
24-26	<3	6.0	<4	<5
30-32	<3	6.6	<4	5.9
34-36	<4	<6	<4	<5
40-42	<3	<5	<4	<6
44-46	<3	<5	<4	<5
50-52	<3	<6	<4	<6
54-56	<3	<5	<4	<5
60-62	<4	<6	<4	<5
64-66	<6	<6	<4	<6
70-72	<4	<6	<4	<6

TABLE 2-9

TOTAL NICKEL
(ug/g Dry Weight)

SAMPLE DEPTH (ft)	BORING/MONITORING WELL TB-1	TB-2	MW-2	MW-1
	DISTANCE FROM CENTER OF DP-2 3 ft.	10 ft.	18.5 ft.	BACKGROUND
0-2	5.1	21	15	12
4-6	<4	11	10	15
10-12	14	6.1	10	12
14-16	4.9	10	13	10
20-22	5.0	9.4	11	17
24-26	4.8	<4	8.0	8.0
30-32	7.0	<4	8.8	7.9
34-36	6.0	17	7.9	6.9
40-42	5.8	8.8	14	8.1
44-46	7.8	8.9	11	5.8
50-52	5.9	4.0	<4	12
54-56	5.0	4.8	7.0	5.0
60-62	5.3	<5	6.9	5.8
64-66	5.5	4.1	7.7	<5
70-72	5.5	<6	6.8	7.1

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TABLE 2-10

TOTAL SELENIUM
(ug/g Dry Weight)

SAMPLE DEPTH (ft)	BORING/MONITORING WELL TB-1	TB-2	MW-2	MW-1
	DISTANCE FROM CENTER OF DP-2 3 ft.	10 ft.	18.5 ft.	BACKGROUND
0-2	<0.6	<0.6	<0.6	<0.6
4-6	<0.5	<0.6	<0.5	<0.6
10-12	<0.5	<0.6	<0.5	<0.5
14-16	<0.5	<0.6	<0.5	<0.6
20-22	<0.5	<0.6	<0.5	<0.6
24-26	<0.5	<0.5	<0.5	<0.5
30-32	<0.5	<0.5	<0.5	<0.5
34-36	<0.5	<0.6	<0.5	<0.5
40-42	<0.5	<0.5	<0.5	<0.6
44-46	<0.5	<0.5	<0.5	<0.5
50-52	<0.5	<0.6	<0.5	<0.6
54-56	<0.5	<0.5	<0.6	<0.5
60-62	<0.6	<0.6	<0.6	<0.5
64-66	<0.6	<0.6	<0.6	<0.6
70-72	<0.6	<0.6	<0.6	<0.6

TABLE 2-11

TOTAL ZINC
(ug/g Dry Weight)

SAMPLE DEPTH (ft)	BORING/MONITORING WELL TB-1	TB-2	MW-2	MW-1
	DISTANCE FROM CENTER OF DP-2 3 ft.	10 ft.	18.5 ft.	BACKGROUND
0-2	32	360	150	130
4-6	8.9	35	18	20
10-12	19	21	13	30
14-16	8.1	17	30	11
20-22	7.0	22	19	11
24-26	7.2	17	14	29
30-32	12	21	18	34
34-36	13	17	20	14
40-42	12	29	18	30
44-46	11	24	34	26
50-52	8.8	17	9.4	34
54-56	9.9	12	11	8.4
60-62	7.8	11	9.4	22
64-66	7.1	18	18	16
70-72	6.9	17	7.6	8.5

TABLE 2-12

LEACHABLE NITRATE
(ug/g Dry Wt.)

SAMPLE DEPTH (ft)	TB-1	TB-2	MW-2	MW-1
	DISTANCE FROM CENTER OF DP-2			
	3 ft.	10 ft.	18.5 ft.	BACKGROUND
0-2	54	<3	9.6	3.7
10-12	16	<3	<3	2.0
20-22	<3	<3	5.3	<3
30-32	<3	<3	2.2	<3
40-42	2.3	<3	5.5	3.1
50-52	<3	2.4	3.3	3.5
60-62	2.7	5.4	4.3	2.8
70-76	3.1	3.4	3.3	5.6

TABLE 2-13

LEACHABLE PHOSPHORUS
(ug/g Dry Wt.)

SAMPLE DEPTH (ft)	BORING/MONITORING WELL			
	TB-1	TB-2	MW-2	MW-1
	DISTANCE FROM CENTER OF DP-2			
	3 ft.	10 ft.	18.5 ft.	BACKGROUND
0-2	79	61	66	<0.9
10-12	400	39	41	<0.9
20-22	48	30	43	<0.9
30-32	22	18	11	<0.9
40-42	32	29	28	<0.9
50-52	17	16	13	<0.9
60-62	17	17	7.5	<0.9
70-72	2.1	6.1	15	<0.9

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TABLE 2-14

LEACHABLE SULFATE
(ug/g Dry Wt.)

SAMPLE DEPTH (ft)	BORING/MONITORING WELL TB-1	TB-2	MW-2	MW-1
	DISTANCE FROM CENTER OF DP-2 3 ft.	10 ft.	18.5 ft	BACKGROUND
0-2	69	120	78	58
10-12	<42	<42	<42	<41
20-22	<42	<42	<42	<41
30-32	<43	<42	<42	<42
40-42	<42	<42	110	<42
50-52	<42	<42	73	64
60-62	<45	<43	<46	<42
70-72	<46	<45	<48	<48

TABLE 2-15

PERCENT DRY WEIGHT

SAMPLE DEPTH (ft)	BORING/MONITORING WELL TB-1	TB-2	MW-2	MW-1
	DISTANCE FROM CENTER OF DP-2 3 ft.	10 ft.	18.5 ft.	BACKGROUND
0-2	93.10	80.16	81.82	88.20
2-4	94.63			
4-6	96.50	89.63	95.67	95.30
6-8	89.06			
8-10	95.83			
10-12	96.00	96.75	97.01	97.51
12-14	96.30			
14-16	96.58	96.67	95.68	95.63
16-18	97.00			
18-20	96.57			
20-22	96.87	95.80	96.09	97.35
24-26	97.03	96.54	95.20	96.79
30-32	92.92	95.64	94.89	96.44
34-36	95.86	95.52	96.08	96.61
40-42	95.83	95.18	95.21	97.06
44-46	95.94	95.01	95.31	96.64
50-52	96.06	95.39	95.54	96.00
54-56	94.94	96.07	95.71	95.90
60-62	89.20	91.30	86.13	93.82
64-66	89.84	88.76	89.01	88.25
70-72	87.66	88.02	82.49	83.58

TABLE 2-16

SUMMARY OF ANALYTICAL RESULTS FOR SOIL SAMPLES
COLLECTED AT DISPOSAL AREAS 1 & 2

		Total Metals (ug/g)									Leachable Inorganics (ug/g)		
Sample I.D.	Depth of Sample (feet)	Cd (BGR MAX 0.76)	Cr (BGR MAX 17)	Cr+6 (BGR MAX 0.44)	Cu (BGR MAX 97)	Fe (BGR MAX 8,710)	Pb (BGR MAX 130)	Ni (BGR MAX 17)	Se (BGR MAX <0.6)	Zn (BGR MAX 130)	NO_3 (BGR MAX 5.6)	PO_4 (BGR MAX <0.9)	SO_4 (BGR MAX 64)
	8-10*	-	4,100	9.5	540	17,000	10,000	-	-	840	9.8	8.0	150
	10-12**	-	1,700	0.28	120	14,000	2,800	-	-	230	1.8	<0.6	47
	13-15	-	69	1.3	31	6,510	150	-	-	30	1.3	9.1	28
	15-17	-	62	0.59	21	6,710	150	-	-	15	1.7	7.7	<20
	17-19	-	34	0.81	21	7,810	110	-	-	17	6.2	6.1	<20
DP-1	19-21	-	13	0.13	12	4,020	55	-	-	9.2	3.7	5.7	<20
	21-23	-	35	0.29	25	13,600	73	-	-	23	3.2	3.6	<20
	23-25	-	8.1	<0.08	7.1	2,920	28	-	-	8.7	1.7	3.7	<20
	25-27	-	8.7	0.10	9.6	5,080	37	-	-	10	1.9	3.9	37
	27-29	-	12	<0.08	19	20,900	97	-	-	12	1.4	5.4	58
	33-35	-	18	0.11	14	4,570	39	-	-	10	1.6	4.7	<20
	0.0-0.5	1.1	25,800	4,610	220	19,000	53,200	29	<0.6	200	-	-	-
	2.0-2.5	<0.6	4,570	150	17	9,220	570	4.6	<0.6	20	-	-	-
	4.0-4.5	<0.6	4,740	220	18	6,820	1,600	5.1	<0.6	19	-	-	-
DP-2	4.5-5.0	<0.6	3,650	400	15	7,050	7,050	<2	<0.6	15	-	-	-
	5.0-5.5	<0.6	3,350	110	10	6,230	830	<2	<0.6	11	-	-	-
	6.0-6.5	<0.6	3,050	69	11	9,510	750	<2	<0.6	9.9	-	-	-
	6.5-7.0	<0.6	3,200	130	11	4,350	5,690	2.8	<0.6	10	-	-	-
	7.0-7.5	<0.6	3,110	87	11	4,010	800	3.7	<0.6	10	-	-	-

Note: BGR MAX is the maximum background value found for each element in the soils from MW-1, all values are in ug/g.

* Composite sample was taken from the 8-9' and 9-10' sampling interval, listed on analytical results as Comp-1.

**Composite sample was taken from the 10-11', 11-11.5' and 11.5-12' sampling interval, listed on analytical results as Comp-2

\- Not analyzed.

2.3 GEOLOGY AND HYDROLOGY

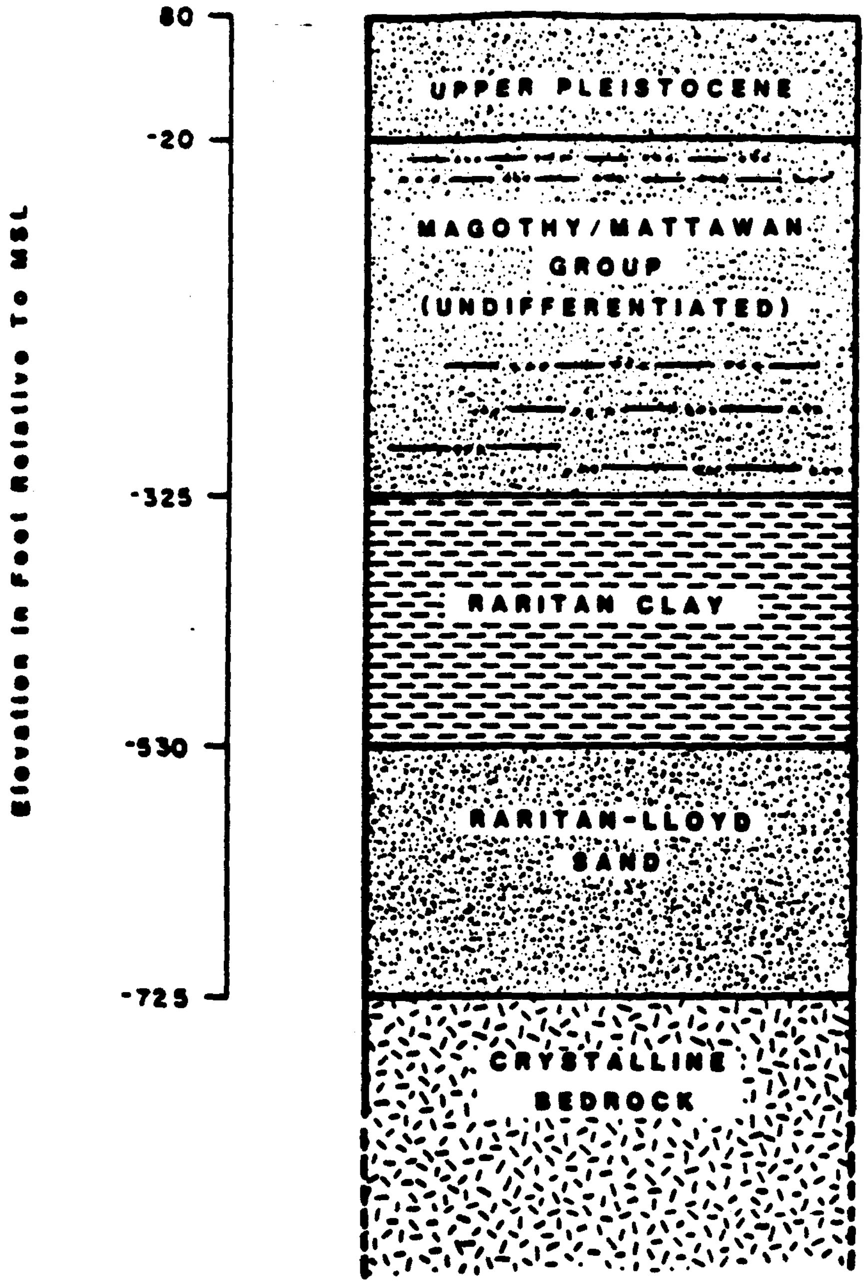
2.3.1 Introduction

The Deknatel site is located in the Atlantic Coastal Plain Physiographic Province. This province is characterized by southeasterly-dipping strata comprised of unconsolidated sand, silt, clay and gravel unconformably overlying crystalline bedrock. The borings for this investigation were relatively shallow compared to the thickness of the unconsolidated sediments at the site.

2.3.2 Hydrogeology of the Study Area

The study area is underlain by over seven hundred (700) feet of unconsolidated sediments (Figure 2-8). From oldest (deepest) to youngest (shallowest) these sediments have been divided into a series of geologic formations: the Raritan Formation; the Magothy Formation and Mattawan Group, undifferentiated; and Pleistocene deposits. The Raritan and Magothy/Mattawan rocks are Late Cretaceous in age and directly overlie crystalline bedrock. The Pleistocene-aged sediments were deposited on the erosional surface of the Magothy/Mattawan deposits. Each geologic formation contains water-bearing zones and intervals; where these zones are prevalent and interconnected they can be considered aquifers.

A brief description of the two geologic and hydrologic units nearest the surface which are of interest in this study follows:



TITLE

GENERAL STRATIGRAPHIC COLUMN UNDERLYING THE DEKNATEL SITE

PREPARED FOR

RECRA ENVIRONMENTAL, INC.

ROUX	Consulting Ground-Water Geologists ROUX ASSOCIATES INC	SCALE SHOWN DATE 3/88	FIGURE 2-8

Magothy Formation/Mattawan Group (Undifferentiated)

The Magothy/Mattawan deposits are also Late Cretaceous in age and unconformably overlie the clay member of the Raritan Formation (Figure 2-8). The Magothy/Mattawan deposits consist of layers and lenses of gravel, sand, silt, and clay. The thickness in the study area based on nearby well logs is between 200 and 300 feet.

The sandy and gravelly layers/lenses yield significant quantities of water to wells. However, less permeable silts and clays dominate certain horizons in the Magothy/Mattawan which causes variations in hydraulic conductivity both vertically and horizontally. These silt/clay layers shield most of the good water-bearing zones from surface contamination and locally cause confined (artesian) conditions.

Wells tapping the Magothy/Mattawan System in Queens have yielded as much as 1,800 gpm. Specific capacities have ranged from less than 15 gpm/ft to over 50 gpm/ft in the coarser, more permeable deposits. This aquifer has been extensively developed in Queens and Nassau Counties.

Pleistocene Deposits

Directly overlying the uneven surface of the Magothy/Mattawan aquifer system are Upper Pleistocene deposits consiting of sands and gravels with minor interbeds of silt and clay. These deposits are of glaciofluvial origin and are termed outwash. These were deposited from the meltwaters of a retreating glacier which sorted sediments previously carried and deposited by the ice. Therefore, these deposits contain sediments having uniform grain sizes and are highly permeable. These outwash deposits comprise the Upper Glacial aquifer. The Upper Glacial aquifer is the aquifer of concern for this study, due to its hydraulic connection with the regionally important Magothy/Mattawan aquifer system.

In 1979, according to Buxton, et.al. 1981, net pumpage from aquifers underlying Queens was approximately 62.5 mgd. Of this total. 16.6 mgd (27%) was pumped from the Upper Glacial; 37.3 mgd (60%) from the Magothy/Mattawan System; and 7 mgd (11%) from the Lloyd aquifer. A small percentage was pumped from the Jameco aquifer which does not underlie the Deknatel area.

Most of the pumpage described above involves the Jamaica Water Supply Company whose nearest wells are approximately half a mile west of the site. This company serves more than half a million people and over 7500 commercial and industrial establishments in southeast Queens. A large cone of depression exists where the Jamaica Water Supply well fields are located. Shallow groundwater under the Deknatel site flows westerly toward the Jamaica Water Supply cone of depression.

Other non-drinking water wells located between the Jamaica Water Supply well fields and the Deknatel site supply cooling water for air conditioning systems and other non-potable water users. After use, the water is generally returned to the aquifer via diffusion wells. These nonpotable, pumping wells are screened either in the Magothy/Mattawan system or Upper Glacial aquifer and will have little effect on shallow groundwater under the Deknatel site because of their location and seasonal usage.

2.3.3 Groundwater Flow Velocity and Direction

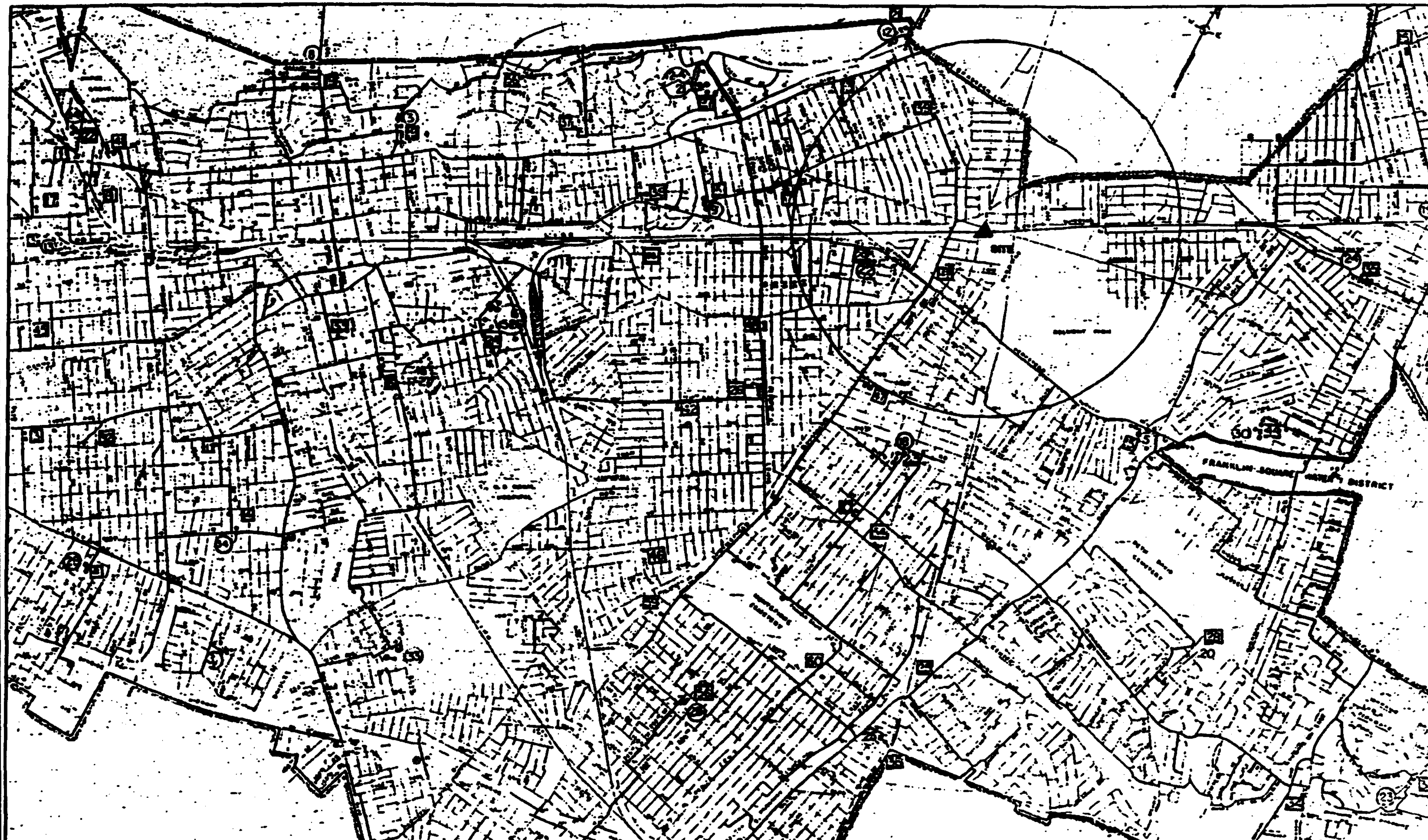
Based on a hydraulic conductivity of 480 gpd/ft2, a measured on-site gradient of 0.002 ft/ft and an assumed porosity of 0.35, the approximate groundwater flow velocity is 0.137 foot/day or 134 feet/year. This value is representative of the upper portion of the water table aquifer under the site and is consistent with values obtained for the Upper Glacial aquifer, in general. Groundwater flow velocities may vary somewhat throughout the thickness of the Upper Glacial aquifer under the site, depending upon the coarseness, sorting and packing of the individual sediment layers.

Figure B-5 in Appendix B shows the regional direction of groundwater flow near the site based on Jamaica Water Supply Company (JWSC) 1987 water levels. This figure reflects water level data consistent with measurements collected on three occasions at the site by Roux Associates during this investigation. The apparent direction of groundwater flow is towards the Jamaica Water Supply Company (JWSC) cone of depression near wells 27, 37 and 38. These wells are over 8500 feet west of the site. Screen settings place these wells in the lower portion of the Upper Glacial aquifer but some screens may also bridge the uppermost portion of the Magothy/Mattawan system. Though JWSC well 29 is the closest Upper Glacial supply well, groundwater from the site appears not to be flowing in that direction but towards the more extensive cone of depression to the west. It is unlikely, that groundwater from the site would be drawn down into the deep well screen of JWSC well 29 (screened -10 to -30 feet MSL). More likely, groundwater would pass by the well at higher horizons in the aquifer and then would turn and flow towards the extensive water table lows (JWSC wells 27, 37 and 38, which are northwest of the site).

Buxton, et.al. 1981, presented a series of plates that show the water table configuration at various times from 1903 to the present. The 1903 data reflect the best estimate for predevelopment conditions and show flow to the west and southwest from the area of the site, away from a water table high in Nassau County. Water table maps compiled in 1936, 1943, and 1961 show extensive cones of depression in Brooklyn and near Woodhaven, Queens and groundwater flow from the area of the site is consistently westerly or southeasterly towards these areas. The data from 1974 and 1981 indicate pumpage has stopped in Brooklyn and the Woodhaven area but shows a pronounced water table low in the area of the Jamaica Water Supply Company (JWSC) well fields. Once again flow from the site is westerly during these periods and towards the JWSC cone of depression.

2.3.4 Nearby Aquifer Usage

Usage of the aquifers underlying the Deknatel site in the general vicinity of the site can be divided into three categories: public potable water supply, commercial and industrial uses, and private domestic uses.



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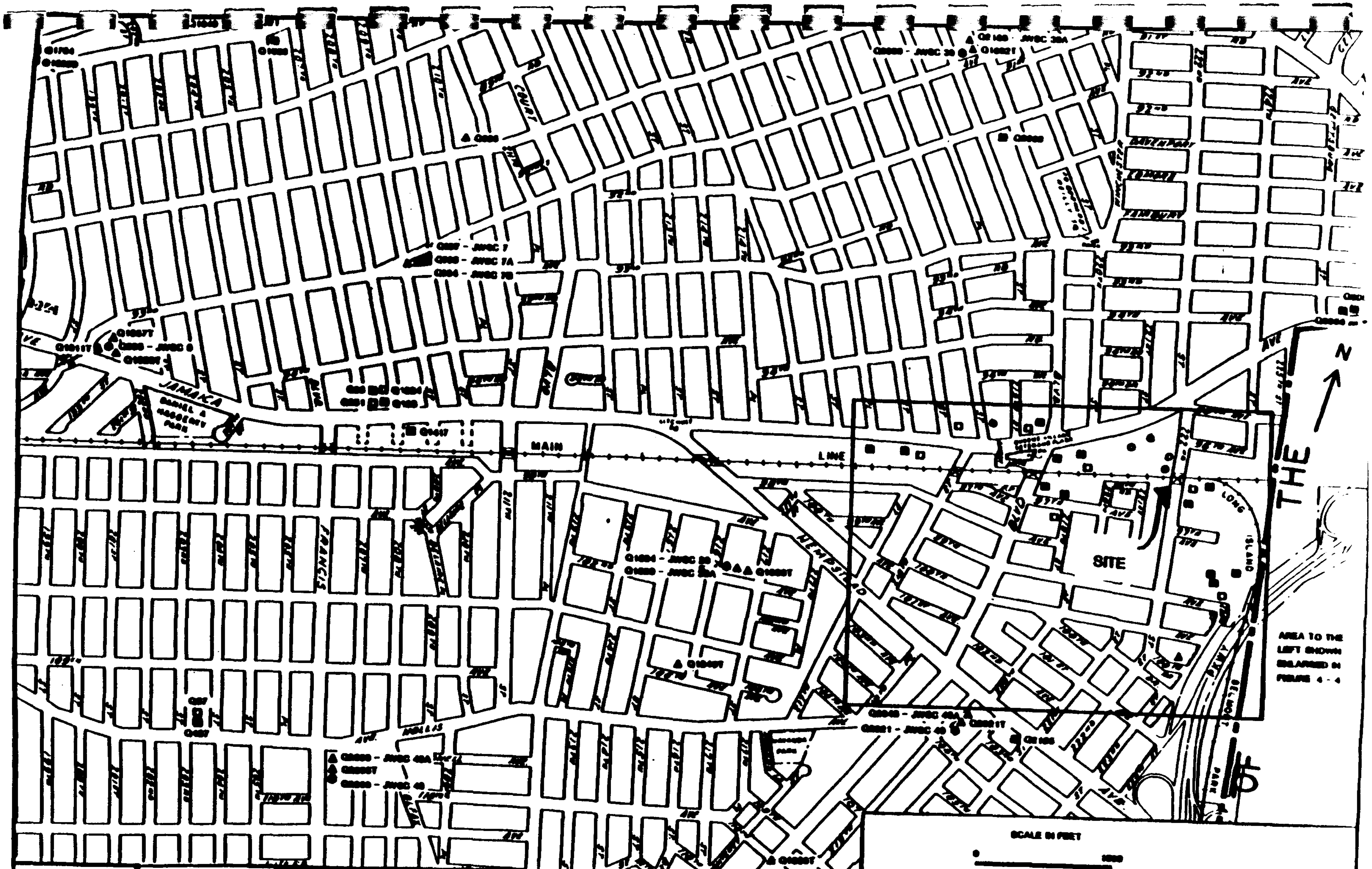
PROJECT NO. 8C1076

JAMAICA WATER SUPPLY COMPANY
DISTRIBUTION SYSTEM

FIGURE 2-9



	BY	DATE	DEKNATEL, INC. 96-20 222ND STREET QUEENS, NEW YORK 11429	NYSDEC REGISTERED WELLS IN THE VICINITY OF THE DEKNATEL SITE
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Public Supply Wells

The public supply wells in the vicinity are all owned and operated by the Jamaica Water Supply (JWSC) which maintains an active well field covering much of Queens County and portions of western Nassau County. A map of the JWSC distribution system showing the locations of these wells and of the Deknatel facility is included as Figure 2-9. Regional groundwater flow near the Deknatel site is generally westerly, approximately parallel to the Long Island Railroad right-of-way next to the Deknatel site.

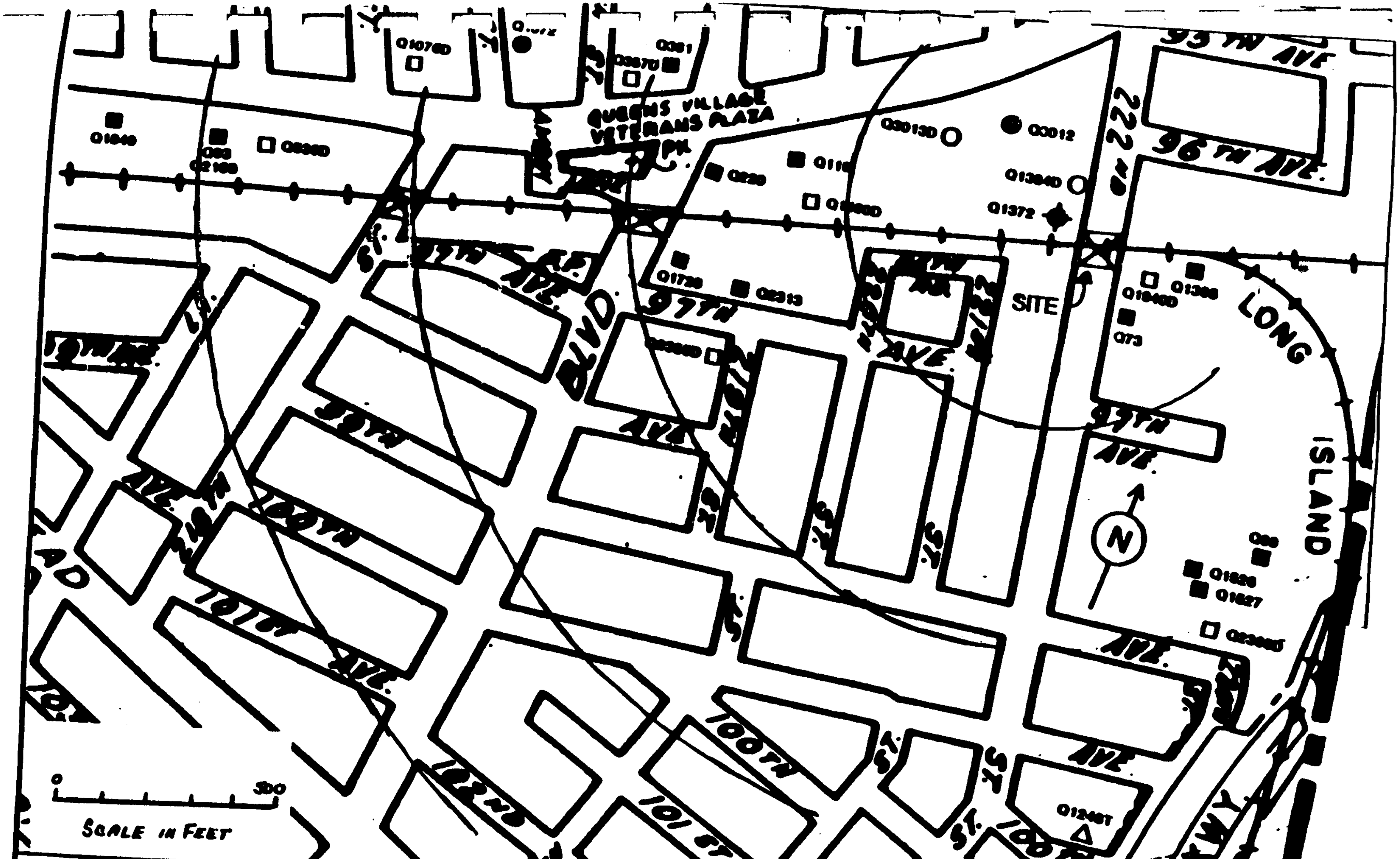
As can be seen from this map and a more detailed map shown in Figure 2-10, a number of the JWSC wells lie in the general downgradient direction from the site. The closest wells, 49 and 49A are approximately 0.5 miles from the site, 29 and 29A are about 0.6 miles away, 7, 7A and 7B are about a mile distant, a number of others lie between 1 and 2 miles, and a few more lie between 2 and 3 miles away.

Of the approximately 60 Jamaica Water Supply Company wells that lie within 3 miles of the Deknatel site in any direction, about half are screened in the Upper Glacial (water table) aquifer, the other half are screened in the Magothy Formation and only one is screened in the Lloyd Formation. In 1987, the net pumpage of JWSC wells within 3 miles of the Deknatel site amounted to approximately 9 billion gallons, of which approximately 80% was from the Upper Glacial Formation, approximately 20% was from the Magothy, and less than 1% was from the Lloyd.

Non-Public Supply Commercial and Industrial Wells

About 125 non-public supply wells at least 4-1/2 inches in diameter, capable of producing at least 45 gallons per minute were identified from NYSDEC records in the area extending about 1 mile north and east (upgradient), 2 miles south and 2-1/2 miles west (downgradient) from the Deknatel site. These wells are predominantly used for commercial or industrial purposes. The majority of these are used for air conditioning or cooling purposes, a few are used for general industrial purposes, a number are test or observation wells and only two were identified as being for domestic use. Both of these latter two wells were located upgradient of the site.

Well completion reports were obtained and reviewed for 58 of these wells located within about 0.5 miles up or across gradient and up to 2 miles downgradient from the site. Of these wells, 22 were pumping wells (15 for air conditioning or cooling), 17 were recharge diffusion wells and 19 were test wells, many of which were exploratory wells for the Jamaica Water Supply Company. Of the 22 pumping wells, 19 are screened in the Upper Glacial (water table) aquifer and the 3 remaining wells are screened in the Magothy Formation. The maps presented in Figures 2-10 and 2-11 show the locations of the non-public supply wells recorded in the NYSDEC well completion files and located within about 1.5 miles downgradient from the site. In addition, a data base has been compiled, which can be found in Appendix E, that contains the locations, relative to the Deknatel site, of all 125 wells iden-



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PROJECT NO. 8C1076

NYSDEC REGISTERED WELLS IN THE IMMEDIATE VICINITY OF THE DEKNATEL SITE

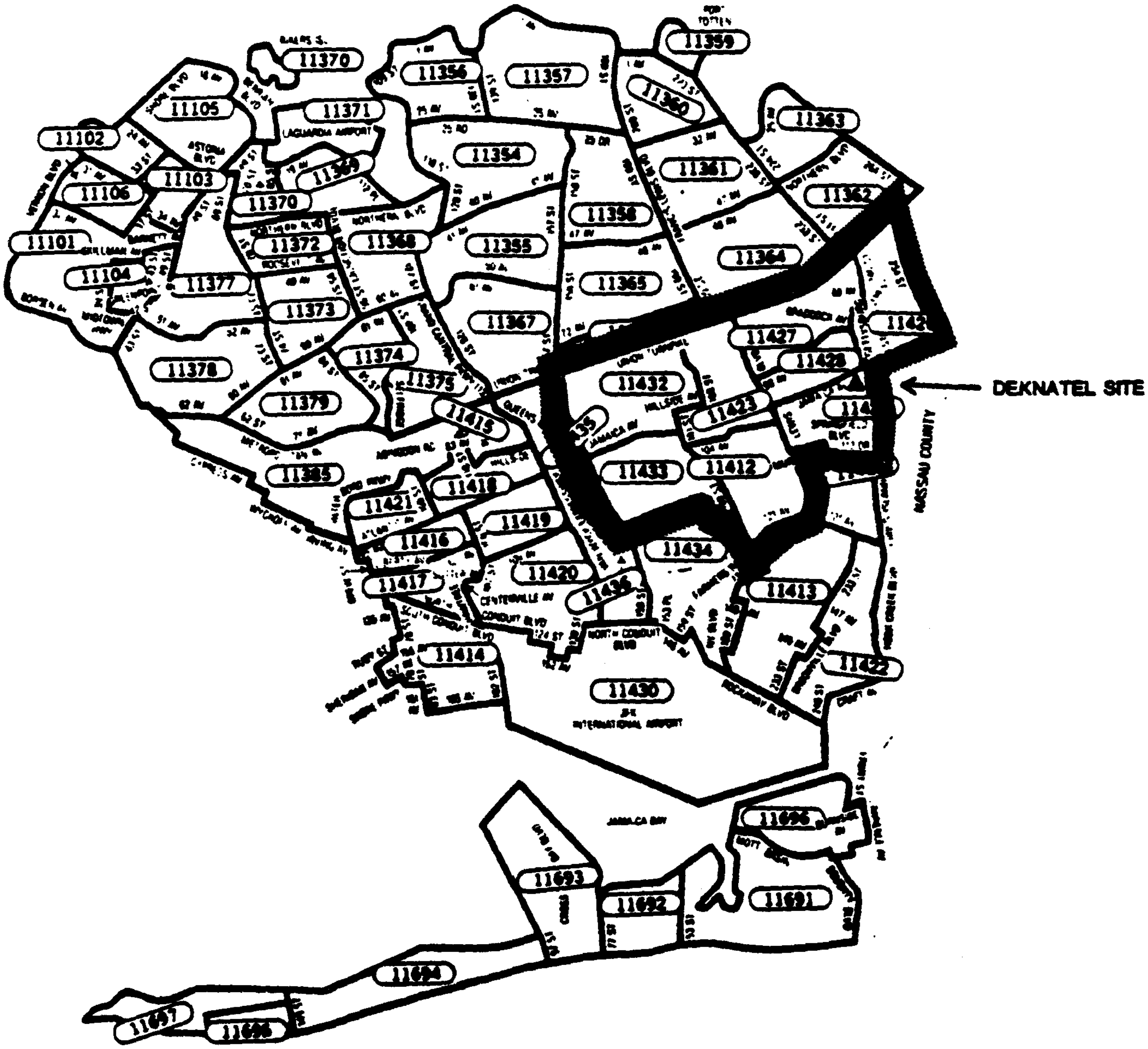
FIGURE 2-11

tified in the general vicinity of the site. It also contains information on the depth, production capacity, intended usage, the original owner and the street address of the wells for which completion reports were obtained.

Private Domestic Wells

Wells capable of producing less than 45 gallons per minute in New York City are regulated by the NYC Department of Health (NYCDOH) by means of permits that must be renewed annually. The NYCDOH does not maintain a reference map showing well locations however, a list of permits arranged by zip code is maintained. The area in the vicinity of the Deknatel site falls in eight zip code zones. As of March 1988 there were 18 active NYCDOH well permits for wells in these zip code zones. Figure 2-12 shows a zip code map of Queens with the location of the Deknatel site indicated and the zip code zones of interest outlined. Table 2-17 lists the number of active NYCDOH well permits in each relevant zip code zone.

The NYCDOH permits these wells for non-potable water uses. Most of these wells are used for such purposes as watering lawns and washing cars, particularly when the use of public water supplies for these purposes is restricted, such as during periods of drought. While no specific information is available, it is likely that most, if not all, of these wells are screened near the top of the water table aquifer because of the size of these wells and the added expense of drilling deeper wells.



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2.3.5 Available Groundwater Quality Information

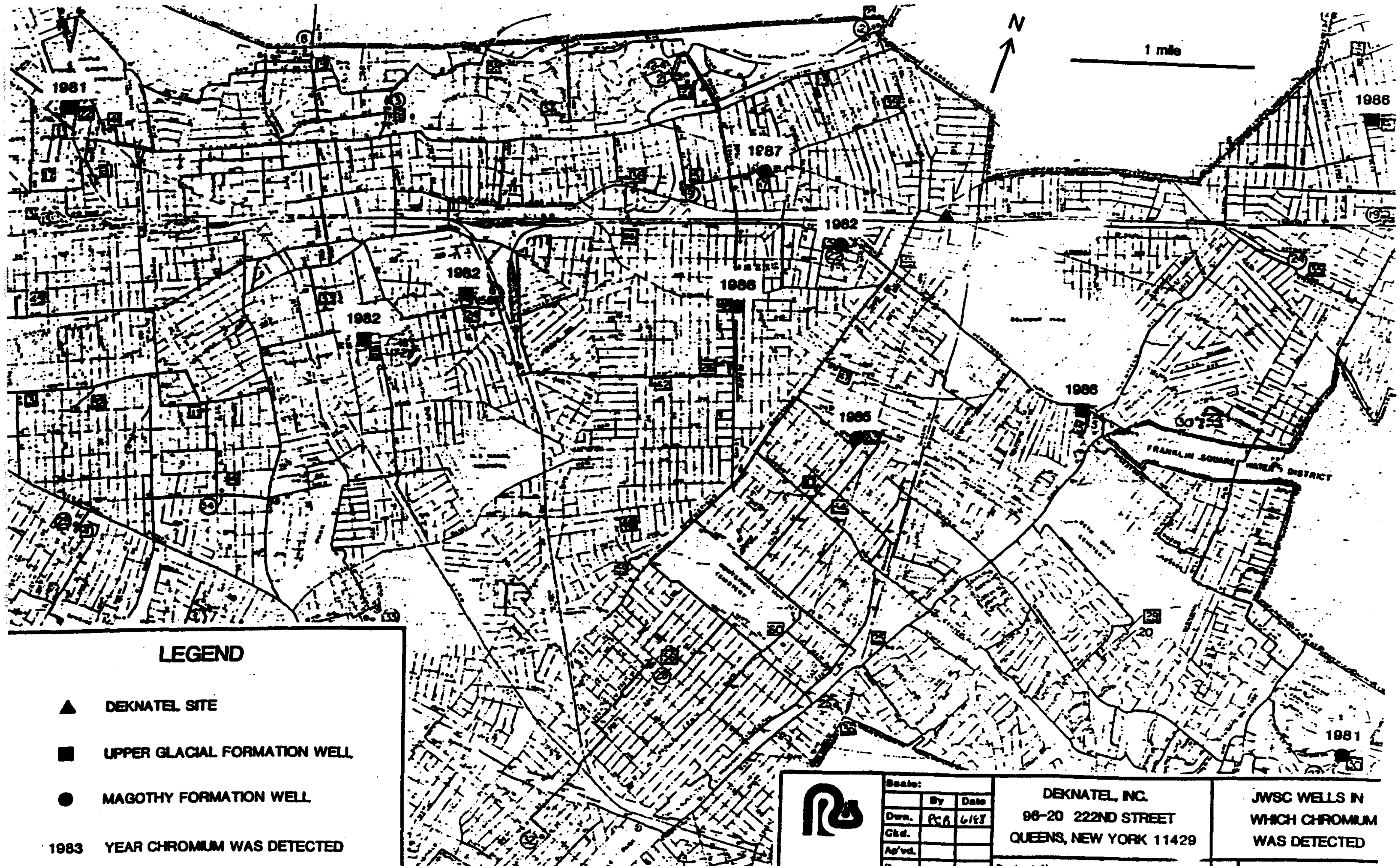
There are two sources of information on the groundwater quality in the vicinity of the Deknatel site and a third source provides information on groundwater quality at locations somewhat further removed from the site. The first source is the data obtained from analyses of groundwater samples collected from the monitoring wells on the Deknatel site which was presented in Section 2.2.4 of this report. Briefly, that data indicated that concentrations of total and hexavalent chromium and phosphorus were elevated immediately downgradient from DP-2 in comparison to nearby background locations, but on average were within applicable drinking water standards.

The other source of information on nearby groundwater quality is the routine data compiled by the Jamaica Water Supply Company on the water pumped from its wells. Since these wells are used for public supply purposes, JWSC is required to develop and maintain water quality data on them. Every well in operable condition is sampled and analyzed at least once a year and most of the wells in regular service are sampled and analyzed several times a year. The Jamaica Water Supply Company has made the results of these analyses available to Recra Environmental. The analytical data from 1975 through 1987 for substances believed to have been constituents of the waste materials disposed at the Deknatel site has been compiled and is presented in data base form in Appendix E. Also included is information on the location, depth, pumpage and static water levels in the wells. JWSC began analyses for metals in 1975, which are included in the data base where available; however, no data exists on metal concentrations before 1975. Since chromium and copper were the key parameters in this study and data on them did not become available until 1975, analytical data for earlier years was not compiled.

Chromium was apparently present in relatively high concentrations in the material disposed at Deknatel since 1956. Chromium was detected in only 7 out of 400 analyses of well water from JWSC wells within 3 miles of the site over the last 13 years. When detected, chromium was found at the minimum detectable concentration of 20 parts per billion (ppb) in 6 of the samples and at 40 ppb in the other one. The standard for chromium in drinking water established by both the United States Environmental Protection Agency (EPA) and New York State is 50 ppb. Therefore, the chromium concentration has not exceeded the drinking water standard in any of the well water samples examined over the last 13 years. The samples in which chromium was detected were from wells throughout the JWSC service area and occurred in 4 of the 13 years for which data was examined. Chromium was not detected more than once in any well during the years examined.

The map shown in Figure 2-13 shows the location of the wells in which chromium was detected, the geologic formation in which the well is screened and the year in which chromium was detected in each well.

Copper was apparently present in the Deknatel waste streams disposed of on site but at unknown concentrations. Copper is a



LEGEND

- ▲ DEKNATEL SITE
- ■ UPPER GLACIAL FORMATION WELL
- ● MAGOTHY FORMATION WELL
- 1983 YEAR CHROMIUM WAS DETECTED

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Project No.

JWSC WELLS IN WHICH CHROMIUM WAS DETECTED

FIGURE 2-13

common trace consistuent in groundwater. About half of the JWSC well water samples from throughout the service area analyzed over the last 13 years had copper concentrations at or above the detection limit of 20 ppb. Copper was not detected in the other samples. Among the samples in which copper was detected, most of the copper concentrations fell between 20 and 100 ppb with a few values between 100 and 300 ppb. The EPA and New York State standard for copper in drinking water is 1 part per million (ppm) or 1,000 ppb. Therefore, none of the well water samples exceeded the permissible concentration.

Sulfate was apparently present as sulfuric acid in the waste streams Deknatel disposed on site from about 1925 until about 1960. Sulfate is commonly present in groundwater and was found in all of the JWSC well water samples analyzed over the last 13 years. The sulfate concentrations found, however, never exceeded the regulatory limit of 250 ppm established by the EPA and New York State in any of the samples.

Nitrate was present as nitric acid in the waste streams Deknatel apparently disposed on site from about 1925 until about 1956. Nitrate is also commonly found in groundwater and was found in most of the JWSC well water samples analyzed over the last 13 years. Concentrations ranged from the detection limit of 0.1 ppm up to and, in a few instances, above the EPA and New York State drinking water standard of 10 ppm (as nitrate nitrogen). Out of 800 to 900 JWSC well water samples analyzed for nitrate, only about 30 samples exceeded the drinking water standard and 16 of those were from 2 wells about five miles from the Deknatel facility which exhibit chronically elevated nitrate levels. Four additonal wells within about 2 miles of the Deknatel facility and generally downgradient from it, account for 12 of the remaining 14 nitrate concentrations above drinkiing water standards. The remaining 2 concentrations above the drinking water standard, were about a mile cross gradient from the site. There are several sources of nitrate in groundwater other than industrial wastes. Two of the most prominent sources are sanitary sewage and septic system effluents, and fertilizer used on lawns and gardens and in agriculture. The Long Island area in general is known to have elevated groundwater nitrate concentrations due to these nitrate sources. The small number of elevated nitrate concentrations in the JWSC wells, therefore, is not unusual in this area and could have originated from any number of sources.

Phosphate was present as phosphoric acid in the waste materials disposed of at DP-2 on the Deknatel site over its period of use. Neither the EPA nor New York State regulates phosphate concentrations in groundwater, and the Jamaica Water Supply Company does not analyze its well water samples for phosphate. Phosphate and phosphoric acid, at moderate concentrations, are generally regarded as safe for human consumption and are found in many food products, including most soft drinks.

The Jamaica Water Supply Company well water quality data base is probably the best, most complete source of information on groundwater quality in the vicinity of and particularly downgradient from the Deknatel site. Most, if not all, of the wells near the Deknatel site which are used to produce drinking water are believed to be part of the JWSC system and most of these wells are analyzed at least once a year. A review of the JWSC data base for the last 13 years indicates that chromium, copper and sulfate have never been found at concentrations above their respective drinking water quality standards. A small fraction of the samples, less than 4%, had nitrate concentrations above the water quality standard. These values may well reflect a general regional problem with high nitrate levels originating from fertilizer and sanitary sewage effluents rather than from any discharges at the Deknatel site.

A third source of information on groundwater quality in the general area is a study conducted in 1981 by the U.S. Geological Survey (USGS), however, very few of the well water samples analyzed in this study were from wells closer than about 4 miles to the Deknatel facility., The USGS data was generally similar to the JWSC data. Chromium was not detected in any of the samples from Queens County. The copper values, all less than prevailing drinking water standards, ranged from 10 ppb to 640 ppb. The well in which the 640 ppb concentration was found is located 3.5 miles cross gradient from the Deknatel facility. Sulfate ranged from 1.5 to 150 ppm except for one value of 1000 ppm from a well adjacent to an arm of Jamaica Bay about 8 miles south of the Deknatel facility. Nitrate nitrogen ranged from 0.1 ppm to 25 ppm with 6 of the 27 values above the regulatory limit of 10 ppm. None of the wells with elevated nitrate levels were closer than 5 miles to

Deknatel.

2.3.6 Field Studies

This section contains a summary of the geological/hydrogeological studies carried out and a brief description of the methodologies used. A more detailed description of these studies and methodologies can be found in Appendix B. Additional field work to better characterize the geology, hydrology and contaminant distribution is outlined is Section 3.1 of this workplan. A total of five test borings (including MW-3) was completed and three of the borings were converted to monitoring wells. Drilling activities were carried out under the supervision of a geologist from Roux Associates, Inc. A truck mounted hollow stem auger rig operated by Python Drilling of Bronx, New York, was used to advance all of the borings and to collect split spoon core barrel samples ahead of the advancing hollow stem auger flights. Split spoon samples were collected continuously from the ground surface to a depth of about 72 feet while advancing the borings at TB-1, TB-2, MW-1 and MW-2. Split spoon samples were collected every five feet from 20 to 70 feet subsurface while advancing the boring at MW-3, which was drilled as part of a separate study as presented in Section 3.1.1. above. The water table was encountered in all borings between 61 and 62 feet below ground surface.

The split spoon core barrel samples were collected in general accordance with ASTM Method D-1586 -84. The hammer blow count required to advance the core barrel sampler each 6 inches was counted by the driller and recorded by the supervising geologist.

The geologist also opened each core barrel and examined the recovered sample for specific soil characteristics and logged his observations. Detailed boring logs are presented in Appendix B.

The recovered soil sample was then transferred as completely as possible to a laboratory supplied precleaned sample jar with the assistance of a field service technician from Recra Environmental, who then took custody of the sample, labeled the sample jar, and prepared the chain of custody documents. Small portions of some of the samples were analyzed in an on site laboratory by a field chemist from Recra for key indicator paramaters, hexavalent chromium, and pH, in order to get a rapid indication of whether waste materials were present in the soils being recovered. The balance of the subsurface soil samples were transported by Recra personnel to Recra Environmental Laboratories in Tonawanda, New York, for further analysis.

The borings at MW-1, MW-2, and MW-3 were converted to monitoring wells by installation of PVC well casings as depicted schematically in Figure 2-14.

MW-1 and MW-2 were completed as 2-inch diameter I.D. wells and were screened from approximately 60 to 70 feet below ground surface. MW-3 was completed as a 4-inch diameter I.D. well and was screened from approximately 50 to 70 feet below ground surface. All of the wells were provided with protective casings at ground level and locking caps. Well completion diagrams for each well can be found in Appendix B. Wells MW-1 and MW-2 were developed by geologists from Roux Associates by purging them with a bailer

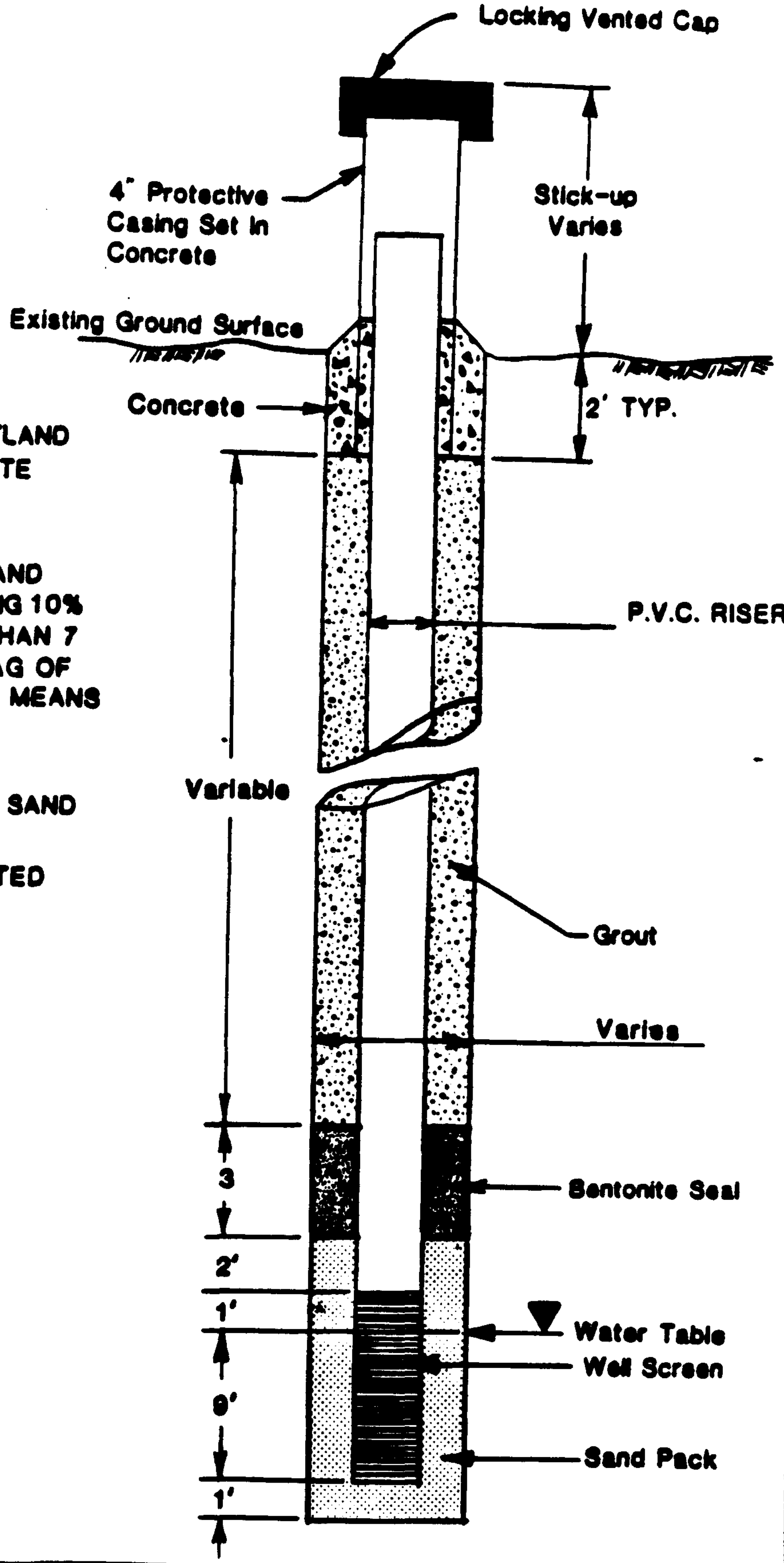
NOTES:

(1) CONCRETE: SAND AND PORTLAND CEMENT MIXTURE OR SAKRETE PREPACKED MIX

(2) GROUT: MIXTURE OF PORTLAND CEMENT AND BENTONITE USING 10% BENTONITE AND NO MORE THAN 7 GALLONS OF WATER PER BAG OF CEMENT. GROUT PLACED BY MEANS OF TREMIE GROUTING.

(3) SAND PACK: NO. 2 QUARTZITE SAND

(4) WELL SCREEN: 2" I.D. SLOTTED P.V.C. (0.01" SLOT)



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TYPICAL MONITORING WELL IN UNCONSOLIDATED MATERIAL

FIGURE 2-14

until a reasonable degree of clarity was achieved. MW-3 was similarly developed by Roux geologists using a submersible pump. Groundwater elevations in each of the wells have been recorded and groundwater samples collected, after suitably purging the wells, on a number of occasions. The groundwater samples were examined in the field by Roux geologists for appearance, conductivity, pH and temperature, and were forwarded to Recra Environmental Laboratories under chain of custody for laboratory analyses.

Since MW-3 had been completed as a 4-inch well to allow it to be pumped if necessary, it was decided to take advantage of this fact by conducting a short term specific capacity pumping testing using this well in order to investigate some of the characteristics of the water table aquifer at the Deknatel site. The test was conducted by Roux hydrogeologists using the procedure given in Appendix B. The results of the test can also be found in Appendix B as well as in the following section.

2.3.7 Hydrogeology at the Deknatel Site

The soil borings drilled for this study were all finished in the Pleistocene glacial outwash deposits which are estimated to be about 100 feet thick in the study area. The five borings completed at the site were advanced to a depth of about 70 feet into the outwash with the final 10 feet penetrating the water table or Upper Glacial aquifer. The geologic logs for these borings are included in Appendix B as Attachment B-1.

The glacial outwash deposits encountered at the site consist of predominantly well-sorted, fine to medium sands with some coarser sand and gravel throughout. These sands are quartzose with less than 10% kaolinitic feldspars, mafic minerals and rock fragments. Due to the good sorting of grain sizes and lack of silt/clay, this unit has a high permeability both vertically and horizontally.

At MW-1 the upper 16 feet of this unit is a predominantly fine sand with some gravel mixed in. Below 16 feet the unit becomes more characteristic of the remainder of the site in that fine sediment grain sizes become predominantly fine to medium sand with some gravel.

There is a characteristic iron staining that occurs from between 30-40 feet below ground surface and continues downward to the water table. This iron staining is the result of the decline of the water table elevation over the past years due to extensive pumpage of the aquifer.

Water Table Location and Direction of Flow

The elevation of the water table in each of the three monitoring wells was measured on a number of occasions and the results have been compiled in Table 2-18.

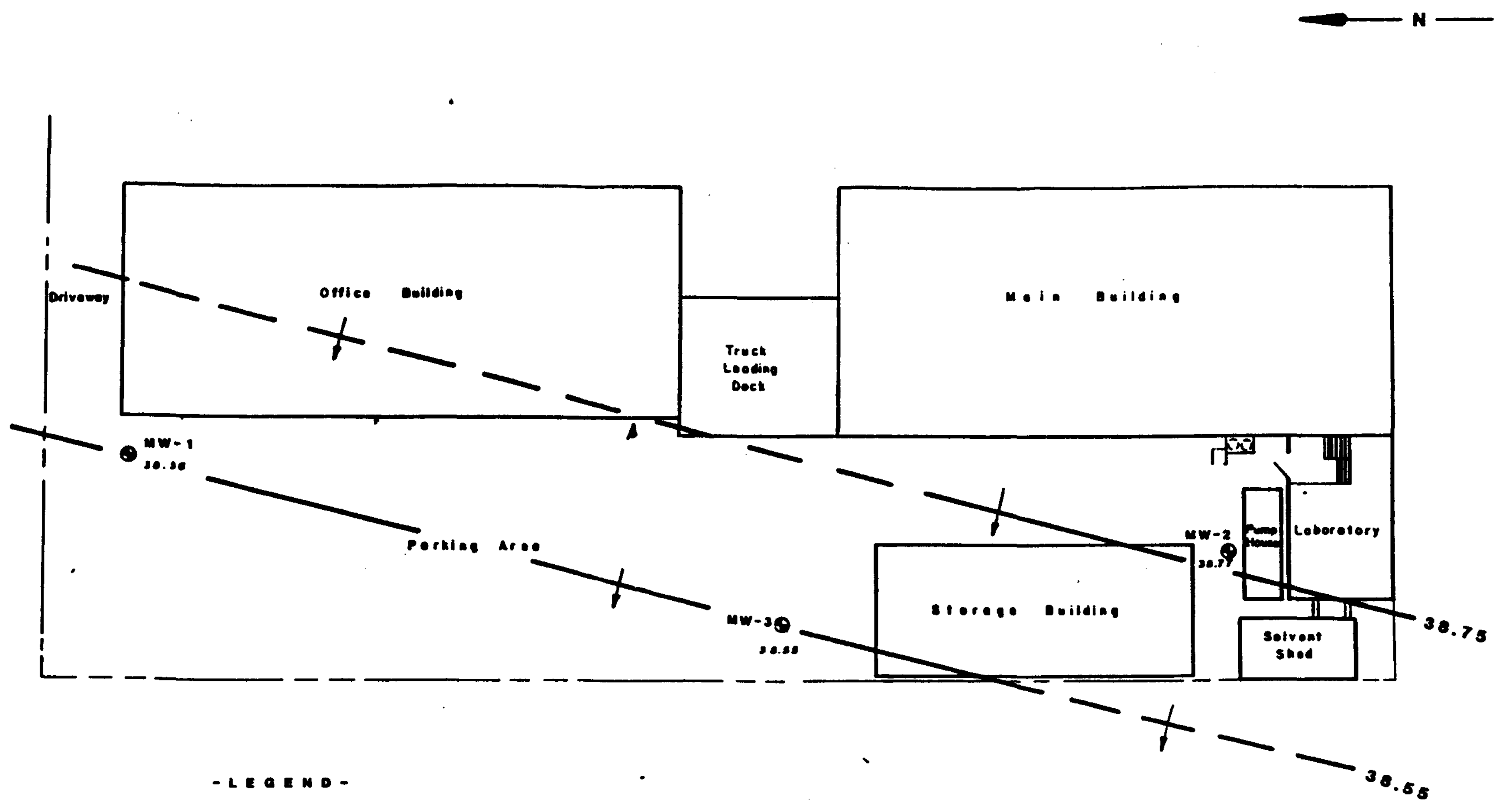
A water table map, based on one of the data sets obtained, is presented in Figure 2-15 and shows that the groundwater flow direction at the water table surface at the site is generally westerly, roughly paralleling the Long Island Railroad right-of-way. Since the three monitoring wells are so closely spaced in the direction of groundwater flow, the hydraulic gradient at the site cannot be reliably estimated from these data. Recent data from Jamaica Water Supply Company wells (see Figure B-5 in Appendix B) in the vicinity, however, suggests that the hydraulic gradient at the site is presently approximately 7.5 feet per mile (0.0015) and that the direction of flow is to the west.

TABLE 2-18

WATER TABLE ELEVATIONS* (FEET) AT THE DEKNATEL SITE

DATE	MW-1	MW-2	MW-3
02-11-88	38.33	38.50	38.52
03-15-88	38.56	38.77	38.55
03-25-88	39.09	39.00	38.83

*Relative to a common datum.



- LEGEND -

Monitoring Well

38.55 —— Line Of Equal Water-Table Elevation

38.75 Elevation Of The Water Table In Feet Relative To A Common Datum (MW-1)

→ Direction Of Ground-Water Flow

TITLE

WATER-TABLE MAP
MARCH 15, 1988
DEKNATEL, QUEENS, NY

PREPARED FOR

RECRA ENVIRONMENTAL, INC.

ROUX Consulting Ground-Water Geologists ROUX ASSOCIATES INC

SCALE	FIGURE
SHOWN	2-15
DATE 3/88	

Hydrogeological Properties of the Water Table Aquifer

One short term specific capacity test was conducted at the site on the four inch diameter monitoring well MW-3. The results of the specific capacity test are given in Appendix B. The calculated transmissivity of the shallow aquifer is 9,000 gallons per day per foot (gpd/ft). Assuming the effective saturated thickness of the aquifer to be 18.75 feet at ME-3, the calculated hydraulic conductivity is 480 gpd/ft2. This value of saturated thickness is approximate since it is based on a saturated thickness estimated from the expected vertical effect from pumpage on the aquifer (water table surface to ten feet below the bottom of the screen zone).

Based on visual inspection of the sediment sizes and the degree of sorting, and using tables compiled by Freeze and Cherry (1979) and the U.S. Department of Interior (1977), the assigned hydraulic conductivity of this aquifer would range from 100 to 1000 gpd/ft2. Published estimates of the average permeability of the Upper Glacial aquifer in this area range from 800 gpd per ft2 to 1,300 gpd per ft2. The experimental value obtained is, therefore, in in reasonable agreement with these published values.

Using the specific conductivity experimentally determined at the site, the hydraulic gradient obtained from recent water level measurements from nearby Jamaica Water Supply Company wells screened in the Upper Glacial aquifer, and a porosity estimated based on the type of grain size distribution of the soil samples collected at the site, the approximate linear velocity of the groundwater can be estimated using the following variation of Darcy's Law:

$$V = \frac{PI}{7.48p}$$

where

V	=	velocity in feet per day
P	=	coefficient of permeability in gpd/ft2
I	=	hydraulic gradient in feet per foot
p	=	porosity (fractional volume)
7.48	=	gallons/cu. ft.

substituting,

$$V = \frac{(480)(0.002)}{(7.48)(0.35)} = 0.37 \text{ ft/day or } 134 \text{ ft/year.}$$

2.3.8 Hydrogeological Results

The Deknatel facility at 96-14 222nd Street, Queens Village, New York, is located on a Pleistocene glacial outwash deposit composed predominantly of fine to medium grained sand, with some coarser sand and gravel throughout. Due to the sorting of the grain sizes and lack of silt and clay, the unit has a high permeability both vertically and horizontally.

The water table is presently located at about 61 feet below ground surface however, the presence of iron staining observed in the core samples indicated that the water table was as much as 20 to 30 feet higher in past years. The decline of the water table to its present elevation was due to extensive pumpage of the aquifer.

A short term specific capacity pumping test indicated that the hydraulic conductivity of the Upper Glacial (water table) aquifer at the Deknatel site is approximately 480 gpd/ft2. This data, taken together with the estimated soil porosity and site specific and regional hydraulic gradient information, indicates that groundwater at the top of the Upper Glacial aquifer flows generally westerly at about 135 feet per year at the Deknatel site.

2.4 Impact Assessment

The ways in which the waste materials disposed at the Deknatel site could potentially affect human health and the environment include:

- o direct contact with the waste materials at the Deknatel site,
- o migration of constituents of the waste materials to the ground water and contact of potential receptors off-site with groundwater containing waste material constituents.

There appears to be little or no chance of adverse effects on human health from direct contact with any waste materials that have remained at the disposal points. Both disposal points are located on the Deknatel property, which is fenced and locked. Further, the brick cistern, DP-1, is covered by a manhole so even Deknatel employees could not accidentally come in contact with any materials that may have remained at that disposal point. The two sunken wooden barrels that comprise Disposal Point 2 are kept covered by a lid that prevents accidental contact with waste materials that have remained in this area.

The only other way humans could be exposed to waste materials disposed at the Deknatel site would be if these materials migrated through the ground to wells, streams or other groundwater discharge points off-site. In order to assess this possibility, information has been gathered on the geology and hydrogeology of the area and the existence, usage and the quality of water from wells in the area, and has been presented in detail in the previous section.

Since the aquifer system underlying the Deknatel site is considered a sole source aquifer, the most serious concern for human exposure to waste material constituents in groundwater would be if these constituents reached and contaminated the water pumped from the public supply wells operated by the Jamaica Water Supply Company (JWSC) to a degree that jeopardized its use as a potable water source. Based on the hydrogeological and water quality information presented in the previous section, this does not appear to have happened to date nor is it likely to occur in the future for the following reasons.

Chromium was detected in the groundwater immediately downgradient from the source on the Deknatel site but only at concentrations that, on average, were within acceptable drinking water standards.

A solute introduced into the top of the water table at the Deknatel site would take approximately 15-20 years to reach the

JWSC cone of depression in the Upper Glacial aquifer, near JWSC Wells 27, 37 and 38. This is a most conservative number since it assumes the solute moves at the same rate as groundwater. The movement of a solute will be retarded and diluted due to adsorption onto aquifer materials and trasverse, and vertical dispersion (a mechanical mixing with "clean groundwater"). In addition, if it reaches a pumping well, further substantial dilution takes place as more "clean" water is drawn into the supply well from all other directions, vertically and horizontally.

Data collected by JWSC on a yearly basis from all Upper Glacial supply wells do not indicate the presence of chromium, the chemical of concern at the Deknatel site. It is even further unlikely that any solutes from the Deknatel site will reach the Magothy/Mattawan Aquifer system particularly because groundwater from the site is strongly influenced and significantly diluted by shallow wells pumping from the Upper Glacial region. Jamaica Water Supply monitoring of nearby Magothy/Mattawan supply wells indicated the sporadic detection of chromium in two wells (29A and 48A) near the detection limit (0.002 ppm). These findings are below the drinking water standard and can, in no way, be directly attributed to the Deknatel site. There easily could be other sources of chromium in a highly urbanized area such as Queens County, New York.

The closest commercial/industrial wells to the Deknatel site are 600 to 1,000 feet downgradient. Water from these wells is predominantly used for non-potable purposes such as air conditioning, cooling and other industrial uses that would not involve any direct human contact. In view of this fact and the very low chromium concentrations found in the groundwater right at the source, the waste materials disposed at the Deknatel site do not appear to have affected the suitability of the groundwater for these uses.

Based on the information obtained from the New York City Department of Health (NYCDOH), there are very few small private non-potable water wells, which are permitted by the department, active in the general vicinity of the site and none in the zip code zone which included the site. Water from these wells is used intermittently and then for purposes such as watering lawns and washing cars. In view of the nature and minimal level of groundwater use in this category, it is most unlikely that the disposal of the waste materials at the Deknatel site could have any effect on human receptors through this route of exposure.

In summary, it can be stated that since the waste materials remaining at the site are all in the subsurface and are inaccessible to human contact, their presence has not affected the suitability of the site for its present use nor would their presence be likely to affect any similar uses.

The waste materials remaining on site are also acting as a source for a small but continuing release of waste constituents, specifically total and hexavalent chromium, to the groundwater. This release has resulted in hexavalent chromium concentrations in the groundwater immediately downgradient from the source area that are detectable but on average within the applicable water quality standards. While this release constitutes some potential for impact on the groundwater, an extensive investigation of the groundwater usage and quality downgradient from the site has failed to identify any present or plausible future adverse effects on the users of the groundwater who would be the potential receptors of this release.

3.0 REMEDIAL ACTIVITIES

3.1 Supplemental Remedial Investigation

The supplemental remedial investigation detailed within this document is being proposed in order to develop a more complete understanding of conditions at the Deknatel facility, specifically with regard to the extent of soil contamination by waste materials (operatively, total and hexavalent chromium) and to further assess groundwater quality downgradient of the facility, at the property line. Furthermore, this supplemental remedial investigaion will be used as an attempt to confirm the current belief that organic contamination of the groundwater is not being realized as a result of Deknatel's past disposal activities. Finally, the data from this supplemental remedial investigation in concert with the volumes of information and data available from the previously completed Source Investigation Study will be used to develop the proposed Feasibility Study, which will delineate a remedial action plan can be cost effectively implemented to provide for a technically and environmentally sound resolution for the site.

3.1.1 Field Sampling Plan

The field sampling plan for the Deknatel site consists of the following four tasks:

TASK I - Installation of Monitoring Wells

TASK II - Drilling of Soil Borings

TASK III - Collection of Groundwater Samples

TASK IV - Determination of Groundwater Flow

These tasks are designed to build upon hydrogeologic and water quality information previously developed at the site and described in the report "Source Investigation Study, Deknatel, Inc., Queens, New York", prepared by Recra Environmental, Inc., and Roux Associates, Inc., in September 1988.

Task I - Installation of Monitoring Wells

Three groundwater monitoring wells will be installed at the site at the locations shown on Figure 3-1. These wells are in addition to the three wells previously installed. The wells will be screened in the upper glacial aquifer at approximately 70 feet below ground surface. Well MW-4 is intended as an upgradient well for the site. Wells MW-5 and MW-6 are intended to complement MW-1, MW-2 and MW-3 as downgradient wells, and are specifically located directly downgradient of DP-1 and DP-2.

The boring/monitoring wells will be drilled using a truck-mounted, hollow-stem auger rig. Upon completion of the borehole, a 4-inch diameter schedule 40 PVC slot casing with a 10-foot long, 0.020

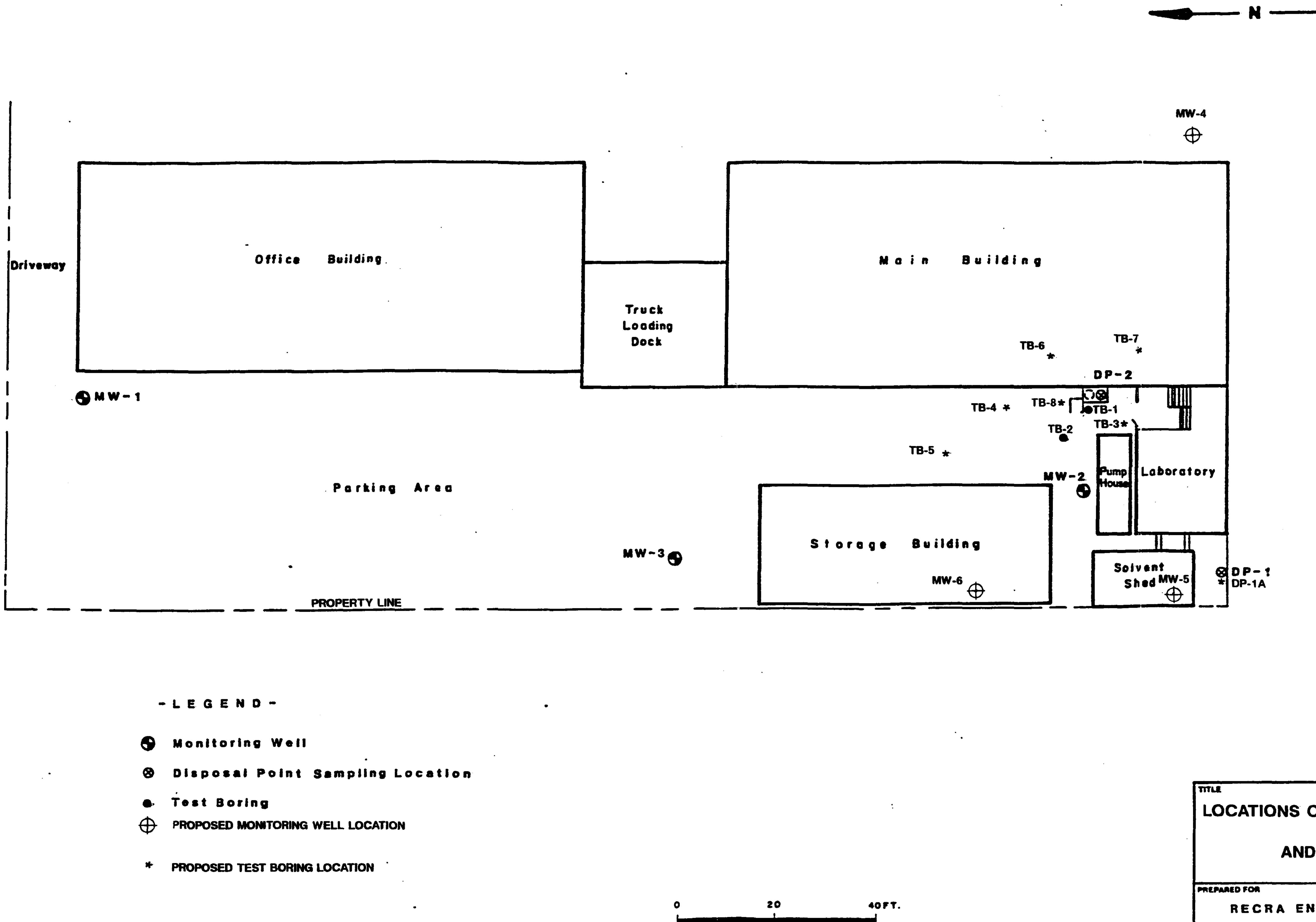
slot screen will be installed through the auger flights. Soil samples from MW-4, MW-5 and MW-6 borings will be collected at the surface and at 5' intervals. All soil samples will be maintained for chemical analysis and/or archiving and future analysis if warranted. The top of the screen will be set two to five feet above the water table to allow for seasonal water-level fluctuations. When the screen and casing are in place, a clean, graded silica sand will be used to pack the annular space around the screen.

Following the emplacement of the sand pack, two feet of bentonite pellets will be placed over the filter pack to seal the annular space. The remainder of the annular space will then be grouted with a cement/bentonite slurry to two feet below grade. Well construction details are shown on Figure 3-2. All wells will be finished flush with grade, have locking caps installed, and protective meter boxes cemented in place over each well (Figure 3-3). NYSDEC guidelines will be followed for all steps of well drilling and construction.

Upon completion, each well will be developed by surging and pumping to remove any fine sediment from around the screen zone and to establish a connection between the aquifer and well. Development will continue until the water is less than 50 nephelometric turbidity units, as required by NYSDEC and both pH and conductivity readings have stabilized.

The well elevations will be surveyed by a New York State Licensed Land Surveyor to the nearest 0.01 feet with a closure of ± 0.05

feet for the site. The measuring point elevation will be marked on each well casing and all water level measurements will be referenced to this point. All elevations and depth, including well casings, will be referenced to a common datum.



- LEGEND -

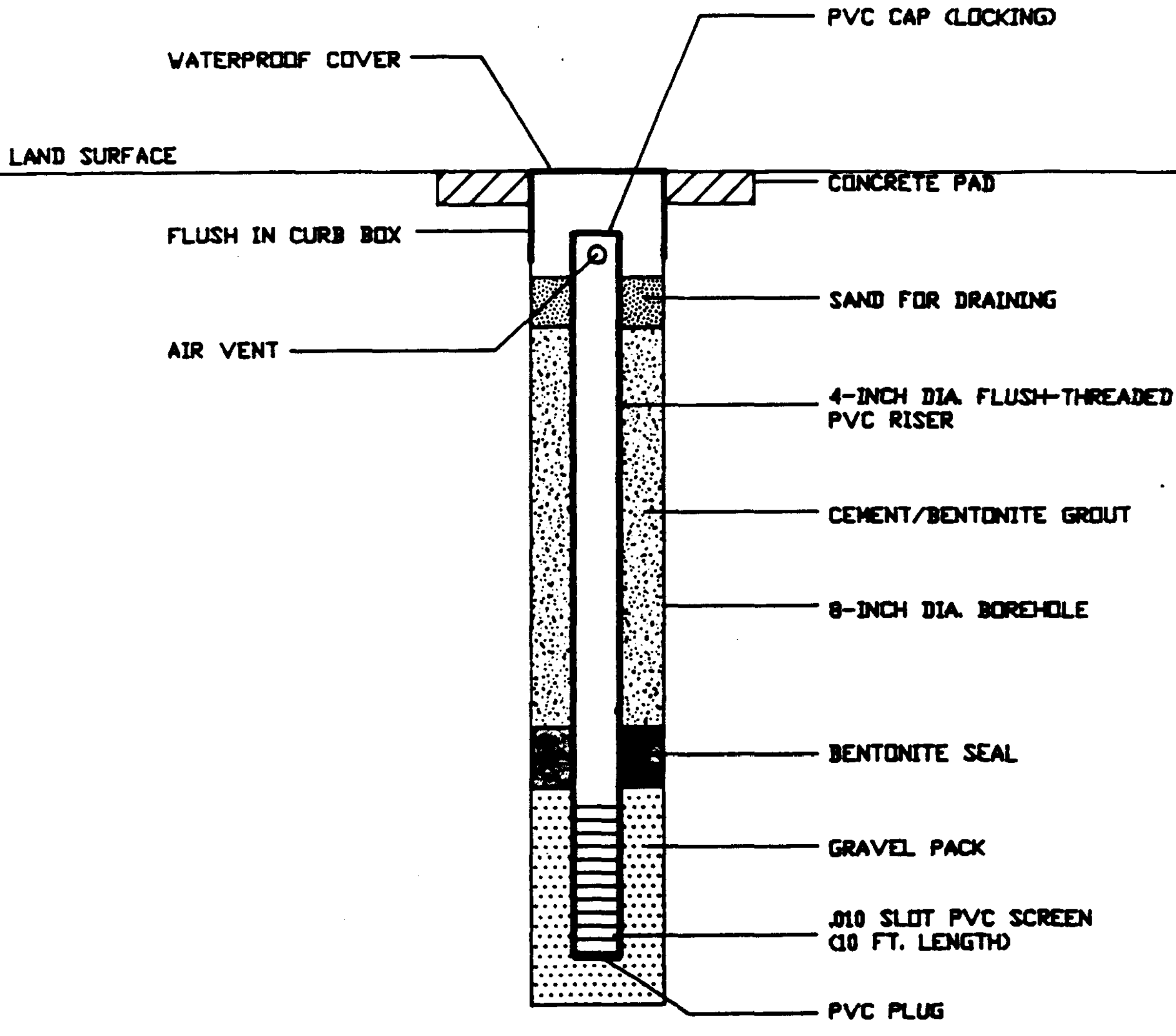
- Monitoring Well
- Disposal Point Sampling Location
- Test Boring
- PROPOSED MONITORING WELL LOCATION
- * PROPOSED TEST BORING LOCATION

TITLE
LOCATIONS OF MONITORING WELLS AND SOIL BORINGS

PREPARED FOR
RECRA ENVIRONMENTAL, INC.

ROUX Consulting Ground-Water Geologists ROUX ASSOCIATES INC

SCALE	DATE	FIGURE
SHOWN	7/89	3-1



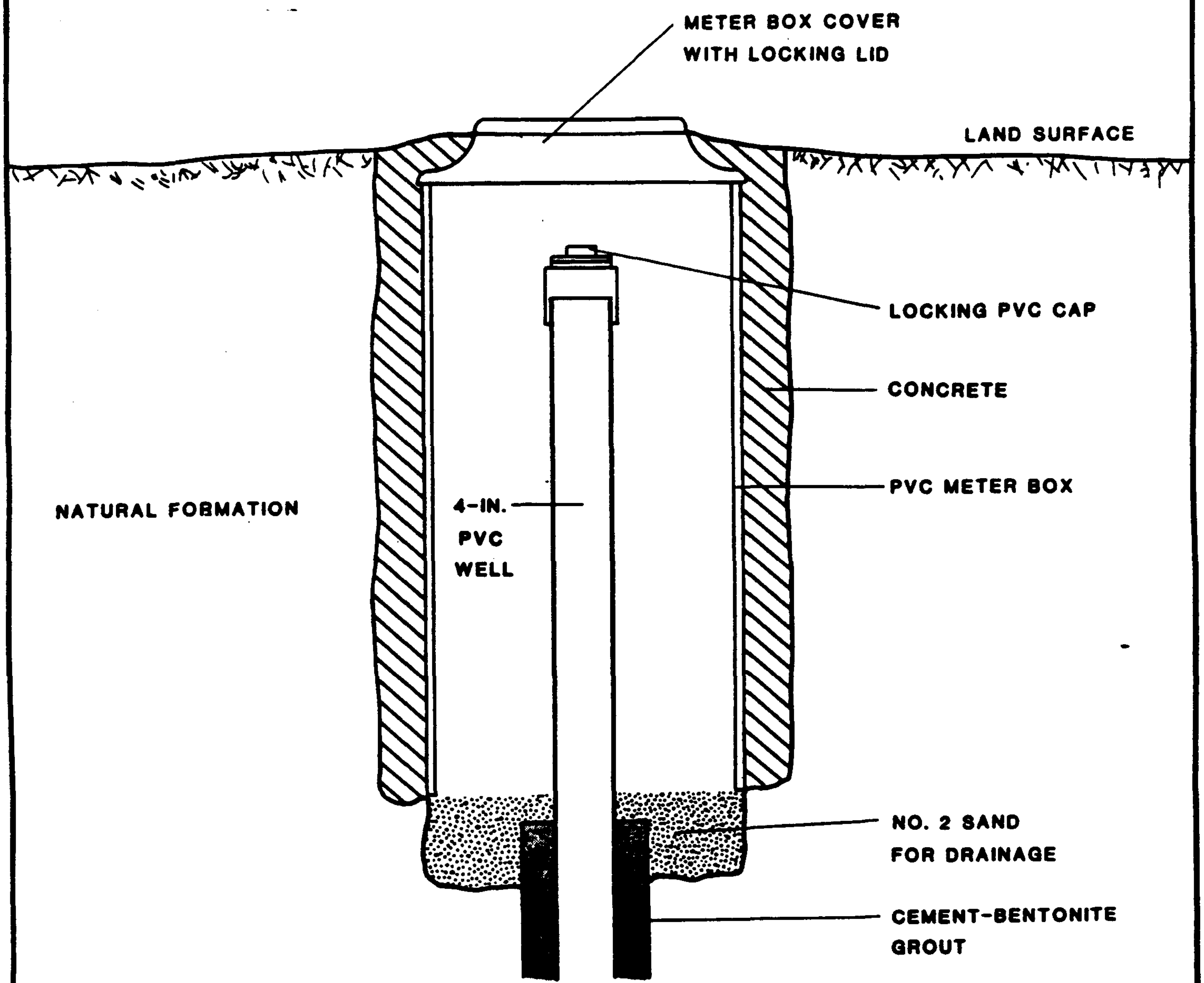
TITLE

WELL CONSTRUCTION DIAGRAM

PREPARED FOR

RECRA ENVIRONMENTAL INC.

ROUX Consulting Ground-Water Geologists ROUX ASSOCIATES INC	SCALE SHOWN	FIGURE
	DATE 7/89	3-2



TITLE

PROPOSED METER BOX CONFIGURATION FOR MONITORING WELLS

PREPARED FOR

RECRA ENVIRONMENTAL, INC.

ROUX Consulting Ground-Water Geologists ROUX ASSOCIATES INC

SCALE NONE | DATE 7 / 89 | FIGURE 3-3

Task II - Drilling of Soil Borings

Seven soil borings (TB-3 through TB-8 and DP-1A) will be drilled adjacent to the two possible contamination source areas labeled DP-1 and DP-2 on Figure 3-1. The boring locations are also shown on Figure 3-1. Illustrated locations for TB-3 through TB-8 are approximate and will ultimately be located in the field dependent upon field conditions and the needs of the program in order to delineate, to the greatest extent possible, the extent of contamination. Field conditions may warrant the installation of additional borings, but no fewer than the seven proposed soil borings will be completed without the approval of the NYSDEC. These borings are in addition to the four borings previously drilled at the site (TB-1, TB-2, DP-1 and DP-2). Two of the new borings (TB-6 and TB-7) will be drilled inside the main building. Drilling will be accomplished using a truck-mounted or skid-mounted hollow stem auger rig. Split-spoon soil samples will be collected continuously to a depth of 20' from land surface and at five-foot intervals thereafter to the bottom of the borings. All borings will extend to 10 feet below the water table. Boring DP-1A, however, will not be sampled for the first 35 feet since this interval has already been sampled as DP-1, completed during the source investigation program.

For the two borings inside the building, a skid mounted hollow stem auger will be used. Several doors and door frames will be removed and the auger will be skidded into the room where the borings are to be drilled. Since the skid mounted rig is lower than a truck mounted rig, there will be enough clearance to get the mast up inside the building. When the rig is set up, holes will be cut into the concrete floor and drilling and sampling will proceed the same as for the outside borings.

Prior to collection of each soil sample, all sampling equipment will be thoroughly pre-cleaned according to standard decontamination protocols (Appendix F).

Once the sample is collected it will be placed on a clean plastic sheet and logged in detail by the geologist. Using disposable vinyl gloves and pre-cleaned stainless steel spoons, the sample will be placed in the appropriate, laboratory supplied, pre-cleaned containers. The sample containers will then be labeled with the following information:

a. Name of person(s) collecting soil sample

b. Type of sample

c. Sample location and depth

d. Time and date of sample collection

e. Sample designation

Samples will then be placed on ice to maintain a temperature of 4°C. A chain-of-custody form will be completed for each sample collected. At the end of each day, the samples will be shipped to the laboratory by overnight delivery for subsequent analysis.

Soil sampling protocols are given in Appendix G. Sample selection for analysis, constituents to be analyzed for, and methods to be used are discussed in section 3.1.2 of this plan.

To prevent cross contamination, the split spoon samples will be washed with soap and water and steam cleaned between each use. The auger flights will be steam cleaned between holes.

Task III - Collection of Groundwater Samples

Prior to sampling of the new installed wells, monitoring well development consistent with the procedures presented in Appendix H will be completed. After a minimum of one week after completion of well development activities, groundwater sampling will commence.

The wells will be purged of a minimum of three casing volumes of water prior to sampling. Purging will be done with a submersible pump for the 4-inch diameter wells and with a bailer for the 2-inch diameter wells. Prior to purging, a water-level measurement will be made to the nearest 0.01 ft. using a steel tape. The volume of water in the well is then calculated based on the measured depth to water and the depth of the well from the well construction data.

All purging equipment - bailer, pump, polypropylene rope, hose, wire and tripod or reel - are cleaned with municipal water in a clean, paved area away from the monitoring wells. All purging equipment will be mounted on tripods or reels to prevent equipment from contacting the ground. The inside of the pump and hose are rinsed by pumping municipal water from a clean, 50 gallon plastic container for at least 2 minutes.

The purging equipment is then transferred to the well site in a manner that prevents the equipment from contacting any surface not cleaned and rinsed.

The pump is started and run at a known pumping rate (measured during purging of the first well) until 3 well casing volumes have been removed.

The pump is slowly raised while running until the pump breaks suction. This ensures that the entire water column is purged. Well purging protocols are given in Appendix I.

After purging, the well will be sampled with a pre-cleaned Teflon or stainless steel bailer and the sample placed in a laboratory supplied sample bottle. Prior to sampling, the well is identified and pertinent information is entered in the field notebook and on a sampling form. The top of the well is cleaned with a clean cloth and the cap or plug removed. The depth to water is measured using a pre-cleaned electric probe or steel tape.

The bottles are prepared for receiving their samples as follows: label the bottle with location number, other pertinent information and place on ice; record all information on the sampling data form (Appendix I).

A Teflon or stainless steel bailer is used to collect the groundwater sample. The bailer will have been thoroughly pre-cleaned following protocols in Appendix F. Prior to lowering the bailer in the well, it is rinsed three times with distilled water. In addition, the first three bailer volumes obtained from the well are discarded. Non-absorbent polyethylene cord is used to lower the bailer into the well. This cord is discarded after use in the well.

The bailer is lowered into the well and allowed to fill as it sinks through the water column. The sample is transferred from the bailer to the pre-labeled bottle, the bottle sealed and placed immediately on ice. The samples are kept in a secure area during the sampling program and forwarded to the laboratory within 24 hours, maintaining strict chain-of-custody.

After the sample is collected, the temperature, conductivity, pH, and the physical appearance of the water are measured and recorded. After sampling, the well cap and cover are replaced on the well and locked.

All the wells will be sampled immediately after being appropriately purged. All wells will be resampled approximately one month after the first sampling for confirmation of the first round findings for metals and as an initial element of on-going monitoring activities.

Groundwater samples will be analyzed by Recra Environmental. Analytical parameters and methods are described in a subsequent section of this work plan.

Task IV - Determination of Groundwater Flow

This task consists of two parts: 1) measurement of water levels; and 2) measurement of hydraulic conductivity. As previously discussed, the elevations of all wells will be determined by a licensed surveyor. Water levels in the wells will be measured by Roux Associates on at least three separate occasions during well development. Water-level measurements will be made with a steel tape and chalk to the nearest 0.01 foot. All wells will be measured within one hour. Water-level elevations will be plotted on a base map and water-table contours will be developed to determine the horizontal direction of groundwater flow.

To determine hydraulic conductivity of the aquifer, short term specific capacity tests will be conducted in the three new wells. These tests provide semi-quantitative data which is adequate for flow velocity determination. Prior to running the test, the water levels in the pumping well and any nearby wells are measured before the pump is inserted in the well. After the pump is inserted in the well, a period of five minutes is allowed for the water level to equilibrate. The new water levels in the pumping well and other wells are then measured.

The pump is started and run for 30 minutes at a constant rate. The pumping rate selected will be based on estimates of well yield made during well development and purging. Water levels are recorded on a predetermined time schedule.

Throughout the test any changes pertinent to the test are noted. Such changes may include water color or turbidity; time and nature of any discharge fluctuations; time and length of any temporary pump shutdown; effects of any nearby pumping wells; and precipitation events.

At the end of the drawdown test, recovery levels are measured until water levels return as close as possible to pre-test levels. The drawdown schedule for water-level measurements will be followed during recovery. Protocols for the pumping test are given in Appendix J. Based on the hydraulic conductivity calculated from these tests and the water-table gradients calculated from the contour maps, the approximate rate of groundwater flow can be determined.

3.1.2 ANALYTICAL SAMPLING AND ANALYSIS PLAN

3.1.2.1 Sampling Plan

Previous sampling and analysis of subsurface soils and groundwaters have been conducted at the Deknatel site for a characterization of site conditions. Specifically, these include three monitoring wells (MW-1, 2, and 3) and borings TB-1, TB-2, DP-1, and DP-2 (Figure 3-1). A discussion of the sampling plan and analytical parameters used has been presented previously in this report (section 2.2.2).

The present supplemental remedial investigation will focus on expanding the existing data base and will consist of a site-specific sampling plan accompanied by laboratory analyses for total and hexavalent chromium. The location of the borings is illustrated on Figure 3-1. At the conclusion of the field investigation, a total of ten borings will have been advanced. Three of these (MW-4, 5 and 6) will be converted to groundwater monitoring wells. Based on the findings of previous hydrological studies, MW-4 will be advanced and later installed as an upgradient monitoring well. Conversely, MW-5 and MW-6 will serve as downgradient wells.

Six test borings (TB-3 thru TB-8) will be installed in order to better define the contaminant distribution both horizontally and vertically. Test boring DP-1A will be a continuation of a previous boring (DP-1) that penetrated a disposal point and was terminated at approximately 35 feet below ground surface. The sampling protocol for the boring program is summarized in Table 3-1.

3.1.2.2 Analysis Plan

All samples will be analyzed at Recra's Laboratories in Tonawanda, New York. All soil samples as identified in Table 3-1 will be analyzed for total and hexavalent chromium. At the conclusion of the monitoring well installation program, the three previously installed wells plus monitoring wells MW-4, 5 and 6 will be sampled and analyzed. Laboratory analysis will consist of the Target Compound List (TCL) inorganics and organics by New York State Contract Laboratory Protocol (CLP) plus hexavalent chromium. This sampling program is designed to characterize the existing groundwater conditions at the site.

Subsequently, the six monitoring wells will be analyzed for total and hexavalent chromium, total lead, and phosphate phosphorus on a quarterly basis for a period of one (1) year.

TABLE 3-1

Sampling and Analysis of Soils

ID	Split Spoon Interval	Sampling Protocol	Analytical Parameters	Analytical Interval
MW-4 MW-5 MW-6	surface to 10' into water table	every 5'	Total and hexavalent chromium	surface and every 10' thereafter
TB-3 TB-6 TB-7 TB-8	surface to 10' into water table	continuous to 20' 5' thereafter	Total and hexavalent chromium	every 5'to 30' every 10' thereafter
DP-1A	35' to 10' into water table	every 5'	Total and hexavalent chromium	every 5' to 40' every 10' thereafter
TB-4 TB-5	surface to 10' into water table	continuous to 20' 5' thereafter	Total and hexavalent chromium	every 5' to 30' every 10' thereafter

3.1.3 Quality Assurance/Quality Control Plan

The activities to be conducted as an element of the integrated RI/FS program will each require a measure of quality control and assurance. Elements of the plan yet to be submitted will include the project organization structure, liaisons with the NYSDEC and Deknatel, as well as the development of the mechanisms to insure appropriate quality assurance in field as well as laboratory activities. Many of the elements of the overall QA/QC plan are presented in the appended Manual of Quality Control and Quality Assurance which forms Recra Environmental, Inc.'s general policy in this regard. (Appendix C)

All samples will be collected, handled, and transported consistent with the protocols consistent with EPA 540/6-89/004 OSWER Directive 9355.3-01, October 1988. Samples will be delivered to the laboratories of Recra Environmental, Inc. for analysis and will be completed in compliance with US EPA methodologies and/or NYS 1987 Contract Laboratory Protocols.

3.1.4 Health and Safety Plan

A site-specific document will be submitted after NYSDEC approval of the supplemental RI/FS workplan document. This document/plan will address the following:

- o Hazard evaluation
- o Delineation of authorized personnel
- o Medical surveillance
- o Training

- Personal protection
- Decontamination
- Safety monitoring procedures
- Emergency information
- Contingency plan

This document will be made site-specific for use during this investigation at the Deknatel facility.

3.1.5 Community Relations Plan

Given the nature of the activities to be performed during the Supplemental Remedial Investigation/Feasibility Study, the community relations measures to be undertaken during this phase of work at the property are believed to be minimal. The NYSDEC and Deknatel will both play active roles in implementing community relations measures should such activities be required. Communications with the Jamaica Water Supply Company, the potable water supplier in the vicinity of the Deknatel property, will continue throughout the completion of the Supplemental Investigation/Feasibility Study.

3.2 FEASIBILITY STUDY

3.2.1 Remedial Action Objectives

The first section of the Feasibility Study (FS) will define and describe the portion of the site which is being addressed. This determination will be based in part, upon data provided in the Supplemental Remedial Investigation (SRI) Report. Utilizing these data, site-specific objectives for remedial action will be developed. These remedial action objectives will address the human health risk, environmental impacts, and exposure pathways of concern.

3.2.2 Identification and Screening of Remedial Technologies

Following a description of the current situation and development of remedial action objectives, the FS will use a rational screening process that will lead to selection of appropriate remedial action(s) for the DP-1 and DP-2 areas of the site. Based upon the known site conditions, pathways of exposure, and remedial action objectives, the potentially feasible technologies will be identified. The first step in this process is to identify appropriate general response actions that present a coordinated remedy for the site. Table 3-2 presents a matrix of general response actions that may be considered. A final determination on those actions will be based upon data developed in the SRI regarding site conditions, waste characteristics and migration pathways.

Based upon the determination of the potentially applicable general response actions, the next step in the FS process will be to identify feasible technologies associated with each of these general response actions. Potential remedial technologies that may be associated with each of the applicable general response actions may include, but are not limited to, those listed on Table 3-3.

Next in the evaluation of remedial technologies will be the screening of the initial list of the technologies. The screening will eliminate those technologies that are clearly inapplicable or not feasible as a component for a remedy. This screening will be based on site conditions, waste characteristics and technical criteria for remediation. Characterization of site conditions will be based on SRI data, and groundwater and soil characteristics. Criteria will include effectiveness, implementability, and cost, and the status of the technical development of the remedial technologies.

To aid in the evaluation and selection of technologies for the remediation of soils and ground water, a limited scope of treatability studies may be conducted as part of the FS (See Section 3.2.5).

TABLE 3-2

REMEDIAL RESPONSE ACTIONS
SITES WITH SOIL AND/OR GROUNDWATER CONTAMINANTS

RESPONSE ACTIONS	SOIL	GROUNDWATER
No Action	x	x
Containment	x	x
Groundwater Recovery		x
In-Situ Treatment	x	
Partial Removal	x	
Complete Removal	x	
On-Site Treatment	x	x
Off-Site Treatment	x	x
On-Site Disposal	x	x
Off-Site Disposal	x	x

TABLE 3-3

POSSIBLE REMEDIAL TECHNOLOGIES ASSOCIATED WITH GENERAL RESPONSE ACTIONS FOR THE SITE

1. No Action or Limited No Action

2. Containment

   a. Capping
   b. Barrier Walls

3. Groundwater Recovery

   a. Pumping Wells

4. On-Site Treatment of Groundwater

   a. Chemical Precipitation and Reinjection

5. Off-Site Treatment of Groundwater via Treatment by a Publicly-Owned Treatment Works (POTW)

6. In-Site Treatment of Soils

   a. Stabilization/Solidification via Auger Mixing
   b. Stabilization/Solidification via Injection Grouting
   c. Contaminant Removal/Reduction via Flushing
   d. Vitrification

7. Partial Soil Removal

   a. Excavation with Full or Partial Building Demolition
   b. Excavation with Foundation Underpinning
   c. Excavation with No Foundation Effect

8. Complete Soil Removal (to Groundwater Table)

   a. Excavation with Full Building Demolition

9. On-Site Treatment of Soils

   a. Stabilization/Solidification
   b. Contaminant Removal/Reduction via Flushing

10. Off-Site Treatment of Soils

    a. Contaminant Removal/Reduction via Flushing
    b. Solidification/Stabilization

11. Off-Site Disposal of Soils

    a. Direct Land Burial
    b. Pretreatment and Disposal in a Landfill

3.2.3 Development of Remedial Alternatives

Remedial technologies that have passed through the previous screening process will be combined, as necessary, into remedial alternatives. Therefore, combinations of different treatment technologies and combinations of treatment and containment technologies may be developed in this phase.

In the development of the remedial alternatives, the following types of alternatives will be developed to the extent practicable.

- A number of treatment alternatives ranging from one that would eliminate or minimize to the extent feasible the need for long-term management (including monitoring) at the site to one that would use treatment as a primary component of an alternative to address the principal threats at the site. Alternatives within this range typically will differ in the type and extent of treatment used and the management requirements of treatment residuals or untreated wastes.

- One or more alternatives that involve containment of waste with little or no treatment but protect human health and the environment by preventing potential exposure and/or reducing the mobility of contaminants.

- A no-action alternative or a limited no-action alternative, which may include some minimal actions such as fencing, using institutional controls, or monitoring, if no action at all is clearly not viable.

Based upon the data and information developed, as well as the preliminary technology screening, remedial alternatives will be developed for further evaluation. For the final evaluation of alternatives, remedial technologies for each of the various media requiring remediation will be combined so that all media identified to be addressed in this FS are evaluated in the detailed analysis phase. If no technologies can be identified which are feasible for remediating one of the types of media, the FS could conceivably result in the recommendation of an alternative which remediates most but not all of the media.

3.2.4 Screening of Remedial Alternatives

The phase will initially evaluate the remedial alternatives previously developed. This phase is an interim screening process prior to the detailed evaluation of the alterntives.

The screening to be performed during this phase will evaluate effectiveness in protecting human health and the environment, technical and administrative feasibility, and costs of the remedial alternatives.

The evaluation of effectiveness in protecting human health and the environment offered by each alternative will consider the protectiveness that the alternative will provide, and the reductions in toxicity, mobility or volume that the alternative will achieve. A qualitative assessment of protectiveness may be performed for each of the alternatives as part of this evaluation. Those alternatives which are unacceptable in providing effective protection of human health and the environment will be eliminated from further consideration.

Those alternatives that do satisfy the environmental objectives without causing unacceptable effects will then be evaluated with regard to their technical feasibility. This evaluation may rely upon the results of treatability testing, technology evaluation as reported in engineering and scientific literature, engineering calculations, past experience and other acceptable means. Those alternatives which rely upon a technology that is difficult to implement, or which have a probability of failure or which pose an unacceptable risk to human health and/or the environment, will be eliminated.

Only those alternatives that satisfy the environmental and technical criteria will be subjected to a cost analysis. The purpose of considering costs at this time will be to eliminate those alternatives whose costs are significantly higher than others, unless significant and necessary environmental, public health or reliability benefits are realized by this additional cost.

Preliminary cost estimates will be developed with an accuracy range of -30% to +50%. The cost estimates will be based upon block flow diagrams, treatment volumes or flow rates, and other appropriate information developed for each alternative. From this information, cost estimates that rely upon standard cost indices, cost estimates from similar projects, and other readily available information will be developed. Where such information is not readily available for an alternative, as may be the case for an innovative technology, costs will be conservatively developed using best engineering judgment.

Estimates will be developed for capital and operating and maintenance costs of each alternative. These estimates will then be utilized to develop the present worth of the competing alternatives. The costs will then be compared. Alternatives that are significantly more expensive than their competing alternatives will be eliminated if they offer similar or fewer environmental, public health, or reliability benefits. Competing alternatives that are significantly more expensive but offer substantially greater and necessary environmental, public health, or reliability benefits will be eliminated.

Those alternative remedial actions which remain will then be subjected to a more comprehensive comparative analysis.

3.2.5 Treatability Studies

A number of information sources, including journal articles and vendor literature, will be used to evaluate remedial technologies. While sufficient information is available to evaluate a number of remediation technologies, there are certain technologies for which available information may not be adequate to complete their evaluation without treatability testing.

3.2.6 Detailed Analysis of Remedial Alternatives

Each remedial alternative that passes the initial screening will be individually evaluated based upon:

- Short-term effectiveness
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, and volume
- Implementability
- Cost
- Compliance with ARARs
- Overall protection of human health and the environment
- Community Acceptance

The above evaluation criteria are defined in terms of specific factors and effects which allow for comparisons between alternatives and identify the relative strengths and weaknesses of each by comparison. The evaluation criteria are defined and presented below for this feasibility study.

3.2.6.1 Short-Term Effectiveness

Each alternative will be addressed in terms of the extent to which it can mitigate short-term exposures to on-site chemicals during remedial actions and until cleanup goals are achieved. This evaluation will focus on:

- the degree to which existing site risks are reduced; possible short-duration risks borne by the cleanup workers and the nearby community, or possible adverse effects on segments of the environment during implementation of a remedial alternative, including potential risks associated with excavation, transport, storage, and treatment/disposal

- of site media;

- the duration of the remedial action required to reduce site risks to human health and the environment to acceptable levels.

3.2.6.2 Long-Term Effectiveness and Permanence

Each alternative will be assessed on its effectiveness in minimizing or reducing long-term exposure to any residual material associated with the site. This evaluation will focus on:

- the magnitude of risk posed by residual material remaining after implementation and completion of a remedial action;

- the type and degree of long-term site management required, including monitoring, operation and maintenance, and site security;

- the long-term reliability of proposed technical and institutional controls on the movement and migration of waste residuals, on the potential for recontamination of remediated site media from off-site sources and phased cleanup efforts.

3.2.6.3 Reduction of Toxicity, Mobility and Volume

Each alternative will be evaluated to determine the extent to which it can reduce the volume or area, minimize or prevent migration, and reduce the toxicity of site materials. This evaluation will focus on:

- the treatment processes to be employed and the wastes/media that are to be treated;

- the degree of treatment provided in terms of amounts destroyed and/or permanently altered;

- the permanence of a treatment process, considering the potential for future mobility or toxicity effects of treated materials;

- the residuals remaining after treatment, considering their persistence, toxicity, mobility, volume and tendency to bioaccumulate.

3.2.6.4 Implementability

This evaluation will focus on the possibilities of off-site treatment/disposal, the constructability and installation of alternatives on-site, and the time required to remediate or complete the cleanup action. It will address issues concerning on-site/off-site placement, equipment availability and limitations, time to complete performance tests, construction duration, and time to operate. The following factors will be considered:

- degree of difficulty associated with constructing and/or installing/arranging the remedy;

- expected operational reliability and control of the remedy;

- need to coordinate and obtain necessary regulatory appro-

- vals and permits to design, conduct/construct and operate a proposed remedy;
- availability of necessary facilities, equipment, chemicals and specialists for a particular treatment measure;
- the relative ease for undertaking additional remedial actions for achieving a cleanup objective;
- ability to monitor the effectiveness of a remedy in operation and the residual content following completion of remedial action.

3.2.6.5 Cost

The evaluation of costs for the alternatives will focus on the following:

- capital costs;
- operation and maintenance (O&M) costs;
- net present worth of capital and O&M costs; and
- potential future remedial action costs.

These estimates will have a target accuracy of -30 to +50 percent.

Consistent with conventional cost estimating practices, separate estimates will be prepared for capital, and operation and maintenance costs. Capital costs include direct costs associated with the following:

- construction, labor, equipment and materials,

- process equipment,
- site development,
- control building, utilities, and services,
- relocation/evacuation, and
- disposal of wastes, including transportation.

Capital costs also include indirect costs associated with the following:

- engineering expenses for administration, design, construction supervision, drafting, and testing of remedial alternatives;
- legal fees, licensing, and permit costs;
- start-up costs; and
- contingency allowances to account for unforeseen circumstances such as adverse weather conditions, labor problems, or new site information that affects the schedule for implementation.

Operation and maintenance costs are the costs that ensue after construction to carry out the remedial action. These costs include the following:

- operating labor costs, including wages, salaries, training, overhead and fringe benefits;
- maintenance materials, labor, and equipment;
- auxiliary materials and energy such as chemicals, fuel, water and sewer service, etc.;
- purchased services for sampling and analytical requirements

- and professional service;
- administrative costs;
- insurance, taxes, and licensing costs such as permit renewal and reporting costs;
- rehabilitation costs for maintenance equipment and/or structures; and
- other costs.

Cost information will be obtained from vendor estimates, from costs calculated for similar alternatives considered for other sites, from EPA costing documents, and from standard cost estimating guides such as the "Means Guide" and "Dodge Guide". Costs for innovative technologies will be based on best engineering judgement when other cost information is not available.

The present-worth analysis will be developed using the current EPA-based discount rate of 5 percent. The period of performance used in the analysis will depend on the individual remedial alternatives.

Where applicable, the necessity of replacing the selected remedial alternative will be evaluated.

3.2.6.6 Compliance with ARARs

An evaluation will be conducted to determine the potential for each alternative to attain legally applicable or relevant and appropriate requirements (ARARs) of Federal and State environmental and public health laws. The basis of the evaluation will include whether chemical-, location- or action-specific ARARs can be met or closely met by the alternative under consideration.

Although ARARs will be used as a goal for remediation of the site, consideration will be given to the circumstances in which ARARs may be waived. The waivers provided by CERCLA (121)(d)(4)(A) are.

i. The remedial action selected is only part of a total remedial action that will attain such levels or standard of control when completed.

ii. Compliance with such requirement at the facility will result in greater risk to human health and the environment than alternative options.

iii. Compliance with such requirements is technically impracticable from an engineering perspective.

iv. The remedial action selected will attain a standard of performance that is equivalent to that required under the otherwise applicable standard, requirement, criteria or limitation through use of another method or approach.

v. With respect to a State standard, requirement, criteria or limitation, the State has not consistently applied (or demonstrated the intention to consistently apply) the standard requirement, criteria, or limitation in similar circumstances at other remedial actions.

3.2.6.7 Overall Protection of Human Health and the Environment

Alternatives for remediation of soils and ground water that have been retained through the screening process will be assessed as to whether they will provide adequate protection of human health and the environment. Exposure to remediated site soils as well as the potential for migration of residual contaminants from the remediated soils will be considered in this assessment.

3.2.6.8 Community Acceptance

The assessment will incorporate the anticipated acceptability to the general public into the analysis of alternatives.

3.2.7 Preliminary Report

A Preliminary FS Report that recommends appropriate remedial measure(s) will be provided to NYSDEC for review.

This report will be formatted as follows. Technologies to be evaluated for use at the site will each be evaluated individually against the requirements described in Section 3.2.2 of this Work Plan. An end-of-section summary indicating which technologies have been retained or discarded will be provided. Preliminary screening of alternatives and/or combinations of the alternatives derived from the retained technologies, will be performed using the criteria given in Section 3.2.4. An end-of-summary for this evaluation will also be provided. An evaluation of the retained alternatives in combinations will be conducted against the nine evaluation criteria discussed in

Section 3.2.6 of this Plan. A summary of this evaluation will be provided in a separate subsection following the detailed evaluation of alternatives. This summary would include tabulated results of the detailed evaluation and would also contain, if appropriate, a discussion of trade-offs among similar alternatives. This summary section will be organized to permit comparison of each alternative against others for all nine criteria described in Section 3.2.6.

3.2.8 Final Report

Upon receipt of written final NYSDEC comments on the Preliminary FS Report, the Report will be modified as may be appropriate to conform with such comments and submitted to NYSDEC for approval, and/or additional engineering evaluations as NYSDEC finds necessary may be initiated.

APPENDIX A

QUANTITATIVE WASTE MATERIAL DISPOSAL ESTIMATES

The Following Information is Included Herein:

Disposal Point #1
- Estimates for Nitric-Sulfuric Acid Baths Containing Copper Salts
- Estimates for Spent Chromium -Sulfuric Acid Baths Containing Copper Salts

Disposal Point #2
- Estimates for Chromic-Phosphoric Acid Electropolishing Bath

APPENDIX A

QUANTITATIVE WASTE DISPOSAL ESTIMATES

1.0 DISPOSAL POINT 1 (DP-1)

Nitric-Sulfuric Acid Baths Containing Copper Salts disposed in DP-1 from about 1925 to about 1956. Because of the complete absence of any records or employee recollections going back to this time period, it has proven impossible to make a quantitative estimate of the amount of this material that may have been disposed.

Spent Chromic-Sulfuric Acid Baths Containing Copper Salts disposed in DP-1 from about 1956 to about 1960. The material disposed from about 1956 to about 1960 is believed to be the same material that is in use today for stripping the copper sheathing from the surgical needles after they have been formed. The material presently in use for this purpose is manufactured by Patchin Chemical Company, Inc. A material safety data sheet for this material is included in Attachment A-1.

Pertinent physical and chemical properties of this material are as follows:

Chemical Composition

Chromic Acid	31.5%
Sulfuric Acid	3.5%
Water	65.0%
	100.0%

Density = 1.277 g/ml or 10.65 lbs/gal

No estimate of the typical copper concentration of this material at the time of disposal has been obtained.

The estimated quantity of chromium derived from this material which was disposed in DP-1 was calculated as follows:

$$\frac{\text{lbs chromium}}{\text{lb chromic acid}} \times \frac{\text{lbs chromic acid}}{\text{lb solution}} \times \frac{\text{lbs solution}}{\text{gal}} \times \frac{\text{gallons used}}{\text{year}} \times \text{est. years of disposal}$$

Substituting

$$\frac{0.552\ \text{lb}}{1\ \text{lb}} \times \frac{0.315\ \text{lb}}{1\ \text{lb}} \times \frac{10.65\ \text{lb}}{1\ \text{gal}} \times 120\ \text{gal/year} \times 4\ \text{years} =$$

669 lbs chromium

A similar calculation for sulfuric acid gives

$$\frac{0.035\ \text{lbs sulfuric acid}}{\text{lb solution}} \times \frac{10.65\ \text{lbs}}{\text{gal}} \times 120\ \text{gal/year} \times 4\ \text{years} =$$

179 lbs sulfuric acid

2.0 DISPOSAL POINT 2 (DP-2)

Spent Chromic-Phosphoric Acid Electropolishing Bath disposed in DP-2 from about 1956 until about 1980. The material of this description which was disposed in DP-2 is also believed to be the same material that is in use today and which is currently disposed off-site as a hazardous waste. A material safety data sheet which describes this material as a raw material and a typical analysis of it when it is disposed today as a waste material are included in Attachment A-1. Pertinent physical and chemical properties of this material as both a raw material and as a waste material are as follows:

Raw Material	Waste Material
Chromic Acid >15%	Chromium 86,700 mg/l
Phosphoric Acid >60%	
Proprietary Reagents	

The estimated quantity of chromium derived from this material which was disposed in DP-2 was calculated as follows:

$$\frac{\text{lbs chromium}}{\text{lb chromic acid}} \times \frac{\text{lbs chromic acid}}{\text{lb solution}} \times \frac{\text{lbs solution}}{\text{gal}} \times$$

$$\frac{\text{est. gal. disposed}}{\text{year}} \times \text{est. years of disposal}$$

Substituting

$$\frac{0.441\ \text{lb}}{1\ \text{lb}} \times \frac{0.17\ \text{lb}}{1\ \text{lb}} \times \frac{14.80\ \text{lb}}{1\ \text{gal}} \times \frac{60\ \text{gal}}{\text{year}} \times 25\ \text{years} =$$

1,664 lbs chromium

A similar calculation for phosphoric acid gives

$$\frac{0.60\ \text{lbs phosphoric acid}}{\text{lb solution}} \times \frac{14.80\ \text{lbs}}{\text{gal}} \times \frac{60\ \text{gals}}{\text{day}} \times 25\ \text{years} =$$

13,320 lbs phosphoric acid

Since phosphoric acid is 31.6% phosphorus, this quantity of phosphoric acid contains 4,213 lbs. phosphôrus.

APPENDIX B

HYDROGEOLOGICAL STUDIES

METHODOLOGIES AND RESULTS

SOURCE INVESTIGATION STUDY
DEKNATEL, INC.
QUEENS, NEW YORK

GEOLOGICAL AND HYDROGEOLOGICAL STUDIES

Prepared for
RECRA Environmental, Inc.
10 Hazelwood Drive, Suite 106
Amherst, New York 14150

April 1988

ROUX ASSOCIATES, INC.
11 Stewart Ave
Huntington, New York 11725

CONTENTS

ATTACHMENTS

FIGURES

Following Page

TABLES

1.0 INTRODUCTION

Roux Associates, Inc. of Huntington, New York was retained in December of 1987 by RECRA Environmental, Inc., Amherst, NY to conduct a test boring and monitoring well installation program at the Deknatel facility in Queens County, New York. The facility is located at 96-14 222nd St., Queens Village, NY between Hempstead Ave. and Jamaica Ave.

The objectives of the investigation were to assess the soil and ground-water conditions at the site to ultimately determine the horizontal and vertical extent of soil contamination, if present, and impacts on ground-water quality, if any.

This study included the drilling of four test borings and conversion of two of the borings to monitoring wells (Figure B-1). Split-spoon soil samples were collected continuously (every 2 feet) from land surface to 10 feet below the water table as the borings were advanced. These soil samples were screened in the field by RECRA chemists for the presence of hexavalent chromium and were then forwarded to the RECRA Environmental Laboratory, in Tonawanda, NY for formal analysis. Soil samples were also collected from one hole drilled with a portable tripod rig and one drilled with a hand auger at Disposal Points 1 and 2 respectively (Figure B-1), and these samples were also sent to the laboratory for analysis. The two monitoring wells installed for this investigation have been sampled on three separate occasions and water-quality results are discussed in this report along with the findings of the soils analysis. As part of a separate investigation carried on simultaneously with the source investigation, one four-inch diameter monitoring well (MW-3) was also installed.

This report provides a description of the methods of drilling, soil sampling, and monitoring well installation; a summary of the regional geology and hydrogeology of the site; and a description of the site specific hydrogeology.

2.0 METHODS OF INVESTIGATION

2.1 General Overview

A total of five soil borings were drilled, and three monitoring wells (including MW-3) installed in January, 1988 by Python Drilling, Inc. of the Bronx, New York. The drilling was done under the supervision of a hydrogeologist from Roux Associates. The locations of all monitoring wells and borings are shown on Figure B-1. Geologic logs are given in Attachment B-1.

The locations of the monitoring wells and borings were jointly selected by personnel from RECRA Environmental, Inc., Deknatel and Roux Associates, Inc. Prior to the start of the well drilling program the locations of the wells and test borings were finalized by a site visit by the above-mentioned personnel and NYSDEC.

A truck-mounted hollow stem auger rig was used to drill the borings and to collect split-spoon core barrel samples continuously from land surface to the bottom of the borings. The split-spoon samplers were driven two feet at a time ahead of the auger flights into undisturbed sediments by a standard 140 lb. hammer with a 30 inch fall. While the split-spoon samplers were being driven ahead of the auger flights, the number of blows by the hammer required to drive the sampler each six inches was noted and logged in the field book. Once the sample was collected, the split-spoon sampler was opened by the hydrogeologist examined in detail, paying particular attention to the presence of contamination (odor, texture, staining, etc.) and logged. Once the sample was logged, it was placed in a clean sample jar and screened in an on-site laboratory by RECRA chemists for the key indicator parameters, hexavalent chromium and pH. The samples were then forwarded to RECRA Environmental Laboratories in Tonawanda, NY for formal analysis.

After three to five split-spoon samples were collected, the hole was advanced five or ten feet with power driven, eight-inch diameter, hollow stem auger flights and the next round of samples were collected. To prevent dilution of any contaminants that might be present, water was not used in the hole during drilling. Cross-contamination of sediments within a hole was minimized as samples were collected ahead of the auger flights.

To avoid cross contamination, all split-spoon samplers were cleaned thoroughly between each use by washing with soap and water and a final potable water rinse.

2.2 Monitoring Well Installation

Upon completion of the soil boring a 10 foot long, 2-inch diameter, schedule 40 PVC, slotted (.020 slot) screen and an appropriate length of blank PVC riser pipe were installed within the hollow stem augers. A Number 2 uniformly graded silica sand was then tremied down the hole to pack the annular space around the screen zone and to at least 2-3 feet above it. Once the sand pack was in place, a two-foot thick, bentonite pellet seal was tremied in place on top of the sand pack and then hydrated. The remainder of the annular space was then grouted by tremie method with a cement/bentonite slurry ratio of 6:1 to two feet below land surface. The wells were completed at land surface by cementing in a 5-foot long, 4-inch diameter protective steel casing with locking cap. A curb box was cemented in over the steel casing. Well construction details are given on Table B-1 and Figures B-2A through B-2C are well completion diagrams for MW-1 through MW-3.

Borings in which monitoring wells were not installed were backfilled with a cement/bentonite slurry with a cement cap installed at land surface to seal off the borehole from potential surface- water runoff.

In addition to the soil borings drilled with the hollow stem auger rig, a portable tripod hole and a hand auger hole, one each, were advanced at Disposal Points 1 and 2 respectively (Figure B-1). These alternate subsurface sampling methods were used because it proved impossible to position an auger rig at these locations. The alternate methods were used to obtain as much information as possible on the subsurface conditions at these locations.

TABLE B-1

Well Construction Details

Deknatel Site

Well No.	Bottom of Boring(1)	Well Diameter (in.)	Bottom of Well (1)	Screen Zone (1)
MW-1	72.0	2	69.60	59.50-69.60
MW-2	72.0	2	69.55	59.45-69.55
MW-3	72.0	4	69.82	49.90-69.82

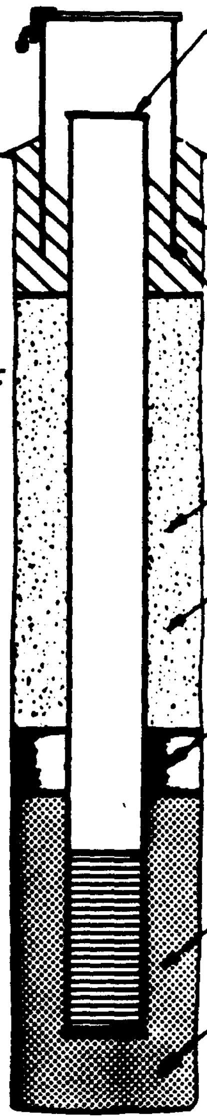
Note

(1) In feet below land surface.

WELL NO. MW-1

Study No. #09001

Date 3/16/88



Well Top Elevation 100.00
Relative To A Common Datum

Stick-Up Of Well Casing Below Grade

Cement Collar From 0.0' To 2

Depth Of
Protective Casing 2'

Backfill Type Bentonite/Grout

Backfill From 2' To 54'

Bentonite
Pellets From 54' To 57'

Sand Pack Material No.2

Sand Pack From 57' To 72'
NOTE: Formation Collapse 65'-72'

Date/Time Of
Construction 1/15/88

Drilling Method Hollow Stem Auger

Well Location 6.5 West And 1.5 South Northwest Corner of Office Building

Well Depth 69.60'

Borehole Diam. 8"

Casing Material PVC - 2" Diam.

Casing Length 59.5'

Screen Material PVC

Screen Slot Size .020"

Screen Length 10.1'

Sump Length .5

Depth To Ground Water
From Mark On Top Of
Well Casing 61.44'
(Date) 3/15/88

Development Method Bailer

Development Time 40 Gallons

NOTE: All Measurements Are In Feet Below Land Surface

TITLE: MONITORING WELL CONSTRUCTION DETAILS DEKNATEL, QUEENS, NY		
PREPARED FOR: RECRA ENVIRONMENTAL, INC.		
ROUX Consulting Ground-Water Geologists ROUX ASSOCIATES INC	SCALE None / DATE 3/88	FIGURE B-2A

WELL NO. MW-2

Study No. #09001

Date 3/16/88

Date/Time Of Construction 1/28/88

Drilling Method Hollow Stem Auger

Well Location 3.0' North and 10.7' West From N-E Corner of Pump House

Well Depth 69.55'

Borehole Diam. 8"

Casing Material PVC-2" Diam.

Casing Length 59.54'

Screen Material PVC

Screen Slot Size .020"

Screen Length 10.1'

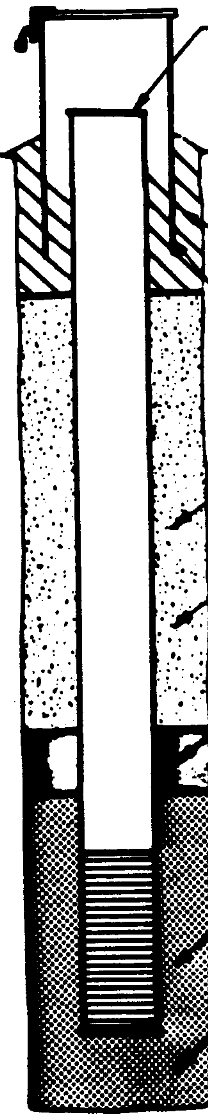
Sump Length .48'

Depth To Ground Water From Mark On Top Of Well Casing 60.91'

(Date) 3/15/88

Development Method Bailer

Development Time 40 Gallons



Well Top Elevation 99.68' Relative To A Common Datum

Stick-Up Of Well Casing Below Grade

Cement Collar From 0.0' To 2.0'

Depth Of Protective Casing 2.0'

Backfill Type Bentonite/Grout

Backfill From 51.5' To 54'

Bentonite Pellets From 51.5' To 54'

Sand Pack Material No.2

Sand Pack From 54' To 72'

NOTE: Formation Collapse 62'-72'

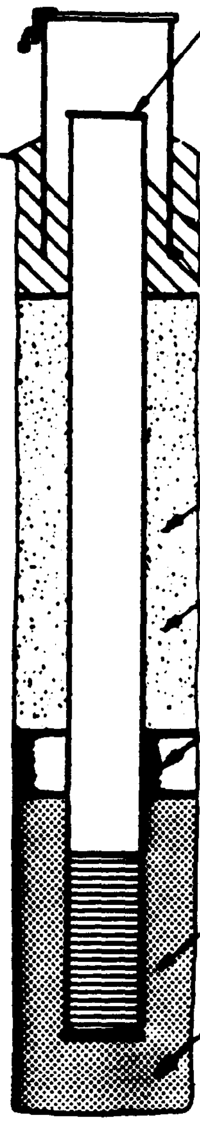
NOTE: All Measurements Are In Feet Below Land Surface

TITLE	MONITORING WELL CONSTRUCTION DETAILS DEKNATEL, QUEENS, NY	
PREPARED FOR	RECRA ENVIRONMENTAL, INC.	
ROUX Consulting Ground-Water Geologists ROUX ASSOCIATES INC	SCALE None; DATE 3/88	FIGURE B-2B

WELL NO. MW-3

Study No. #09002

Date 3/16/88



Well Top Elevation 99.79'
Relative To A Common Datum

Stick-Up Of Well Casing Below Grade

Date/Time Of Construction 1/28/88

Drilling Method Hollow-Stem Auger

Well Location 18' North of Storage Building 10.5' East of Fense

Well Depth 69.82'

Borehole Diam. 8"

Casing Material PVC-4" Diam.

Casing Length 49.90'

Screen Material PVC

Screen Slot Size .020"

Screen Length 19.92

Sump Length

Depth To Ground Water From Mark On Top Of Well Casing 61.24'
(Date) 3/15/88

Development Method Pumping

Development Time 900 Gallons

Cement Collar From 0.0' To 3'

Depth Of Protective Casing 3.0'

Backfill Type Bentonite/Grout

Backfill From 30' To 43'

Bentonite Pellets From 43' To 45'

Sand Pack Material No. 2

Sand Pack From 45' To 72'

NOTE: Formation Collapse 70'-72'

NOTE: All Measurements Are In Feet Below Land Surface

TITLE

MONITORING WELL CONSTRUCTION DETAILS DEKNATEL, QUEENS, NY

PREPARED FOR

RECRA ENVIRONMENTAL, INC.

ROUX Consulting Ground-Water Geologists ROUX ASSOCIATES INC

SCALE None | DATE 3 88 | FIGURE B-2C

The tripod boring at DP-1 was drilled by collecting continuous split-spoon samples to 35 feet below land surface where the hole collapsed and representative samples could no longer be collected. Soil samples were collected in the same manner as when using the hollow stem auger rig, and the split-spoon samplers were decontaminated between each use. At DP-2 a stainless-steel hand auger was used to bore down through the middle of the disposal point and collect soil samples for analysis. As the borehole was advanced each soil increment that was removed with the hand auger was carefully logged, noting specific soil characteristics, and was placed in a pre-cleaned laboratory supplied sample jar for later analysis.

To avoid cross contamination the hand auger and split spoons were decontaminated between each sample by a soap and water wash, potable water rinse, nitric acid wash, potable rinse, and final distilled water rinse.

After the samples were collected they were placed immediately on ice and shipped overnight to RECRA Environmental Inc. A Chain of Custody was maintained for each sample through receipt by the laboratory and subsequent analysis.

2.3 Well Development

After all monitoring wells were installed, MW-1 and MW-2 were developed with a sand bailer. Development of these wells was continued until relatively sediment-free water was obtained from the bailer discharge. This ensured that a good hydraulic connection had been created between the aquifer and the well, and that fine sediments from around the screen zone were removed. MW-3 was developed by removing 900 gallons with a submersible pump.

2.4 Surveying

After the well installation had been completed at all locations, a designated measuring point on each of the monitoring wells were surveyed by Roux Associates, Inc. The relative elevations of these points were established to an accuracy of ± 0.02 feet and the horizontal locations of all the wells and the borings were fixed with respect to existing landmarks near each location, using a 100-foot tape.

2.5 Water-Level Measurements

Water levels have been measured with an electronic water level detector on three occasions in the two monitoring wells installed for this study (MW-1 and 2) and also in MW-3 which was installed as part of a separate study. Table B-2 lists all the water-level monitoring results and Figure B-3 is a ground-water flow map compiled from these data.

TABLE B-2

WATER-LEVEL ELEVATIONS

Deknatel Site

Well No.	Date	Measuring Point (1)	Depth to Water (ft.)	Water-Table Elevation (1)
MW-1	2-11-88	100.00	61.67	38.33
MW-1	3-15-88	100.00	61.44	38.56
MW-1	3-25-88	100.00	60.91	39.09
MW-2	2-11-88	99.68	61.18	38.50
MW-2	3-15-88	99.68	60.91	38.77
MW-2	3-25-88	99.68	60.68	39.00
MW-3	2-11-88	99.79	61.27	38.52
MW-3	3-15-88	99.79	61.24	38.55
MW-3	3-25-88	99.79	60.96	38.83

(1) Elevation, in feet, Relative to Common Datum (MW-1)

2.6 Hydraulic Conductivity Testing

To determine the approximate ground-water flow rate and hydraulic conductivity of the aquifer at the site, a short-term specific capacity test was conducted on MW-3. MW-3 was pumped for 45 minutes using a submersible pump, and water levels were measured on a prescheduled basis. Protocols for the short-term pump test and for water-level measurement frequencies are given in Attachment B-2. In addition to monitoring water levels in the pumping well, wells MW-1 and MW-2 were also monitored to determine the influence of pumping beyond the immediate area of MW-3. All water-level measurements and pumping rates are given on the pump test forms in Attachment B-2. The results of the specific capacity test are discussed in Section 3.3 of this report.

2.7 Ground-Water Sampling

On 2/11/88, 3/15/88 and 3/21/88, monitoring wells MW-1 and MW-2 were sampled by Roux Associates, Inc. The wells were purged with a precleaned Teflon bailer to remove a minimum of three casing volumes. Detailed ground-water sampling protocols are given in Attachment B-3. Once the sample was collected it was placed in precleaned laboratory-supplied jars, packed on ice, and then shipped via overnight delivery to RECRA Environmental, Inc. Chain of Custody was maintained for each sample. All data gathered during the well sampling are given on the ground-water sampling data sheets in Attachment B-3.

As part of the QA/QC program, duplicates, bailer blanks, and field blanks were collected on all sampling events and delivered blind to the laboratory for analysis.

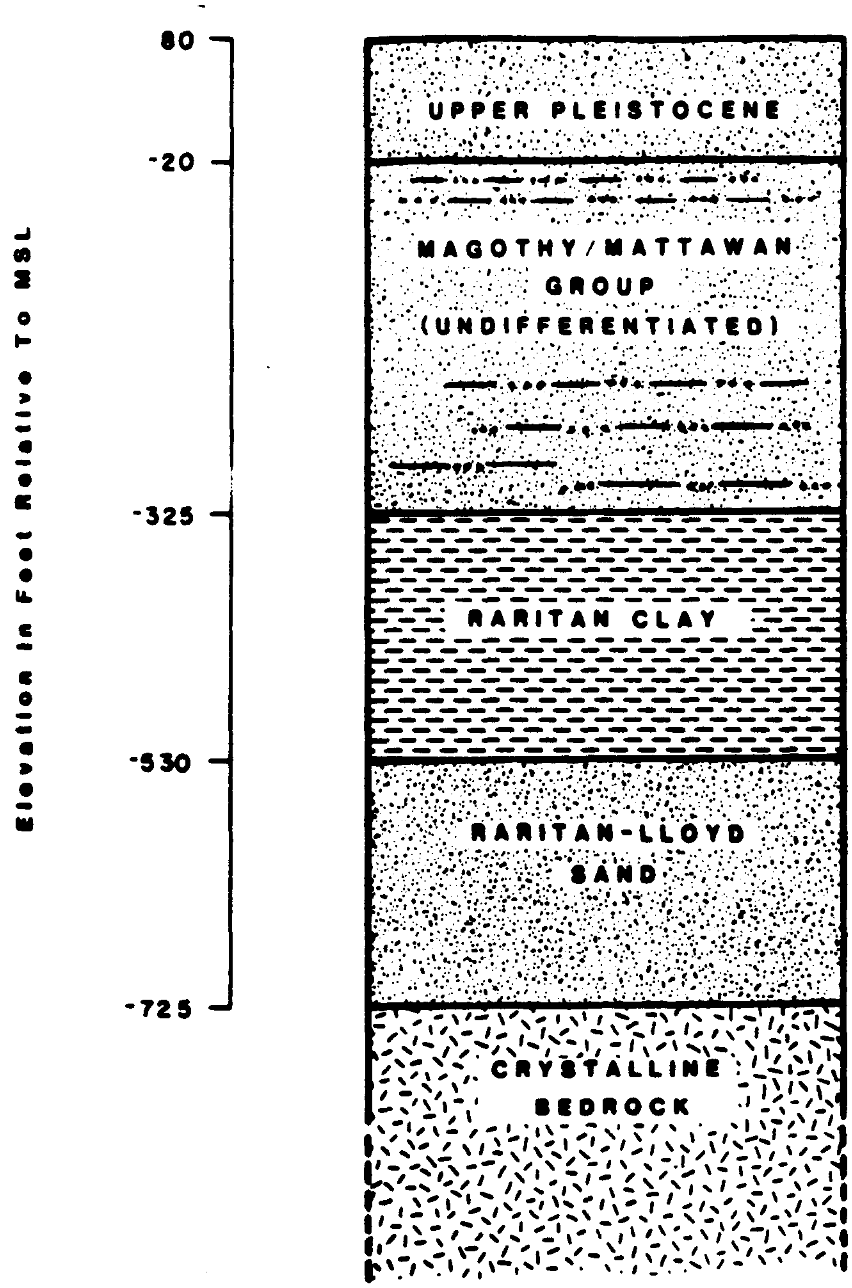
3.0 HYDROGEOLOGY

The Deknatel site is located in the Atlantic Coastal Plain Physiographic Province. This province is characterized by southeasterly-dipping strata comprised of unconsolidated sand, silt, clay and gravel unconformably overlying crystalline bedrock. The borings for this investigation were relatively shallow compared to the thickness of unconsolidated sediments at the site. The regional hydrogeology at the site will be presented first followed by the site-specific hydrogeology.

3.1 Hydrogeology Of The Study Area

The study area is underlain by over seven hundred feet of unconsolidated sediments (Figure B-4). From oldest (deepest) to youngest (shallowest) these sediments have been divided into a series of geologic formations: the Raritan Formation; the Magothy Formation and Mattawan Group, undifferentiated; and Pleistocene deposits. The Raritan and Magothy/Mattawan Formations are Late Cretaceous in age and directly overlie crystalline bedrock. The Pleistocene-aged sediments were deposited on the erosional surface of the Magothy/Mattawan deposits. Each geologic formation contains water-bearing zones and intervals where these zones are prevalent and interconnected can be considered aquifers.

A brief description of each geologic and hydrologic unit is



TITLE

GENERAL STRATIGRAPHIC COLUMN UNDERLYING THE DEKNATEL SITE

PREPARED FOR

RECRA ENVIRONMENTAL, INC.

ROUX Consulting Ground-Water Geologists ROUX ASSOCIATES INC

SCALE	FIGURE
SHOWN	B-4
DATE 3/88	

presented as follows:

Bedrock

Data from well logs near the Deknatel Site indicate the upper surface of the bedrock to be between -675 and -725 feet mean sea level. The bedrock has been identified as either granite or gneiss with an extensive weathered zone on the upper surface. These rock types are virtually impermeable except where fractures are abundant and interconnected. There is no evidence to suggest this is the case in this area of Queens.

The significance of the bedrock surface is that it acts as an impermeable barrier to ground-water movement and, therefore, is considered the bottom of the ground-water reservoir. No known wells are finished in bedrock in Queens or adjacent counties.

Raritan Formation

The Raritan Formation consists of unconsolidated sands, silts and clays of Late Cretaceous age that unconformably overlie bedrock. This formation has been divided into two members; the Lloyd sand and the clay member.

The Lloyd sand is the oldest member of the Raritan Formation and directly overlies bedrock in the Deknatel area. The Lloyd sand aquifer is artesian, being confined between the impermeable bedrock and the overlying clay member.

The clay member of the Raritan Formation, sometimes referred to as the Raritan clay, is an aquitard that restricts the downward movement of water from overlying aquifers to the underlying Lloyd sand. The clay member is estimated to be 200 feet thick in the area of the site and effectively confines the Lloyd sand.

Magothy Formation/Mattawan Group (undifferentiated)

The Magothy/Mattawan deposits are also Late Cretaceous in age and unconformably overlie the clay member of the Raritan Formation (Figure B-4). The Magothy/Mattawan deposits consist of layers and lenses of gravel, sand, silt and clay. The thickness in the study area based on nearby well logs is between 200 and 300 feet.

The sandy and gravelly layers/lenses yield significant quantities of water to wells. However, less permeable silts and clays dominate certain horizons in the Magothy/Mattawan which causes variations in hydraulic conductivity both vertically and horizontally. These silt/clay layers shield most of the good water-bearing zones from surface contamination and locally cause confined (artesian) conditions.

Wells tapping the Magothy/Mattawan System in Queens have yielded as much as 1,800 gpm. Specific capacities have ranged from less than 15 gpm/ft to over 50 gpm/ft in the coarser, more permeable deposits. This aquifer has been extensively developed in Queens and Nassau Counties.

Pleistocene Deposits

The Jameco Gravel of Illinoian (?) age unconformably overlies and fills in channels scoured into the upper surface of the Magothy/Mattawan deposits. The Jameco consists of coarse sand, granules, pebbles and cobbles (predominantly rock fragments) and has a high permeability. The Jameco is hydraulically connected to water-bearing sands of the Magothy in many parts of Brooklyn and Queens, however it does not appear to underly the Deknatel site.

The Gardiners Clay is an aquitard that hydraulically separates the Jameco/Magothy aquifer system from the Upper Glacial aquifer. The Gardiners Clay is not present in the Deknatel area.

Directly overlying the uneven surface of the Magothy/Mattawan aquifer system are Upper Pleistocene deposits consisting of sands and gravels with minor interbeds of silt and clay. These deposits are of glacio-fluvial origin and are termed outwash. These were deposited from the meltwaters of a retreating glacier which sorted sediments previously carried and deposited by the ice. Therefore, these deposits contain sediments having uniform grain sizes and are highly permeable. These outwash deposits comprise the Upper Glacial aquifer. The Upper Glacial aquifer is the aquifer of concern for this study, due to it's hydraulic connection with the regionally important Magothy/Mattawan aquifer system.

In 1980, according to Buxton, et al 1981, net pumpage from aquifers underlying Queens was approximately 62.5 Mgd. Of this total: 16.6 mgd (27%) was pumped from the Upper Glacial; 37.3 mgd (60%) from the Magothy/Mattawan System; and 7 mgd (11%) from the Lloyd aquifer. A small percentage was pumped from the Jameco aquifer which does not underly the Deknatel area.

Most of the pumpage described above involves the Jamaica Water Supply Company whose nearest wells are approximately half a mile west of the site. This company serves more than half a million people and over 7500 commercial and industrial establishments in southeast Queens. A large cone of depression exists where the Jamaica Water Supply well fields are located. Shallow ground water under the Deknatel Site flows toward the Jamaica Water Supply cone of depression.

Other wells located between the Jamaica Water Supply Well fields and the Deknatel Site supply cooling water for air conditioning systems. After use the water is returned to the aquifer via diffusion wells. These nonpotable, pumping wells are screened either in the Magothy/Mattawan system or Upper Glacial aquifer and will have little effect on shallow ground water under the Deknatel Site because of their location and seasonal usage.

There are several industrial wells for car washing facilities and lawn watering downgradient of the site but these reflect nonpotable and intermittent usage.

3.2 Deknatel Site Hydrogeology

The soil borings drilled for this study were all finished in the Pleistocene outwash deposits. The outwash is estimated to be about 100 thick in the study area. At the site five borings were advanced as deep as 70 feet into the outwash or 10 feet into the water-table or Upper Glacial aquifer. The geologic logs for these borings are included in Appendix B-1.

The outwash encountered at the site consists of predominantly well-sorted, fine to medium sands with some coarser sand and gravel throughout. The sands are quartzose with less than 10% kaolinitized feldspars, mafic minerals and rock fragments. Due to the good sorting of grain sizes and lack of silt/clay, this unit has a high permeability both vertically and horizontally.

At MW-1 the upper 16 feet of the unsaturated zone is a predominantly fine sand with some gravel mixed in, below 16 feet the unit becomes more characteristic of the remainder of the site in that fine sediment grain sizes become predominantly fine to medium sand with some gravel.

There is a characteristic iron staining that occurs between 30-40 feet below land surface and continues downwards to the water table. This iron staining is the result of the decline of the water-table elevation over the past years due to increased pumpage of the aquifer with time.

3.3 Hydraulic Conductivity Test Results

One short term specific capacity test was conducted at the site on the four-inch diameter monitoring well, MW-3. The results of the specific capacity test are given in Attachment B-4. The calculated transmissivity of the shallow aquifer near the water table is 9,000 gallons per day per foot (gpd/ft). This value was derived using the following formula from Walton (1970).

$$\frac{Q}{S} = \frac{T}{264 \log\left(\frac{Tt}{2{,}693\, r_w^2 S}\right) - 65.5}$$

Where $\frac{Q}{S}$ = Specific capacity, gpm/ft (drawdown)

Q = pumping rate, in gpm (discharge)

S = drawdown, in feet

T = coefficient of transmissivity in gpd/ft

S = coefficient of storage. For water-table aquifer, assume S = 0.2

rw = nominal radius of well, in feet

t = time after pumping started, in minutes

<u>MW-3</u>
Pumping Rate (Q) = 7.2 gpm

Specific Capacity $\left(\frac{Q}{S}\right) = \frac{7.2}{.64} = 11.25$

Time (t) = 3 minutes

Transmissivity = 9,000 gpd/ft

Assuming a pumping saturated thickness of the aquifer to be 20 feet at MW-3 the hydraulic conductivity is approximately 500 gpd/ft^2.

The use of 20 feet as the saturated thickness is approximate since it is based on the expected vertical effect from pumpage of MW-3 (ten feet below the screen zone). This is worst case since half the screen length (10' out of 20') was above the water table at the time of pumping.

Based on visual inspection of the sediment sizes and degree of sorting and using tables compiled by Freeze and Cherry (1979) and the U.S. Department of Interior (1977), assigned hydraulic conductivity of this aquifer zone would range from 10^2 to 10^3 gpd/ft^2, which is consistent with the results of the specific capacity test.

Ground-water Flow Velocity and Direction

Based on a hydraulic conductivity of 500 gpd/ft^2, a measured on-site gradient of .005 ft/ft and an assumed porosity of 0.3, the approximate ground-water flow velocity is 1 foot/day or 365 feet/year. This value is representative of the upper portion of the water-table aquifer under the site and is consistent with values obtained for the Upper Glacial aquifer, in general. Ground-water flow velocities will vary throughout the thickness of the Upper Glacial aquifer under the site, depending upon the coarseness, sorting and packing of the individual sediment layers. Ground water will flow faster through gravelly portions of the aquifer and will be impeded by silt and clay deposits.

Figure B-5 shows the regional direction of ground-water flow near the site based on JWSC 1987 water levels. This figure reflects water-level data consistent with measurements collected on three occasions at the site during the Roux investigation. The apparent direction of ground-water flow is towards the Jamaica Water Supply Company cone of depression near wells 27, 37 and 38. These wells are over 8500 feet west of the site. These screen settings place these wells in the lower portion of the Upper Glacial aquifer but some screens may also bridge the uppermost portion of the Magothy/Mattawan system. Though JWSC 29 is the closest Upper Glacial supply well, ground water from the site appears not to be flowing in that direction but towards the more extensive cone of depression to the west. It is unlikely, anyway, that ground water from the site would be drawn down into the deep well screen of JWSC 29 (screened -10 to -30 feet MSL). More likely ground water would pass the well by at higher horizons in the aquifer and then would turn and flow towards the extensive water-table lows (JWSC 27, 37, and 38 which are northwest of the site).

Buxton, et al, 1981 present a series of plates that show the water-table configuration at various times from 1903 to the present. The 1903 data reflect a best estimate for pre-development conditions and show flow to the west and southwest from the area of the site, away from a water-table high (mound) in Nassau County. Water-table maps compiled in 1936, 1943 and 1961 show extensive cones of depression in Brooklyn and near Woodhaven, Queens and ground-water flow from the area of the site is consistently westerly or southwesterly towards these areas. The data from 1974 and 1981 indicate pumpage has stopped in Brooklyn and the Woodhaven area but shows a pronounced water-table low in the area of the Jamaica Water Supply Company (JWSC) well fields. Once again flow from the site is westerly during these periods and towards the JWSC cone of depression.

Assuming a solute was introduced into ground water at the Deknatel site, it would take approximately 15 - 20 years to reach the JWSC cone depression in the Upper Glacial aquifer, near JWSC Wells 27, 37 and 38. This is a worst case number since it assumes the solute moves at the same rate as ground water. The movement of a solute will be retarded due to transverse, longitudinal and vertical dispersion (a mechanical mixing with "clean" ground water) and sorption onto aquifer materials. In addition, if it reaches a pumping well, significant dilution takes place as more "clean" water is drawn into the supply well from all directions (vertically and horizontally).

Data collected by JWSC on a yearly basis from all Upper Glacial supply wells do not indicate the presence of chromium, the chemical of concern at the Deknatel site. It is even further unlikely that any solutes from the Deknatel site will reach the Magothy/Mattawan Aquifer system particularly because ground water from the site is strongly influenced and significantly diluted by shallow wells pumping from the Upper Glacial. Jamaica Water Supply monitoring of nearby Magothy/Mattawan supply wells indicated the sporadic detection of chromium in two wells (29A and 48A) near the detection limit (.02 ppm). These findings are below the drinking water standard and should not be attributed to the site. There easily could be other sources of chromium in a highly urbanized area such as Queens County, New York.

4.0 REFERENCES

Buxton, et al, 1981, Reconnaissance of the Ground-water Resources of Kings and Queens Counties, New York, USGS Open-File Report 81-1186.

Freeze, R.A., and Cherry, J.A., 1979, Groundwater, Prentice-Hall, Inc., Englewood Cliffs, N.J.

Ground-water Manual, U.S. Department of Interior, 1977

Walton, W.C., 1970, Groundwater Resource Evaluation, McGraw-Hill Company, New York

ATTACHMENT B-1

Geologic Logs

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date 2/22/88
Project Deknatel
Client RECRA Environmental
Page 1 of 5
Logged By John Sheehan
Well No. MW-1
Loc.
M.P. Elevation
Drilling Started 1/14/88 Ended 1/15/88
Driller Python Drilling
Type Of Rig Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8"
Final Depth (ft.) 72'
Casing Diam. (in.) 2"
Casing Length (ft.) 71.0
Screen Setting (ft.) 61.0'-71.0'
Screen Slot & Type
Well Status

G W READINGS(1)

Date	DTW MP(2)	Elev. W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.1'	0'-2.0'	13,10,8,4		0	Top .4: Grayish Black - Asphalt .4-.8: Black Sand and Gravel .8-1.1: Brown Sand and Some Gravel. Dry. No Staining, No Odor.
		1.0'	2.0'-4.0'	3,4,7,4		2	Brown Fine Sand with Some Gravel and Some Coarse Sand. Dry. No Odor.
		1.0'	4.'-6.0'	4,4,5,8		4	Brown Fine Sand and Gravel. Dry.
		1.2'	6.0'-8.0'	13,18,24,20		6	Brown to Light Brown Fine Sand and Gravel (C-M-F) Dry. No Odor.
		.9'	8.0'-10.0'	22,22,28,27		8	Fine Sand and Gravel. Light Brown in Color.
		1.0	10.0'-12.0'	26,29,21,23		10	Light Brown to Brown Fine Sand and Medium to Coarse gravel. Dry. No Odor.
		1.4'	12.0'-14.0'			12	Light Brown to Brown Fine Grained and Some Coarse and Medium Gravel. Dry. No Odor.
		.9'	14.0'-1	17,11,19,19		14	Light Brown Fine Sand and Some Very Coarse Gravel. Top.4': Dark Brown in Color. Dry. No Odor.
						16	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date 2/22/88
Project Deknatel
Client RECRA Environmental
Page 2 of 5
Logged By John Sheehan
Well No. MW-1
Loc.
M.P. Elevation
Drilling Started 1/14/88 Ended 1/15/88
Driller Python Drilling
Type Of Rig Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8"
Final Depth (ft.) 72'
Casing Diam. (in.) 2"
Casing Length (ft.) 71.0
Screen Setting (ft.) 61.0'-71.0'
Screen Slot & Type
Well Status

G W READINGS (1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	Sample No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.1'	16'-18'	18,23,27,29		16	Light brown fine-medium sand. Trace of gravel Dry. No odor.
		1.2'	18'-20'	28,33,26,32		18	Light Brown fine and medium sand. Trace of gravel. Dry. No odor.
		1.5'	20'-22'	13, 20,39,37		20	Light brown and brown fine and medium sand. Some fine and medium gravel. Dry. No Odor.
		1.0'	22'-24'	38,52,45,53		22	Brown fine and medium sand. Some fine and medium gravel. Dry. No odor.
		1.7'	24'-26'	30,80,60,82		24	Light brown fine sand with some coarse and medium gravel. Dry. No odor.
		1.4'	26'-28'	Switch from 140 lb. Hammer to 300 lb. 29,24,19,20		26	Light brown and brown fine sand and fine to medium gravel. Dry. No odor. Poorly sorted.
		1.4'	28'-30'	15,19,11,9		28	Light brown fine-medium sand and gravel. Dry No odor.
		1.7'	30'-32'	Switched from 300 lb. to 140 lb. Hammer 7,12,13,18		30	Top .6': Brown fine sand some fine gravel. 6 - Bottom: light brown fine sand and some gravel. Dry. No odor.
						32	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date 2/22/88
Project Deknatel
Client RECRA Environmental
Page 3 of 5
Logged By John Sheehan
Well No. MW-1
Loc.
M.P. Elevation
Drilling Started 1/14/88 Ended 1/15/88
Driller Python Drilling
Type Of Rig Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8"
Final Depth (ft.) 72'
Casing Diam. (in.) 2"
Casing Length (ft.) 71.0
Screen Setting (ft.) 61.0'-71.0'
Screen Slot & Type
Well Status

G W READINGS(1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	Sample No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.6'	32'-34'	21,31,34,35		32	Brown Fine-Medium Sand and Medium and Coarse Gravel. Very Poorly Sorted. Dry. No Odor.
		1.7	34'-36'	10,19,30,28		34	Brown Fine-medium Sand with Some Medium and Fine Gravel. Dry. No Odor. Finer towards Tip
		1.7	36' - 38'	32,37,35,37		36	Light Brown-tn Fine and Medium Sand. Trace of Fine Gravel. Dry. No Odor.
		1.6	38'-40'	28,35,38,39		38	Brown Fine-Medium Sand. Trace of Medium Gravel Iron staining in Band Near Tip. Dry. No Odor
		1.2	40'-42'	15,27,37,41		40	Brown Fine-medium Sand. Some Medium Gravel. Iron Staining Towards Tip. Dry. No Odor.
		1.6	42'-44'	40,42,39,46		42	Light Brown Fine-Medium Sand. Trace of Gravel Iron Staining. Dry. No Odor.
		1.1'	44'-46'	20,30,36,53		44	Light Brown Fine-medium Sand. Some medium and and Coarse Gravel. Poorly Sorted. Some Iron Staining. Dry. No Odor.
		1.2	46'-48'	28,19,25,31		46	Brown Fine-medium Sand. Reddish-brown Where Iron Stained. Some M-C Gravel. Dry. No Odor. Iron Staining.
						48	

REMARKS: (1) in feet relative to a common datum

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date 2/22/88
Project Deknatel
Client RECRA Environmental
Page 4 Of 5
Logged By John Sheehan
Well No. MW-1
Loc.
M.P. Elevation
Drilling Started 1/14/88 Ended 1/15/88
Driller Python Drilling
Type Of Rig Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8"
Final Depth (ft.) 72'
Casing Diam. (in.) 2"
Casing Length (ft.) 71.0
Screen Setting (ft.) 61.0'-71.0'
Screen Slot & Type
Well Status

G W READINGS(1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.6'	48'-50'	30,33,35,42		48	Brown fine-medium sand with some medium gravel. Reddish-brown, iron stained. Dry. No odor.
		1.6'	50'-52'	17,13,17,29		50	Brown reddish-brown fine sand. Some gravel iron stained. Dry. No odor.
		1.7'	52'-54'	27,25,35,36		52	Brown fine-medium sand. Reddish-brown where iron stained. Some fine-medium gravel. Dry. No odor.
		1.6'	54'-56'	32,25,28,32		54	Brown fine-medium sand. Trace of fine-medium gravel. Iron stained. Reddish-brown where iron stained. Dry. No odor.
		1.7'	56'-58'	12,18,29,32		56	Brown fine-medium sand. Trace of fine-medium gravel. Iron staining. Reddish-brown where iron stained. Dry. No Odor.
		1.8'	58'-60'	33,30,28,33		58	Brown fine sand. Trace of fine-medium gravel Iron staining. Reddish-brown where iron stained. Dry. No Odor.
		1.8'	60'-62'	18,17,10,11		60	Brown fine-medium sand. Lighter brown towards tip. Bands of ironish staining, Reddish-brown in color. Trace of gravel. Wet at tip. No odor.
		1.9'	62'-64'	13,25,25,23	Water Table	62	Brown and light brown fine and medium sand with some gravel. Wet. No odor.
						64	

REMARKS: (1) in feet relative to a common datum

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date 2/22/88
Project Deknatel
Client RECRA Environmental
Page 5 Of 5
Logged By John Sheehan
Well No. MW-1
Loc.
M.P. Elevation
Drilling Started 1/14/88 Ended 1/15/88
Driller Python Drilling
Type Of Rig Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8"
Final Depth (ft.) 72'
Casing Diam. (in.) 2"
Casing Length (ft.) 71.0
Screen Setting (ft.) 61.0'-71.0'
Screen Slot & Type
Well Status

G W READINGS (1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.9'	64'-66'	2,3,5,12		64	Light Brown Fine-Medium Sand with + Trace of Gravel. Wet. No Odor.
		1.9'	66'-68'	11,14,21,31		66	Light Brown-tan Fine and Medium Sand. Little Coarse Sand Trace of Fine Gravel. Wet. No Odor.
		1.8'	68'-70'	5,7,25,34		68	Brown Fine/Medium Sand. Some Coarse Sand Wet. No Odor.
		2.0	70'-72'	2,2,2,2		70	Brown Fine/Medium Sand. Trace of Coarse Sand
						72	B.O.B. = 72'

REMARKS: (1) in feet relative to a common datum

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date 2/23/88
Project Deknatel
Client RECRA Environmental
Page 1 Of 5
Logged By John Sheehan
Well No. MW-2
Loc.
M.P. Elevation
Drilling Started 1/26/88 Ended 1/27/88
Driller Python Drilling
Type Of Rig Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8"
Final Depth (ft.) 72'
Casing Diam. (in.) 2"
Casing Length (ft.) 71.0'
Screen Setting (ft.) 61.0-71.0'
Screen Slot & Type
Well Status

G W READINGS(1)

Date	DTW MP(2)	Elev. W.T.

SAMPLER

Type Split Spoon
Hammer 300 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.5	0.0-2.0'	1-1-1-1		0	Top 2": concrete .2"-4": gravel .4"-tip: dark brown fine sand no odor. dry
		1.2	2.0-4.0'	2-1-1-3		2	Brown fine sand. Trace of gravel. No odor silty Dry
		1.2	4.0-6.0'	8-15-20-34		4	Lt. Brown fine/medium sand. little to some gravel. Gravel in tip no odor no staining dry.
		1.1	6.0-8.0'	30-33-28-26		6	Brown fine + medium sand and gravel No odor. No staining dry
		1.0	8.0-10.0'	35-28-40-58		8	Lt. brown fine + medium sand with some gravel. No odor. Dry
		.7	10.0-12.0	4-7-9-12		10	Lt. brown fine-medium sand little gravel. No odor. Dry
		1.2	12.0-14.0	9-11-12-14		12	Lt. brown fine + medium sand with some coarse gravel. No odor. No staining. Dry
		1.2	14.0-16.0	11-12-12-14		14	Lt. Brown fine + medium sand. Some fine + medium gravel. No staining No odor. Dry
						16	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. ______ Date ______
Project ______
Client ______
Page 2 Of 5
Logged By ______
Well No. ______
Loc. ______
M.P. Elevation ______
Drilling Started ______ Ended ______
Driller ______
Type Of Rig ______

WELL DATA

Hole Diam. (in.) ______
Final Depth (ft.) ______
Casing Diam. (in.) ______
Casing Length (ft.) ______
Screen Setting (ft.) ______
Screen Slot & Type ______
Well Status ______

G W READINGS(1)

Date	DTW MP(2)	Elev.W.T.

SAMPLER

Type ______
Hammer ______ lb.
Fall ______ in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.4	16.0-18-0'	5-7-8-10		16	Lt. brown-tan fine-medium sand with coarse sand and fine gravel. No odor Dry.
		.3'	18.0-20.0'	11-14-16-15		18	Brown fine - medium sand. Trace of gravel. Dry. No odor.
		1.5	20.0-22.0'	5-8-10-12		20	Lt. brown fine + medium sand. Some coarse sand and little gravel. No odor. Dry
		1.7	22.0-24.0'	10-12-21-23		22	Lt. brown fine + medium sand. Little gravel. Some coarse sand. No odor No staining. Dry
		1.2	24.0-26.0'	21-16-20-33		24	Lt. brown fine + medium sand. Some gravel and coarse sand. Finer dk brown layer .6' to 2' from tip.
		1.1	26.0-28.0'	15-30-35-27		26	Lt brown fine + medium sand with gravel. No odor. Dry
		1.2	28.0-30.0'	14-20-19-19		28	Lt. brown fine + medium sand with some coarse sand. Trace of gravel no odor. Dry
		1.1	30.0-32.0'	7-7-8-9		30	Lt. brown fine + medium sand trace of gravel and coarse sand. Some iron staining. No odor dry.
						32	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. ______ Date ______
Project ______
Client ______
Page 3 Of 5
Logged By ______
Well No. ______
Loc. ______
M.P. Elevation ______
Drilling Started ______ Ended ______
Driller ______
Type Of Rig ______

WELL DATA

Hole Diam. (in.) ______
Final Depth (ft.) ______
Casing Diam. (in.) ______
Casing Length (ft.) ______
Screen Setting (ft.) ______
Screen Slot & Type ______
Well Status ______

G W READINGS(1)

Date	DTW MP(2)	Elev. W.T.

SAMPLER

Type ______
Hammer ______ lb.
Fall ______ in.

DEVELOPMENT

Elev. (1)	Sample No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.2	32.0-34.0'	9-8-9-10		32	Lt. brown and brown fine + medium sand. Trace of gravel and coarse sand. Iron staining. No odor. Dry
		1.9	34.0-36.0'	10-12-13-1[illegible]		34	Lt. brown and brown fine + medium sand. Little gravel. Iron staining no odor. Dry
		1.5	36.0-38.0'	8-9-12-13		36	Brown fine + medium sand trace of gravel. No odor. Iron staining dry. Bottom .3' fine dk. brown sand.
		1.5	38.0-40.0'	17-12-13-7		38	Brown fine + medium sand - trace of gravel. Some iron staining. No odor. Dry
		1.2	40.0-42.0'	7-8-7-9		40	Brown fine and medium sand + little gravel. No odor. Dry
		1.1	42.0-44.0'	7-8-9-12		42	Brown fine + medium sand - trace of gravel. Some grey silt, sand top .3'. No odor. Dry
		1.7	44.0-46.0'	11-12-7-9		44	Lt. brown and brown fine + medium sand some gravel. Iron staining; rustic brown in color no odor. Dry
		1.3	46.0-48.0'	4-6-5-7		46	Brown fine + medium sand. Little gravel. Iron staining throughout no odor. Dry
						48	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. ______ Date ______
Project ______
Client ______
Page 4 Of 5
Logged By ______
Well No. ______
Loc. ______
M.P. Elevation ______
Drilling Started ______ Ended ______
Driller ______
Type Of Rig ______

WELL DATA

Hole Diam. (in.) ______
Final Depth (ft.) ______
Casing Diam. (in.) ______
Casing Length (ft.) ______
Screen Setting (ft.) ______
Screen Slot & Type ______
Well Status ______

G W READINGS (1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER

Type ______
Hammer ______ lb.
Fall ______ in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.6	48.0-50,0'	4-5-5-7		48	Brown fine + medium sand. Little gravel. Iron staining throughout no odor. Dry
		1.1	50.0-52.0'	4-7-6-9		50	Brown + lt. brown fine + medium sand. Trace of gravel. Iron staining throughout (40%) dry no odor.
		1.5	52.0-54.0'	7-5-7-7		52	Brown & lt. brown fine & medium sand. Iron staining throughout in layers (25%) dry no odor.
		1.6	54.0-56.0'	5-7-6-9		54	Brown & lt. brown fine and medium sand - trace of gravel. Iron staining no odor. Dry.
		1.2	56.0-58.0'	5-7-8-7		56	Brown & lt. brown fine and medium sand. Iron staining throughout (20%). - trace of gravel. Dry no odor.
		1.7	58.0-60.0'	6-9-9-10		58	Brown + lt. brown fine + medium sand. - trace of gravel. Iron staining throughout no odor. dry.
		1.2	60.0-62.0'	4-5-7-7		60	Brown fine + medium sand. - trace of gravel. Iron staining throughout wet at tip. No odor
		2.0	62.0-64.0'	5-6-6-8		62	Brown fine + medium sand. Trace of fine gravel. Wet. No odor no staining.
						64	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. ______ Date ______
Project ______
Client ______
Page 5 Of 5
Logged By ______
Well No. ______
Loc. ______
M.P. Elevation ______
Drilling Started ______ Ended ______
Driller ______
Type Of Rig ______

WELL DATA
Hole Diam. (in.) ______
Final Depth (ft.) ______
Casing Diam. (in.) ______
Casing Length (ft.) ______
Screen Setting (ft.) ______
Screen Slot & Type ______
Well Status ______

G W READINGS (1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER
Type ______
Hammer ______ lb.
Fall ______ in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		2.0	64.0-66.0'	7-8-7-6		64	Brown f/m sand. Trace of gravel wet. No odor. No staining.
		2.0	66.0-68.0'	2-2-2-3		66	Brown fine + medium sand trace of fine gravel. Some coarse land. Wet. No odor
		1.9	68.0-70.0'	4-5-6-6		68	Brown fine + medium sand. - trace of gravel. - Some coarse sand. Wet no odor.
		1.9	70.0-72.0'	3-6-9-13		70	Brown fine + medium sand. Some coarse sand. Wet no odor.
						72	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09002 Date 2/23/88
Project Deknatel
Client RECRA Environmental
Page 1 Of 4
Logged By John Sheehan
Well No. MW-3
Loc.
M.P. Elevation
Drilling Started 2/1/88 Ended Same
Driller Python Drilling
Type Of Rig Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 8"
Final Depth (ft.) 72'
Casing Diam. (in.) 4"
Casing Length (ft.) 71'
Screen Setting (ft.) 69.82-49.90
Screen Slot & Type
Well Status

G W READINGS(1)

Date	DTW MP(2)	Elev. W.T.

SAMPLER

Type Split Spoon
Hammer 300 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	Sample No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.5'	20.0-22.0'	5-9-7-11		20	Lt. brown + brown fine and medium sand. Little fine and medium gravel dry no odor.
						22	
		1.7'	25.0-27.0'	6-7-23-28		25	Lt. brown fine and medium sand. ⊖ Some gravel, finer sand toward tip dry. No odor. No staining.
						27	
		1.0'	30-32.0'	7-8-13-14		30	Lt. brown fine and medium sand. Some gravel. Dry. No odor. No staining.
						32	
		1.7'	35.0-37.0'	6-9-11-14		35	Lt. brown fine + medium sand with some ⊖ gravel. Dry, no odor. No staining.

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. ______ Date ______
Project ______
Client ______
Page 2 Of 4
Logged By ______
Well No. ______
Loc. ______
M.P. Elevation ______
Drilling Started ______ Ended ______
Driller ______
Type Of Rig ______

WELL DATA

Hole Diam. (in.) ______
Final Depth (ft.) ______
Casing Diam. (in.) ______
Casing Length (ft.) ______
Screen Setting (ft.) ______
Screen Slot & Type ______
Well Status ______

G W READINGS (1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER

Type ______
Hammer ______ lb.
Fall ______ in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
						37	
		1.2'	40.0-42.0'	3-7-9-14		40	Lt. brown fine and medium sand. Little gravel, iron staining. no odor. Dry
						42	
		1.7'	45.0-47.0'	6-10-10-9		45	Lt. brown fine + medium sand trace of (+) gravel. Iron staining. No odor. Dry
						47	
		1.7'	50.0-52.0'	6-8-7-10		50	Brown and rustic brown fine and medium sand. Trace of (-) gravel. Iron staining. Dry no odor.
						52	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. ______ Date ______
Project ______
Client ______
Page 3 Of 4
Logged By ______
Well No. ______
Loc. ______
M.P. Elevation ______
Drilling Started ______ Ended ______
Driller ______
Type Of Rig ______

WELL DATA

Hole Diam. (in.) ______
Final Depth (ft.) ______
Casing Diam. (in.) ______
Casing Length (ft.) ______
Screen Setting (ft.) ______
Screen Slot & Type ______
Well Status ______

G W READINGS(1)

Date	DTW MP(2)	Elev. W.T.

SAMPLER

Type ______
Hammer ______ lb.
Fall ______ in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.0	55.0-57.0'	6-9-10-11		55	Lt. brown fine and medium sand - trace of gravel - reddish brown iron staining - no odor. dry
						57	
		1.2'	60.0-62.0'	7-3-1-3		60	Brown and reddish brown sand fine and medium sand - trace of gravel iron stained 75% of sample. Wet at tip. no odor.
						62	
		1.8'	65.0-67.0'	1-1-2-3		65	Lt. brown fine and medium sand. some coarse sand. Trace of fine gravel wet no odor.
						67	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. ______ Date ______
Project ______
Client ______
Page 4 Of 4
Logged By ______
Well No. ______
Loc. ______
M.P. Elevation ______
Drilling Started ______ Ended ______
Driller ______
Type Of Rig ______

WELL DATA

Hole Diam. (in.) ______
Final Depth (ft.) ______
Casing Diam. (in.) ______
Casing Length (ft.) ______
Screen Setting (ft.) ______
Screen Slot & Type ______
Well Status ______

G W READINGS(1)

Date	DTW MP(2)	Elev. W. T.

SAMPLER

Type ______
Hammer ______ lb.
Fall ______ in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.8	70.0-72.0'	1-1-1-2		70	Lt. brown - tan fine and medium sand. Some coarse sand and very fine gravel. Wet. No odor.
						72	B.O.B. = 72'

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date ______
Project DEKNATEL
Client RECRA ENVIRONMENTAL
Page 1 Of 5
Logged By JOHN SHEEHAN
Well No. TR-1
Loc. ______
M.P. Elevation ______
Drilling Started 1/22/88 Ended 1/25/88
Driller PYTHON DRILLING
Type Of Rig HOLLOW STEM AUGER

WELL DATA

Hole Diam. (in.) 6"
Final Depth (ft.) 72'
Casing Diam. (in.) ______
Casing Length (ft.) ______
Screen Setting (ft.) ______
Screen Slot & Type ______
Well Status ______

G W READINGS(1)

Date	DTW MP(2)	Elev. W.T.

SAMPLER

Type SPLIT SPOON
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.7'	0.0'-2.0'	2,2,3,2		0–2	Top .7' Concrete .7-1.0: Gravel, Pavement 1.0-1.6: Brown flm sand. Brown V. Fine sand Bottom 1.5'. No odor. Dry.
		1.0'	2.0'-4.0'	3,5,9,16		4	Top .3': Brown V. fine sand. .3 - Bottom: Fine and medium sand. Some gravel. Green staining. Black staining. Dry. Slight odor.
		1.2'	4.0'-6.0'	30,64, 18,26 Change from 140 lb. Hammer to 300 lb.		6	Brown fine/medium sand. Some gravel. Coarse gravel towards tip. Green staining. Slight odor. Dry.
		1.2'	6.0'-8.0'	40,26,60/3 Refulal		8	Top .2: f/m sand. Stained slightly. .2-.5: Black stained coarse sand. .5-1.2: f/m sand with some gravel. Dry. Odor. Stain green in color. Fuel oil smell. Musty smell.
		.2'	8.0'-10.0'	50/2" Refusal		10	Brown fine and medium sand with some gravel. Green staining. Musty smell. HNU reading -65 ppm.
		1.5'	10.0'-12.0	36,48,50,57		12	Green fine/medium sand. Some gravel. Extensive green staining throughout. Slight odor. Dry.
		1.0	12.0'-14.0'	52,77,82 Refusal		14	Green fine/medium sand. Little gravel. Extensive green staining covering total.
		1.5'	14.0'-16.0'	3,9,13,14		16	Light green fine/medium sand, with some gravel. Light green staining throughout. Odor. Dry. Musty smell.

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date
Project DEKNATEL
Client RECRA ENVIRONMENTAL
Page 2 Of 5
Logged By JOHN SHEEHAN
Well No. TB-1
Loc.
M.P. Elevation
Drilling Started 1/22/88 Ended 1/25/88
Driller PYTHON DRILLING
Type Of Rig HOLLOW STEM AUGER

WELL DATA

Hole Diam. (in.) 6"
Final Depth (ft.) 72'
Casing Diam. (in.)
Casing Length (ft.)
Screen Setting (ft.)
Screen Slot & Type
Well Status

G W READINGS(1)

Date	DTW MP(2)	Elev. W.T.

SAMPLER

Type SPLIT SPOON
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.6'	16.0'-18.0'	17,18,16,17		16 – 18	Light green fine/medium sand - some gravel. Light green staining throughout. Light green.
		1.0'	18.0'-20.0'	14,13,15,18		20	Brown fine/medium sand. Very light green staining at top. Odor. Dry.
		1.5'	20.0'-22.0'	9,9,11,9		22	Brown fine/medium sand. Little fine gravel. Top .5 light green staining. Slight odor. Dry. some iron staining.
		1.6'	22.0'-24.0'	10,14,22,25		24	Light brown fine/medium sand, little gravel, (in bands). Odor. Some iron staining. Dry. No sign of green staining. Odor still there
		1.5'	24.0'-26.0'	35,30,36,52		26	Brown fine/medium sand. some coarse and medium gravel. Some iron staining. Slight odor. Dry.
		1.8'	26.0'-28.0'	13,27,46,30		28	Brown fine/medium. Sand. Little gravel, (in bands). some iron staining. Slight odor. Dry.
		1.5	28.0'-30.0'	25,25,21,22		30	Brown fine/medium. Sand. Trace of gravel. Small amounts of iron staining. Dry.
		1.6'	30.0'-32.0'	7,9,10,12		32	Brown fine/medium sand. Some coarse sand. Some gravel. Finer sand towards tip. No staining. Dry. No odor.

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date
Project DERNATEL
Client RECRA ENVIRONMENTAL
Page 3 of 5
Logged By JOHN SHEEHAN
Well No. TB-1
Loc.
M.P. Elevation
Drilling Started 1/22/88 Ended 1/25/88
Driller PYTHON DRILLING
Type Of Rig HOLLOW STEM AUGER

WELL DATA

Hole Diam. (in.) 6"
Final Depth (ft.) 72'
Casing Diam. (in.)
Casing Length (ft.)
Screen Setting (ft.)
Screen Slot & Type
Well Status

G W READINGS(1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER

Type SPLIT SPOON
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	Sample No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.5'	32.0'-34.0'	11,12,11,9		32 – 34	Brown fine/med. sand. Little gravel. Some iron staining. Dry. No odor.
		1.4'	34.0'-36.0'	14,17,18,21		34 – 36	Brown fine-medium sand. Trace of gravel, (in bands). Iron staining on 50% of sample. No odor. Dry.
		1.7'	36.0'-38.0'	16,23,22,21		38	Rustic brown fine/medium sand with little fine gravel. Iron staining. Dry.
		1.4'	38.0'-40.0'	19,15,19,16		40	Rustic brown fine/medium sand. Some coarse sand. iron staining. No odor. Dry.
		.9'	40.0'-42.0'	12,23,13,14		42	Rustic brown fine/medium sand, some coarse sand. Trace of fine gravel. Iron staining No odor. Dry.
		1.4'	42.0'-44.0'	12,14,15,21		44	Rustic brown fine/medium sand. Trace of gravel. Iron staining throughout. Crushed gravel .4'-.6'. Dry. No odor.
		1.5'	44.0'-46.0'	18,18,22		46	Brown and rustic brown fine and medium sand. some gravel. iron staining. No odor. Dry.
		1.5'	46.0'-48.0'	10,7,11,11		48	Brown and rustic brown fine/medium sand. Iron staining. No odor. Dry.

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date
Project DEKNATEL
Client RECRA ENVIRONMENTAL
Page 4 Of 5
Logged By JOHN SHEEHAN
Well No. TB-1
Loc.
M.P. Elevation
Drilling Started 1/22/88 Ended 1/25/88
Driller PYTHON DRILLING
Type Of Rig HOLLOW STEM AUGER

WELL DATA

Hole Diam. (in.) 6"
Final Depth (ft.) 72'
Casing Diam. (in.)
Casing Length (ft.)
Screen Setting (ft.)
Screen Slot & Type
Well Status

G W READINGS(1)

Date	DTW MP(2)	Elev. W.T.

SAMPLER

Type SPLIT SPOON
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	Sample No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.9'	48.0'50.0'	9,9,13,26		48 / 50	Brown and rustic brown fine and medium sand. Trace of gravel. No odor. Dry.
		1.6'	50.0'-52.0'	9,10,11,18		52	Light brown and rustic brown fine/medium sand. Trace of coarse gravel. Iron staining. No odor. Dry.
		1.2'	52.0'-54.0'	14,12,7,11		54	Light brown and rustic brown fine/ medium sand. Trace of gravel. No odor. Dry.
		1.7'	54.0'-56.0'	12,7,13,21		56	Brown and rustic brown fine and medium sand. 25% iron staining. No odor. Dry.
		1.5'	56.0'-58.0'	7,8,7,17		58	Top .5: Brown f/m sand. Trace of gravel. .5-tip: Light brown f/m sand. Trace of gravel. Iron staining. No odor. Dry.
		1.5'	58.0'-60.0'	8,9,8,10		60	Light brown fine/medium sand. - trace of gravel. Iron staining. No odor. Dry.
		1.1'	60.0'-62.0'	7,10,10,10	Water Table	62	Light brown fine/medium sand. Iron staining. No odor. Coarser sand at tip. Wet at tip.
		2.0'	62.0'-64.0'	8,10,11,12		64	Brown fine and medium sand. some coarse sand. iron staining. No odor. Wet.

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date
Project DEKNATEL
Client RECRA ENVIRONMENTAL
Page 5 of 5
Logged By JOHN SHEEHAN
Well No. TB-1
Loc.
M.P. Elevation
Drilling Started 1/22/88 Ended 1/25/88
Driller PYTHON DRILLING
Type Of Rig HOLLOW STEM AUGER

WELL DATA

Hole Diam. (in.) 6"
Final Depth (ft.) 72'
Casing Diam. (in.)
Casing Length (ft.)
Screen Setting (ft.)
Screen Slot & Type
Well Status

G W READINGS (1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER

Type SPLIT SPOON
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		2.0'	64.0'-66.0'	8,9,12,21		64 – 66	Light brown fine and medium sand. Some coarse sand. Grey color in middle. Wet No odor.
		2.0'	66.0'-68.0'	7,7,7,10		68	Brown fine/medium sand. some coarse sand. No odor. Wet.
		2.0'	68.0'-70.0'	6,7,6,7		70	Brown fine/medium sand. Some coarse sand and fine gravel. No odor. Wet.
		2.0'	70.0'-72.0'	5,6,7,8		72	Brown fine/medium sand. some coarse sand and fine gravel. Wet. No odor.
							B.O.B. = 72'

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date
Project DEKNATEL
Client RECRA ENVIRONMENTAL
Page 5 Of 5
Logged By JOHN SHEEHAN
Well No. TB-2
Loc.
M.P. Elevation
Drilling Started 1/20/88 Ended 1/21/88
Driller PYTHON DRILLING
Type Of Rig HOLLOW STEM AUGER

WELL DATA

Hole Diam. (in.) 6"
Final Depth (ft.) 72'
Casing Diam. (in.)
Casing Length (ft.)
Screen Setting (ft.)
Screen Slot & Type
Well Status

G W READINGS(1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER

Type SPLIT SPOON
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.9'	64.0'-66.0'	6-8-8-9		64 66	Brown and grayish-brown fine and medium sand. Trace of fine gravel. Wet. No odor. No staining.
		2.0'	66.0'-68.0'	8-9-7-10		68	Brown fine/medium sand. Wet. No odor. No staining. Running sand.
		2.0'	68.0'-70.0'	5-5-8-11		70	Brown fine/medium sand. Trace of gravel. No odor. No staining. Wet. Problem with running sand.
		2.0'	70.0'-72.0'	9-10-10-10		72	Brown fine/medium sand and trace of gravel. No odor. No staining. Wet.
							B.O.B. 72'

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date

Project DEKNATEL

Client RECRA ENVIRONMENTAL

Page 1 of 5

Logged By JOHN SHEEHAN

Well No. TB-2

Loc.

M.P. Elevation

Drilling Started 1/20/88 Ended 1/21/88

Driller PYTHON DRILLING

Type Of Rig HOLLOW STEM AUGER

WELL DATA

Hole Diam. (in.) 6"

Final Depth (ft.) 72'

Casing Diam. (in.)

Casing Length (ft.)

Screen Setting (ft.)

Screen Slot & Type

Well Status

G W READINGS(1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER

Type SPLIT SPOON

Hammer 140 lb.

Fall 30 in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.6'	0.0'-2.0'	1,2,3,2		0–2	Fill Top .4: Concrete .4-1.0: gravel fill 1.0-1.6: Dark brown fine/med. sand Trace of gravel. Slight odor. Dry.
		.6'	2.0'-4.0'	4,4,5,15		4	Brown fine-medium sand with some coarse sand. Trace of fine gravel. Odor. No staining.
		1.5'	4.0'-6.0	23,52,47,70		6	Light brown-grey silty sand. Trace of coarse gravel. Odor. Green staining 1.0 from Tip. Dry.
		.6	6.0'-8.0	72-57-46-40 Changed from 140 lb. hammer to 300 lb.		8	Brown-green fine sand with some coarse sand. Tight. Green staining throughout. Slight odor. Dry.
		.7	8.0'-10.0'	21-40-52-76		10	Brown-grey silty fine sand. Trace gravel. Very dense. No staining. Dry. No odor.
		.9	10.0'-12.0'	9-41-36 -51 Changed from 300 lb. hammer to 140 lb. hammer.		12	Brown fine and medium sand. Some coarse and medium gravel. .3 to .5 crushed cobble. Dry. No odor. No staining.
		.8	12.0'-14.0'	44-34-47-61		14	Light brown fine and medium sand. Trace of gravel. No staining. No odor. Dry.
		.9	14.0-16.0'	41-35-36-42		16	Light brown fine and medium and coarse sand. Little gravel. Poorly sorted. No odor. No staining. Dry.

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 08001 Date
Project DEKNATEL
Client RECRA ENVIRONMENTAL
Page 2 Of 5
Logged By JOHN SHEEHAN
Well No. TB-2
Loc.
M.P. Elevation
Drilling Started 1/20/88 Ended 1/21/88
Driller PYTHON DRILLING
Type Of Rig HOLLOW STEM AUGER

WELL DATA

Hole Diam. (in.) 6"
Final Depth (ft.) 72'
Casing Diam. (in.)
Casing Length (ft.)
Screen Setting (ft.)
Screen Slot & Type
Well Status

G W READINGS(1)

Date	DTW MP(2)	Elev. W.T.

SAMPLER

Type SPLIT SPOON
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.0	1.6'-18.0	18-26-33-29		16	Light brown fine|medium sand. Trace of gravel. Small amount of iron staining. No odor. Poorly sorted.
		1.4'	18.0'-20.0'	26-31-32-41		18	Light brown fine|medium sand. Trace of gravel. No odor, no staining. Dry.
		1.6'	20.0'-22.0'	20-29-38-52		20	Light brown fine|medium sand. Trace of fine gravel. No odor. No staining. Dry.
			22.0'-24.0'	29-29-60-80		22	Light brown fine|medium sand. Trace of gravel. Very coarse gravel 2" from tip. No odor. No staining. Dry.
		1.6'	24.0'-26.0'	74-110-99-83		24	Light brown fine|medium sand. Little gravel. No odor. Small layer of iron staining. Dry. Poorly sorted.
		1.5'	26.0'-28.0'	22-44-91-153		26	Light brown fine|medium sand. Some gravel. Cobble in tip. No odor. No staining. Dry.
		1.2'	28.08'-20.0'	26-24-31-27 Changed from 140 lb. hammer to 300 lb.		28	Light brown fine|medium sand with some fine|medium gravel. Little coarse gravel. Dry.
		.9'	30.0'-32.0'	15-25-9-9		30	Light brown fine|medium sand - some fine and coarse grave. Dry. No odor. No staining.

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 08001 Date
Project DERNKIEL
Client RECRA ENVIRONMENTAL
Page 3 of 5
Logged By JOHN SHEEHAN
Well No. TB-2
Loc.
M.P. Elevation
Drilling Started 1/20/88 Ended 1/20/88
Driller PYTHON DRILLING
Type Of Rig HOLLOW STEM AUGER

WELL DATA

Hole Diam. (in.) 6"
Final Depth (ft.) 72'
Casing Diam. (in.)
Casing Length (ft.)
Screen Setting (ft.)
Screen Slot & Type
Well Status

G W READINGS (1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER

Type SPLIT SPOON
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	Sample No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.4'	32.0'-34.0'	9-9-10-10		32–34	Light brown fine/medium sand. Little gravel. Dry. No odor. Small amount of iron staining.
		1.5'	34.0'-36.0'	9-9-25-36		34–36	Light brown and brown fine/medium sand with - Some gravel. Poorly sorted. Dry. No odor. No staining
		1.4'	36.0'-38.0'	12-16-13-21		36–38	Brown and rusty brown fine and medium sand. Little gravel. Dry. No odor. No staining.
		1.5'	38.0'-40.0'	16-17-18-21		38–40	Rustic brown fine and medium sand. Some gravel. Dry. No odor. Iron staining. Fine sand layer .5 from tip.
		1.2'	40.0'-42.0'	7-14-13-19		40–42	Rustic brown fine and medium sand. Little gravel. Dry. No odor. Iron staining.
		1.6'	42.0'-44.0'	14-17-21-33		42–44	Brown fine and medium sand. Trace of fine gravel. Dry. No odor. No staining.
		1.4'	44.0'-46.0'	20-24-23-19		44–46	Brown fine/medium sand with some gravel. Iron staining from .7'-.3' from Tip. No odor.
		N.R.	46.'-48.0'	15-15-23-16		46–48	N.R.

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date
Project DEKNATEL
Client RECRA ENVIRONMENTAL
Page 4 Of 5
Logged By JOHN SHEEHAN
Well No. TB-2
Loc.
M.P. Elevation
Drilling Started 1/20/88 Ended 1/21/88
Driller PYTHON DRILLING
Type Of Rig HOLLOW STEM AUGER

WELL DATA

Hole Diam. (in.) 6"
Final Depth (ft.) 72'
Casing Diam. (in.)
Casing Length (ft.)
Screen Setting (ft.)
Screen Slot & Type
Well Status

G W READINGS(1)

Date	DTW MP(2)	Elev. W.T.

SAMPLER

Type SPLIT SPOON
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	Sample No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		N.R.	48.0'-50.0'	14-16-16-25		48 – 50	N.R.
		1.5'	50.0'-52.0'	8-9-11-7		50 – 52	Light brown fine and medium sand. Trace of fine gravel. Iron staining. Dry. No odor
		1.4'	52.0'-54.0'	8-11-11-11		52 – 54	Brown fine and medium sand. 25% iron staining. Dark brown silty sand at tip. No odor.
		1.6'	54.0'-56.0'	13-7-9-16		54 – 56	Top .4': Dark brown silty sand .4 - Bottom: fine/medium sand with trace of gravel. Iron staining. No odor. Dry.
		1.4'	56.0'-58.0'	6-9-11-15		56 – 58	Light brown fine/medium sand. Trace of fine gravel. No odor. 25" iron staining. Dry.
		1.2'	58.0'-60.0'	10-10-10-13		58 – 60	Light brown and rustic brown fine and medium sand. - trace of gravel. Rustic brown where iron stained. Dry. No odor.
		1.5'	60.0'-62.0'	14-10-10-11		60 – 62	Brown fine/medium sand. Iron staining. No odor. Wet at 61 feet.
		1.8'	62.0'-64.0'	10-11-13-14		62 – 64	Brown fine and medium sand. Iron staining Trace of gravel. Coarse toward tip. Wet. No odor.

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09002 Date 2/23/88
Project Deknarel
Client RECRA Environmental
Page 1 Of 2
Logged By John Sheehan
Well No. USTB-1
Loc.
M.P. Elevation
Drilling Started 1/19/88 Ended Same
Driller Python Drilling
Type Of Rig Hollow Stem Auger

WELL DATA

Hole Diam. (in.) 6"
Final Depth (ft.) 20'
Casing Diam. (in.)
Casing Length (ft.)
Screen Setting (ft.)
Screen Slot & Type
Well Status

G W READINGS(1)

Date	DTW MP(2)	Elev. W.T.
-		

SAMPLER

Type Split Spoon
Hammer 140 lb.
Fall 30' in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		.6'	0.0-2.0'	21-10-5-6		0	Dk gravel & pavement. No odor. No staining. Dry
		N.R.	2.0-4.0'	6-7-7-9		2	
		.7'	4.0-6.0'	10-14-28-32		4	Brown fine and medium sand with some medium and coarse gravel. No odor dry.
		1.0	6.0-8.0'	31-47-25-42		6	Top - .4: brownish fine & medium sand, some coarse & medium gravel. Dry. No odor. .4 - tip: brownish grey silty sand.
		1.7'	8.0-10.0'	65-63-81 98		8	Brown fine & medium sand with coarse & medium gravel. Dry no odor.
		1.0	10.0-12.0'	5-27-27-29		10	Brown fine and medium sand and some coarse and medium gravel. No odor. Dry
		1.5	12.0-14.0'	29-25-24-29		12	Brown fine sand with little gravel. No odor. Dry
		1.0	14.0-16.0	4-10-22-23		14	Brown fine and medium sand. Trace of gravel. No odor dry.

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. ____ Date ____
Project ____
Client ____
Page 2 of 2
Logged By ____
Well No. ____
Loc. ____
M.P. Elevation ____
Drilling Started ____ Ended ____
Driller ____
Type Of Rig ____

WELL DATA

Hole Diam. (in.) ____
Final Depth (ft.) ____
Casing Diam. (in.) ____
Casing Length (ft.) ____
Screen Setting (ft.) ____
Screen Slot & Type ____
Well Status ____

G W READINGS (1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER

Type ____
Hammer ____ lb.
Fall ____ in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		1.7	16.0-18.0'	27-18-26-26		16	Brown fine and medium sand with some fine gravel. No odor. Dry
		1.6	18.0-20.0'	27-14-22-31		18	Brown fine and medium sand with some coarse sand. Trace of coarse gravel. Dry no odor.
						20	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date 3/24/88
Project RECRA Environmental Inc.
Client Deknatel
Page 1 Of 3
Logged By John Sheehan
Well No. DP-1
Loc.
M.P. Elevation
Drilling Started 3/15/88 Ended 3/22/88
Driller Parratt-Wolff
Type Of Rig Hand Auger/Tripod Rig

WELL DATA

Hole Diam. (in.) 2"
Final Depth (ft.) 35'
Casing Diam. (in.)
Casing Length (ft.)
Screen Setting (ft.)
Screen Slot & Type
Well Status

G W READINGS (1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER

Type Stainless Steel Auger / Split spoon
Hammer 140 lb.
Fall 30 in.

DEVELOPMENT

Elev. (1)	Sample No.	Sample Rec.	Sample Depth (ft.)	Sample Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
						0.0	Vacant 8.2' Soil Surface
						8.0'	Gray very fine sand. Clayey like. Moist. Odor.
						9.0'	Gray colored, with some multicolored strips. Very fine grained clayey like sand. Moist. Some odor.
						10.0'	Gray colored very fine grained sand with some gravel. Clayey lik. Moist. Odor.
						11.0'	Gray fine sand and gravel. Moist. Odor.
						11.5'	Gray fine sand and gravel. Moist. Odor.
					Discontinued Hand Augering 12.0'	12.0'	
		1.0'			13.0' Sampled Using Tripod Rig	13.0'	Brown and light brown fine and medium sand. Trace of coarse gravel. some iron staining. No odor. Dry. Very course quartz gravel .3'-.4' from tip
						15.0'	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date
Project RECRA Environmental Inc.
Client Deknatel
Page 2 Of 3
Logged By
Well No.
Loc.
M.P. Elevation
Drilling Started Ended
Driller
Type Of Rig

WELL DATA
Hole Diam. (in.)
Final Depth (ft.)
Casing Diam. (in.)
Casing Length (ft.)
Screen Setting (ft.)
Screen Slot & Type
Well Status

G W READINGS (1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER
Type
Hammer lb.
Fall in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
	.9'		15.0'-17.0'			15.0'	Brown and light brown fine and medium sand. Trace of fine gravel. No odor. No staining.
	1.2'		17.0'-19.0'			17.0'	Brown and light brown fine and medium sand. Some gravel. Iron staining. No odor. Dry.
	1.1'		19.0'-21.0'			19.0'	Brown and light brown fine and medium sand. Some coarse sand. No odor. Dry.
	1.0'		21.0'-23.0'			21.0	Brown and light brown fine and medium sand. Some fine and medium gravel. Dry. Poorly sorted. No odor.
	1.2'		23.0'-25.0'			23.0'	Light brown fine and medium sand. Some fine gravel layered at .5'-.7' from tip. No odor. Dry.
	1.3'		25.0'-27.0'			25.0'	Light brown fine and medium sand. Some fine and medium gravel. No odor. No staining. Dry.
	1.1'		27.0'-29.0'			27.0'	Brown and light brown fine and medium sand. Some gravel. Dry. No odor.
	N.R.		29.0'-31.0'			39.0'	
						31.0'	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date 3/24/88
Project RECRA Environmental, Inc.
Client Dekratel
Page 3 Of 3
Logged By
Well No.
Loc.
M.P. Elevation
Drilling Started Ended
Driller
Type Of Rig

WELL DATA

Hole Diam. (in.)
Final Depth (ft.)
Casing Diam. (in.)
Casing Length (ft.)
Screen Setting (ft.)
Screen Slot & Type
Well Status

G W READINGS(1)

Date	DTW MP(2)	Elev. W.T.

SAMPLER

Type
Hammer lb.
Fall in.

DEVELOPMENT

Elev. (1)	Sample No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
		N.R.	31.0'-33.0'			31.0'	
		.5'	33.0'-35.0'			33.0'	Brown and light brown fine and medium sand. Some gravel. No odor. Dry.
		—				35.0'	B.O.B. 35.0'

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date 2/19/88
Project Deknatel
Client RECRA Environmental
Page 1 of 2
Logged By John Sheehan
Well No. DP-2
Loc.
M.P. Elevation
Drilling Started 2/19/88 Ended Same
Driller
Type Of Rig Hand Auger

WELL DATA

Hole Diam. (in.) 2"
Final Depth (ft.) 9.5"
Casing Diam. (in.)
Casing Length (ft.)
Screen Setting (ft.)
Screen Slot & Type
Well Status

G W READINGS (1)

Date	DTW MP (2)	Elev. W.T.

SAMPLER

Type ~~Stainless Steel~~ Auger
Hammer lb.
Fall in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
						0	
						1	
						2	Green and yellow fine sand with some very fine sand. Metal parts and other garbage. Moist. Extensive staining. Strong odor.
						3	
						4	Bright green fine and medium sand. Trace of coarse sand. Strong odor. Extensive staining. Dry.
						5	
						5.5	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC

GEOLOGIC LOG

Study No. 09001 Date 2/19/88
Project Deknatel
Client RECRA Environmental
Page 2 Of 2
Logged By John Sheehan
Well No.
Loc.
M.P. Elevation
Drilling Started 2/19/88 Ended Same
Driller
Type Of Rig Hand Auger

WELL DATA

Hole Diam. (in.) 2"
Final Depth (ft.) 9.5"
Casing Diam. (in.)
Casing Length (ft.)
Screen Setting (ft.)
Screen Slot & Type
Well Status

G W READINGS(1)

Date	DTW MP(2)	Elev. W.T.

SAMPLER

Type ~~Stainless Steel~~ Auger
Hammer lb.
Fall in.

DEVELOPMENT

Elev. (1)	SAMPLE No.	Rec.	Depth (ft.)	Blows/6"	Strata Change & Gen. Desc.	Depth (ft.)	SAMPLE DESCRIPTION
						6	Bright green and green fine and medium sand with some coarse sand. Strong odor. Extensive staining. Dry.
							Bright green and green fine and medium sand. Trace of fine gravel. Strong odor. Extensive staining. Dry.
						7	Bright green fine and medium sand. Some gravel. Strong odor. Extensive staining. Dry.
						8	Green fine and medium sand. Some coarse sand and fine gravel. Odor. Extensive staining. Dry.
							Green fine and medium sand. coarse sand and some gravel. Odor. Extensive staining. Dry.
						9	Green fine and medium sand. Some gravel. Extensive staining. Odor. Dry.
							B.O.B. = 9.5'
						10	

REMARKS: (1) in feet relative to a common datum
(2) from top of PVC casing

ATTACHMENT B-2

Protocols for Specific Capacity Test and Results

Specific Capacity Test Procedure

1. Enter all pertinent data concerning the pumping well and piezometers to be measured on the data sheets provided.

2. Check to make sure that all equipment is available and functioning: electric probes, data sheets, pencils, rain gauges (if necessary), stop watches, pump, generator, water quality meters (if necessary).

3. Record water level in pumping well and piezometers before pump is inserted in pumping well.

4. Insert pump in well, allow five minutes for water level to equilibrate, record new water level in pumping well and piezometers.

5. Start the pump and run a short term (15-30 minute) drawdown-recovery test pumping at a constant rate. The pumping rate selected should be based on estimates of well yield from soil samples collected during drilling.

6. Record water levels on a predetermined time schedule.

7. If one of the first closely-spaced readings is missed, just catch the next one (do not attempt to alter data).

8. Throughout note any changes pertinent to the test such as: changes in water color or turbidity; time and nature of any discharge fluctuations; time and length of any temporary pump shutdown; effects of any nearby pumping wells; and precipitation events.

9. If there is a shutdown (even if it's brief) measure water levels in at least the pumping well.

10. At the end of the drawdown test, recovery levels should be measured until water levels return as close as possible to pre-test levels. The drawdown schedule for water level measurements should be followed during recovery.

TABLE - Pumping Tests - Frequency of Readings

Elapsed Time (minutes)	Frequency of Measurements
0 - 5	Every 30 seconds
5 - 10	Every minute
10 - 30	Every 2 minutes
30 - 60	Every 5 minutes
60 - 120	Every 10 minutes
120 - 180	Every 20 minutes
180 - 360	Every 30 minutes
360	Every hour

CONSULTING GROUND-WATER GEOLOGISTS
ROUX ASSOCIATES INC
11 STEWART AVENUE
HUNTINGTON, NEW YORK 11743

PUMPING TEST FORM

PROJECT DEKNATEL WELL MW-3 LOCATION 18' FROM STORAGE BLDG, 10.5' FROM FENCE PAGE 1 OF 1

DATE 2-12-88 M.P. Top of PVC HT. ABOVE G.S. 0.0 W.L. MEAS. W/ M-SCOPE
M.P. ELEV. ______ MEAS. BY JOHN - NEEMAN

r 2" PUMPING WELL MW-3 Q 7.2 GPM ORIFICE ______ WEATHER Cloudy, Rain
SCREEN 70-50.29'

✓ DRAWDOWN ___ RECOVERY ✓ LOCATION SKETCH TEST START 1:19 P.M END 2:04 P.M.

TIME	t	HELD	WET	D.T.W.	s			MANO-METER	Q	WATER TEMP.	REMARKS
1.19	0			61.38'	—						
	5			61.86	.48						
	1			61.80'	.42						
	1.5			62.00	.62						
	2.0			61.93	.55						
	2.5			62.02	.62						
	3.0			62.02'	.64						
	3.5			62.01'	.63						
	4.0			62.01'	.63						
	4.5			62.01	.63						
	5.0			62.01'	.63				7.5 GPM		
	6.0			62.02	.64						
	7.0			62.01	.63						
	8.0			62.02'	.64						
	9.0			62.01'	.63						
	10.0			62.02	.64				6.67 GPM		
	12.0			62.02'	.64						
	14.0			62.02'	.64				7.0 GPM		
	16.0			62.01'	.63						
	18.0			62.02'	.64						
	20.0			62.02'	.64						
	22.0			62.02'	.64				7.14 GPM		
	24.0			62.03'	.65						
	26.0			62.03	.65						
	28.0			62.03'	.65						
	30.0			62.03'	.65						
	35.0			-					7.5 GPM		
	45.0			62.02	.64						

CONSULTING GROUND WATER GEOLOGISTS
ROUX ASSOCIATES INC
11 STEWART AVENUE
HUNTINGTON NEW YORK 11743

PUMPING TEST FORM

PROJECT DEKNATEL WELL MW-3 LOCATION 10' FROM STORAGE BLDG, 10' FROM FENCE PAGE 1 OF

DATE 2-12-93 M.P. TOP OF PVC M.P. ELEV. HT. ABOVE G.S. 0.0 W.L. MEAS. W/ M SCOPE MEAS. BY SHEEHAN/SC...

r 2" PUMPING WELL MW-3 SCREEN 70' - 50' Q — ORIFICE WEATHER CLOUDY, RAIN

__ DRAWDOWN ✓ RECOVERY ✓ LOCATION SKETCH TEST START 2:04 P.M. END 2:04 P.M.

TIME	t	HELD	WET	D.T.W.	s			MANO-METER	Q	WATER TEMP.	REMARKS
2:04	0			62.02	—						
	.5			61.34	.32						
	1.0			61.46	.44						
	1.5			61.46	.44						
	2.0			61.46	.44						
	2.5			61.45	.43						
	3.5			61.46	.44						

ATTACHMENT B-3

Ground-Water Sampling Protocols
and Completed Data Sheets

GROUND-WATER SAMPLING PROCEDURE - VOLATILE ORGANICS AND OTHER CONSTITUENTS

1. Identify the well and enter the number in the field notebook.

2. Cut a slit in one corner of a new plastic sheet and slip it over and around the well, creating a clean surface onto which the sampling equipment can be positioned. **Do not kick, transfer, drop or in any way let soil or other material fall ont this sheet unless it comes from inside the well. Do not place any meters, tools, equipment, etc. on the sheet unless they have been cleaned with a clean rag to remove any sediments.**

3. Clean the top of the well off with a clean rag and remove the cap or plug placing it on the plastic sheet.

4. Clean the first 10 feet of the steel tape with a clean rag, then wash with distilled water and measure the depth to water. Record this and compute the volume of water in the well.

5. Existing wells will be purged by the hydrogeologist on site. All monitoring wells will be pumped or bailed before sampling and a minimum of three to five casing volumes will be removed. Hand bailers, submersible pumps, etc. will be clean and sediment-free prior to use.

6. Record the physical appearance of the water (color, smell, turbidity, etc) as it is pumped or bailed.

7. Prepare the bottles for receiving their samples (labels, place on ice, etc.).

8. After the well has been purged and developed, a stainless steel/teflon bailer will be used to collect the ground-water sample. This bailer will have been thoroughly pre-cleaned. Immediately prior to lowering in the well, rinse three volumes of distilled water through the bailer. In addition, the first three bailer volumes obtained from the well should be discarded. Use non-absorbent polyethylene cord to lower the bailer into the well. This cord will be discarded after use in the well.

9. Appropriate pre-cleaned, VOA sample bottles supplied by the laboratory are required. Fill bottles to the top creating a convex surface with no air bubbles. Place the cap on tightly. Gently turn the bottle over and tap lightly on the soft surface to insure

that no bubbles are present. Seal the cap further by using vinyl electrical tape.

10. Fill the other containers provided by the laboratory according to directions.

11. Label the bottle with location number, date and other pertinent information. Record all information in field notebook. Cool the sample immediately on ice. Maintain the samples in a secured area, maintain chain of custody and deliver to the laboratory within twenty-four hours.

12. After the last sample is collected, measure and record the temperature, conductivity, pH, and the physical appearance of the water.

13. Replace the well cap and cover the well.

14. Decontaminate the bailer and/or pump.

15. Discard the cord, rags, gloves, and plastic sheeting in an appropriate manner.

WELL SAMPLING DATA

Well Number: MW-2 Date: 2-11-88 Sampled By: SHEEHAN/SUCHARSKI

Time at Start: 12:00 Weather: PARTLY CLOUDY, 35°F

Tape Held At: Wet Cut: Depth to Water: 61.18

Depth to Well Bottom: 69.55' Length of Water Column (LWC): 8.37'

Volume of Water in Well = LWC x C = 1.34 gallons

C = (for 1½" diam. wells) 0.07; (for 2" diam. wells) 0.17;
(for 4" diam. wells) 0.64 = gal.

Physical Appearance at Start:

Color: Brown Odor: None Turbidity: TURBID, SILTY

Remarks: BAILED 5 GALLONS

Type of samples collected, preservations and bottles used:
COLLECTED 2 SAMPLES OF WATER USING A TEFLON BAILER AND A 1-QUART TEFLON SEALED JAR.

Conductivity: 550μ

Physical Appearance After Sampling:

Color: Brown Odor: None Turbidity: TURBID, VERY SILTY

Remarks:

Amount of Water Removed Before Sampling: 5 GALLONS

Did Well Go Dry?: No

Time at Finish: 1:20p

Laboratory Name, Number and Location: RECRA ENVIRONMENTAL INC
111 WALES AVE.
TONAWANDA N.Y. 14150
(716) 691-2600

Method of Sample Collection:
TEFLON BAILER

WELL SAMPLING DATA

Well Number: MW-1 | Date: 2-11-88 | Sampled By: SHEEHAN/SUCHOS

Time at Start: 12:00p | Weather: PARTLY CLOUDY, 35°

Tape Held At: | Wet Cut: | Depth to Water: 61.67'

Depth to Well Bottom: 69.60' | Length of Water Column (LWC): 7.93'

Volume of Water in Well = LWC x C = 1.3 gal

C = (for 1½" diam. wells) 0.07; (for 2" diam. wells) 0.17;
(for 4" diam. wells) 0.64 = gal.

Physical Appearance at Start:

Color: Brown | Odor: None | Turbidity: TURBID, SILTY

Remarks: BAILED 4 GALLONS

Type of samples collected, preservations and bottles used:
COLLECT 2 SAMPLES USING TEPHLON BAILER AND A 1-QUART TEPHLON SEALED JAR.

Conductivity: 800 u

Physical Appearance After Sampling:

Color: Brown | Odor: None | Turbidity: TURBID, SILTY

Remarks:

Amount of Water Removed Before Sampling: 4 GALLONS

Did Well Go Dry?: No

Time at Finish: 1:00p

Laboratory Name, Number and Location: RECRA ENVIRONMENTAL INC, 716-691-2600, 111 WALES AVE, TONAWANDA N.Y. 14[illegible]

Method of Sample Collection:
TEPHLON BAILER

WELL SAMPLING DATA

Well Number: MW-1 Date: 3-15-88 Sampled By: SHEEHAN/BEACON

Time at Start: 9:00A Weather: CLOUDY, COLD

Tape Held At: Wet Cut: Depth to Water: 61.44'

Depth to Well Bottom: 69.60' Length of Water Column (LWC): 8.16'

Volume of Water in Well = LWC x C = 1.387 gal

C = (for 1½" diam. wells) 0.07; (for 2" diam. wells) 0.17;
(for 4" diam. wells) 0.64 = gal.

Physical Appearance at Start:

Color: BROWN Odor: None Turbidity: VERY TURBID

Remarks: BAILED 5 GALLONS

Type of samples collected, preservations and bottles used:

COLLECTED A ONE QUART SAMPLE OF WATER USING A TEPHLON BAILER AND A 1-QUART TEPHLON SEALED JAR.

Conductivity:

800μ, pH - 5.71, Temp 13°C

Physical Appearance After Sampling:

Color: BROWN Odor: None Turbidity: V. TURBID

Remarks:

Amount of Water Removed Before Sampling: 5 GALLONS

Did Well Go Dry?: No

Time at Finish: 11:00A

Laboratory Name, Number and Location: RECRA ENVIRONMENTAL INC LAB (716) 691-2600 111 WALES AVE. TONAWANDA, N.Y. 14150

Method of Sample Collection:

TEPHLON BAILER

WELL SAMPLING DATA

Well Number: MW-2 Date: 3-15-88 Sampled By: SHEEHAN/BEACOM

Time at Start: 9:00A Weather: CLOUDY, COLD

Tape Held At: Wet Cut: Depth to Water: 60.91'

Depth to Well Bottom: 69.55' Length of Water Column (LWC): 8.64'

Volume of Water in Well = LWC x C = 1.47 gal

C = (for 1½" diam. wells) 0.07; (for 2" diam. wells) 0.17;
(for 4" diam. wells) 0.64 = gal.

Physical Appearance at Start:

Color: BROWN Odor: NONE Turbidity: VERY TURBID

Remarks: BAILED 5 GALLONS

Type of samples collected, preservations and bottles used:
COLLECTED 2 WATER SAMPLES USING TEPHLON BAILER AND A 1-QUART TEPHLON SEALED JAR.

Conductivity: 600µ, pH - 5.91, Temp 12°C

Physical Appearance After Sampling:

Color: BROWN Odor: NONE Turbidity: VERY TURBID

Remarks:

Amount of Water Removed Before Sampling: 5 GALLONS

Did Well Go Dry?: NO

Time at Finish: 11:15A

Laboratory Name, Number and Location: RECRA ENVIRONMENTAL INC (716)-691-2600 111 WALES AVE TONAWANDA NY 14150

Method of Sample Collection: TEPHLON BAILER

WELL SAMPLING DATA

Well Number: MW-3 Date: 3-15-88 Sampled By: SHEEHAN/BEACON

Time at Start: 9:00A Weather: CLOUDY, COLD

Tape Held At: Wet Cut: Depth to Water: 61.24'

Depth to Well Bottom: 69.37' Length of Water Column (LWC): 8.13'

Volume of Water in Well = LWC x C = 5.20 gal

C = (for 1½" diam. wells) 0.07; (for 2" diam. wells) 0.17;
(for 4" diam. wells) 0.64 = gal.

Physical Appearance at Start:

Color: BROWN Odor: NONE Turbidity: VERY TURBID

Remarks: BAILED 18 GALLONS

Type of samples collected, preservations and bottles used:
COLLECTED 3 WATER SAMPLES USING A TEPHLON BAILER AND A 1-QUART TEPHLON SEALED JAR.

Conductivity: 700μ, pH - 5.88, Temp 13°C

Physical Appearance After Sampling:

Color: Brown Odor: None Turbidity: Very TURBID

Remarks:

Amount of Water Removed Before Sampling: 18 GALLONS

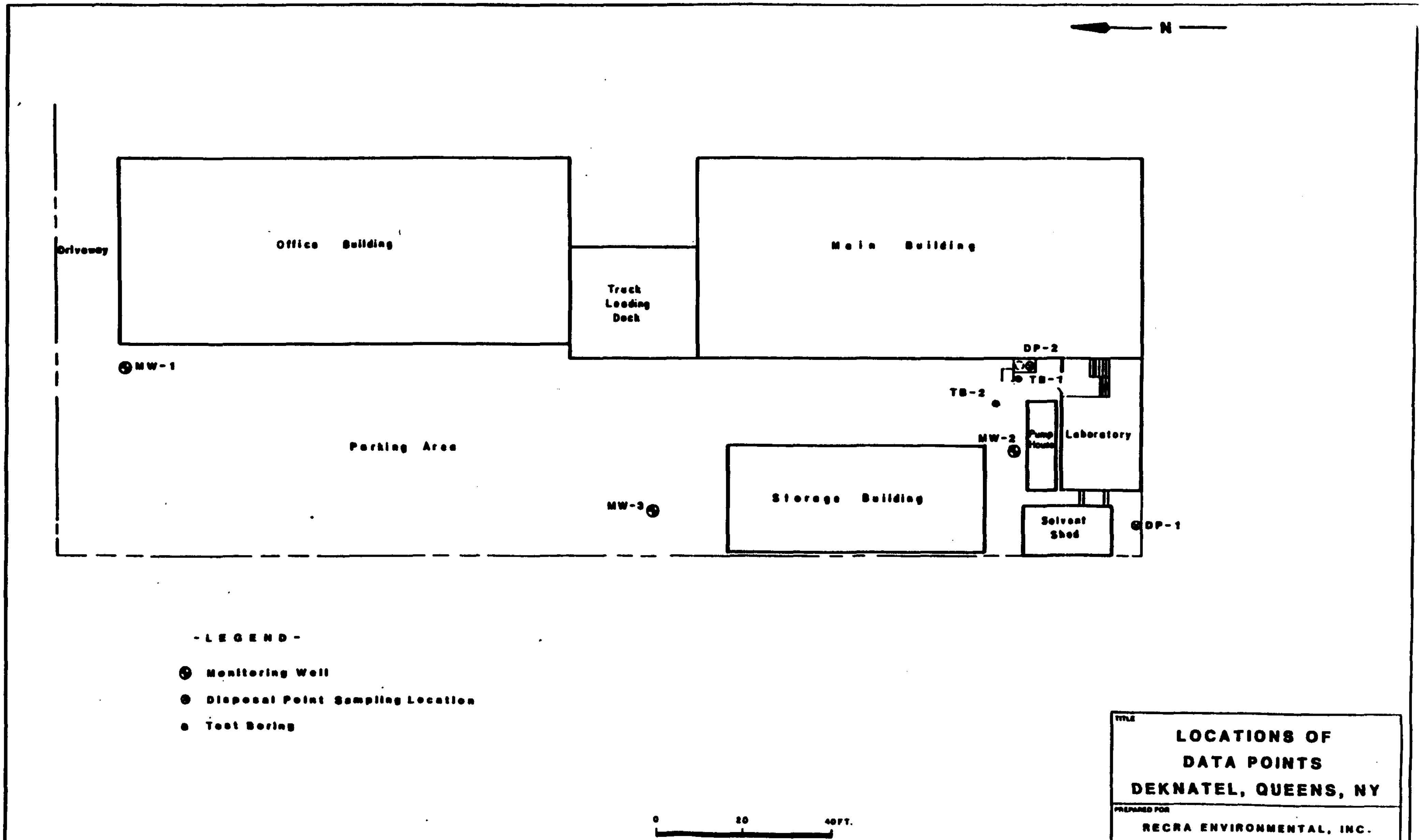
Did Well Go Dry?: No

Time at Finish: 11:30A

Laboratory Name, Number and Location: RECRA ENVIRONMENTAL INC. (716)-691-2600 111 WALES AVE. TONAWANDA NY 14150

Method of Sample Collection:

TEPHLON BAILER

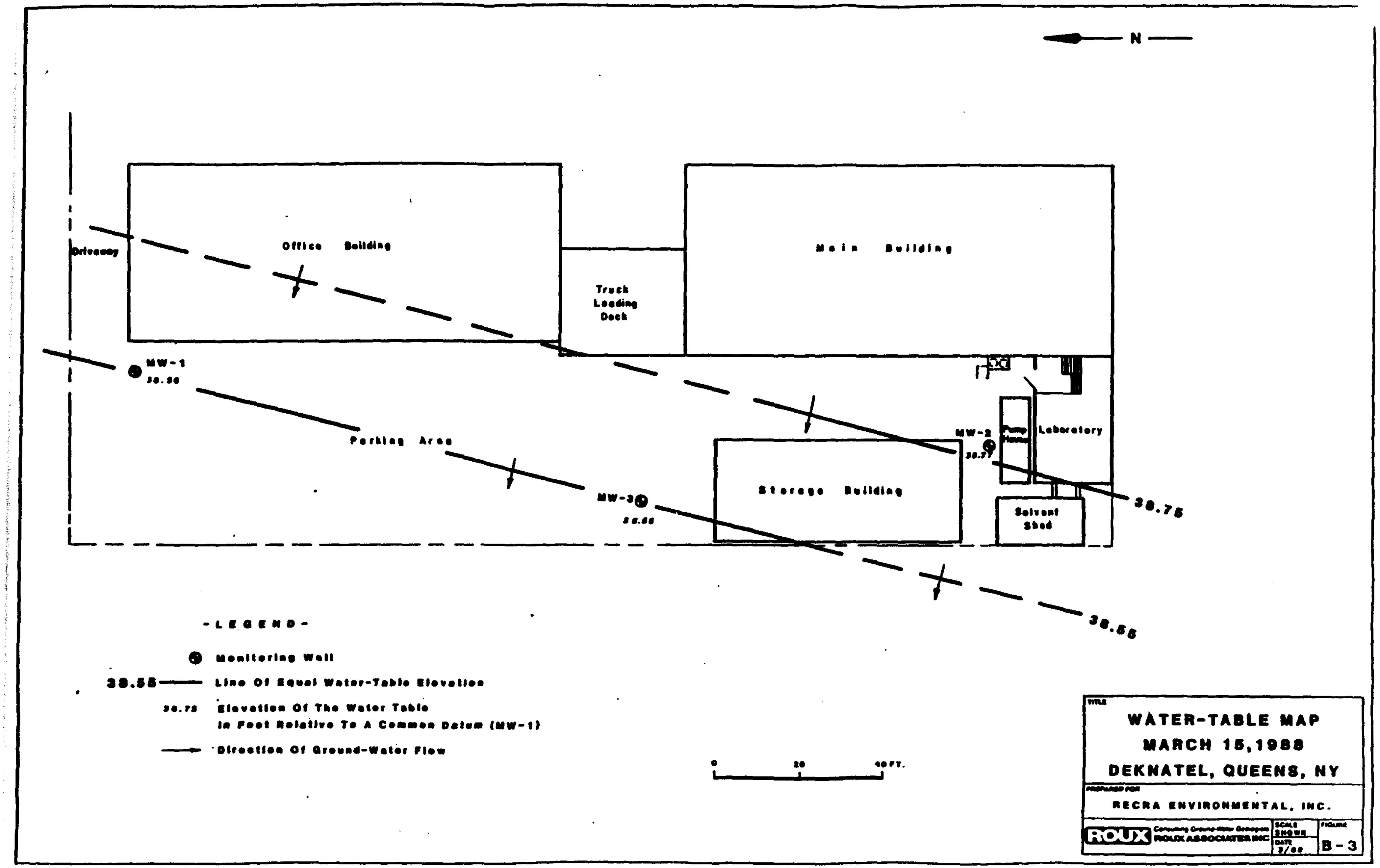


TITLE
LOCATIONS OF DATA POINTS DEKNATEL, QUEENS, NY

PREPARED FOR
RECRA ENVIRONMENTAL, INC.

ROUX Consulting Ground-Water Geologists ROUX ASSOCIATES INC

SCALE: SHOWN | DATE: 3/88 | FIGURE: B-1


N
Driveway
Office Building
Truck Loading Dock
Main Building
Laboratory
Pump House
Solvent Shed
Storage Building
Parking Area
MW-1
MW-2
MW-3
38.75
38.55
- LEGEND -
Monitoring Well
38.55 Line Of Equal Water-Table Elevation
38.75 Elevation Of The Water Table In Feet Relative To A Common Datum (MW-1)
Direction Of Ground-Water Flow
0 20 40 FT.
TITLE
WATER-TABLE MAP
MARCH 15,1988
DEKNATEL, QUEENS, NY
PREPARED FOR
RECRA ENVIRONMENTAL, INC.
ROUX
ROUX ASSOCIATES INC
SCALE SHOWN
FIGURE B-3

APPENDIX C

STANDARD OPERATING PROCEDURES

'/ST4

RECRA ENVIRONMENTAL, INC.

Chemical Waste Analysis, Prevention and Control

STANDARD OPERATING PROCEDURES

REVISED APRIL, 1989

Arun K. Bhattacharya, Ph.D.
Laboratory Director
Senior Vice President

Robert K. Wyeth
Corporate QA/QC Officer
Executive Vice President

Audubon Business Centre • 10 Hazelwood Drive, Suite No. 106 • Amherst, New York 14150 • (716) 691-2600

STANDARD OPERATING PROCEDURES

REVISED APRIL 1989

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APPENDICES

1.0 INTRODUCTION

The purpose of this document is to present and describe the standard operational procedures which are employed at Recra Environmental, Inc. Laboratories are located at 111 Wales Avenue and 505 Fillmore Avenue in Tonawanda, New York and 10 Hazelwood Drive in Amherst, New York.

In order to insure that established policies are indeed carried out, this manual has been assembled to document exact procedures to be followed on a daily basis within the laboratory operation.

The contents of this manual are arranged in order of occurrence at the facilities once a sample has been received for analysis. A flow chart describing the sequence of procedures is presented in Figure 1.

The general categories to be addressed are as follows:

- Organizational Structure
- Sample Receipt
- Sample Preservation
- Sample Storage
- Analysis
- Quality Control
- Reporting
- Sample Disposal

The modern environmental laboratory of today is extremely information intensive in its operations. The simplest analytical test can require the involvement of several individuals and the gathering of significant amounts of information before the final product, an analytical report, can be issued. If any piece of needed information is unavailable for any reason, the quality of the final product can be jeopardized. In some cases, missing information may not allow a final product to be complete at all. In such cases, resampling and/or reanalysis may be required.

In order to assure that all required procedures are followed and that all needed information is gathered and maintained, these standard operating procedures (SOPs) have been created. They are intended to provide a firm structure within which laboratory operations are to be conducted in a consistent and defined manner.

2.0 ORGANIZATIONAL STRUCTURE

Recra Environmental, Inc., as a corporate entity has the singular responsibility of providing consulting and analytical services to our clients relative to the management of hazardous waste. Recra Environmental laboratories represents the avenue by which Recra Environmental, Inc. provides these analytical services. Figure 2 illustrates the position of Recra Environmental laboratories within the overall organizational structure of Recra Environmental, Inc. The management of Recra Environmental, Inc. rigidly adheres to accepted protocols and methodologies and is dedicated to a program that provides an analytical product of consistent quality. The organizational chart for Recra Environmental laboratories is shown in Figure 3.

3.0 SAMPLE RECEIPT

A large number of details are required at the time of sample receipt to insure proper protocols are followed. The following paragraphs provide detail on each aspect of sample receipt.

3.1 Sample Controller

A full-time, permanent Sample Controller is assigned the responsibility of sample handling for the laboratory. It is the responsibility of the Sample Controller to receive all incoming samples at the laboratory. Once received, the Sample Controller insures that all samples are received in good condition (ie., unbroken, cooled, etc.). He insures that the associated paperwork, such as Chain of Custody sheets, are completed and is responsible for signing the Chain of Custody forms. The Sample Controller sees that the samples are subsampled if necessary and preserved properly for the specific parameters of interest. The Sample Controller is responsible for the final disposal of all samples once such disposal authorization is received from the Laboratory Operations Manager.

3.2 Chain of Custody

Recra's Chain of Custody procedures are based upon the NEIC policies and procedures (EPA-330/9-78-001-R).

Upon sample receipt the Sample Controller checks the Chain of Custody sheet (Figure 4) which is initiated by the sampler.

If samples are received after the full-time Sample Controller has finished his shift, either second or third shift personnel must inspect and take over possession of the samples and properly sign the Chain of Custody. The samples are then to be stored inside the inner cooler (chilled to 4°C).

Upon arriving the next business morning, the Sample Controller takes possession of the samples and signs for them on the Chain of Custody.

The custody form is checked for the following items:

1. Project Name (optional)
2. Sampler's Signature
3. All samples are given a unique identification
4. All samples and bottles listed have been received
5. All appropriate signatures are in place
6. If all items are in order, controller signs that samples were received by laboratory
7. Date/time samples are recorded
8. Job # is filled in once job # is assigned

3.2.1 Additional Checks for EPA Samples

1. Presence or absence of airbills
2. Presence or absence of EPA traffic reports or SAS (Special Analytical Services) packing lists
3. Presence or absence of custody seals or shipping and/or sample containers and their condition
4. Presence or absence of sample tags
5. Sample tag ID numbers if not recorded on the Chain of Custody record(s) or packing list(s)
6. Condition of the shipping container
7. Condition of the sample bottles
8. Verification of agreement or non-agreement of information or receiving documents

9. Resolution of problems or discrepancies with the Sample Management Office
10. Ensure that discrepancies and their resolution with the Sample Management Office are documented

Once all checks have been made, the original Chain of Custody form is attached to the analytical services request form (Figure 5), which will be filed in the central job folder located at the Hazelwood Office Complex.

3.3 Analytical Services Request Form

Once samples are received by the Sample Controller, the Customer Service Representative is requested to complete an analytical services request form (ASRF), (Figure 5).

The analytical services request form provides necessary information such as tests to be performed, client address, telephone number, due date, safety precautions, etc.

The items to be completed are as follows:

1. Project Number - Each client is assigned a unique project number by the Accounting Department for billing purposes.
2. Initiator of Request - Recra employee most familiar with this request.
3. Sales Contract - Salesperson involved in project - if any.
4. Date of Request - Date when ASRF was filled out.
5. Requested Completion Date - Self-explanatory.
6. Client Name and Address - Self-explanatory.

7. Carbon Copies - Are carbon copies required and if so, who receives them.

8. Telephone Number - Self-explanatory.

9. Chain of Custody - Indicates whether samples were received under Chain of Custody.

10. Sample Date - Sampling date is entered. If multiple samples have varying sample dates the box marked "See log for sample dates" is checked.

11. Sample I.D. - If sample identifications are long or a large number of samples are involved, this box is checked to indicate that the full sample identifications can be found in the sample inventory log.

12. Preserved in Field - The appropriate box is checked depending upon whether the samples were preserved in the field or in the laboratory.

13. Collected By - self-explanatory.

14. Field Report - This box is checked if a field report is to accompany the analytical report.

15. Sample Type - Are samples soils, waters, etc. Each matrix type requires a separate ASRF to be filled out. For example, if soils and waters were sent in together, two (2) separate ASRF's would be filled out and separate job numbers would be assigned.

16. Expected Levels - If expected contamination levels are known, one (1) of the appropriate boxes is checked.

    L = Low M = Medium H = High U = Unknown

17. Sample History - Any pertinent background on the samples is provided.

18. Anticipated Number of Samples - if known - The anticipated number of samples to come in for an entire project is listed.

19. Analytical Parameter - Requested tests are listed under each appropriate category. For example:

TESTS	CATEGORY
Arsenic, Lead, Silver	Metals
BOD, Chloride, Sulfate	Water Quality (WQ)
Trihalomethanes, Pesticides	GC/LC
Volatiles - 624	GC/MS

20. Sample Identification - The sample identifications are listed along with the actual number of samples for each area.

21. Volatile Samples - The actual number of volatile samples are listed along with field blank information.

22. Specific Requirements - Any special requirements such as those listed below are indicated in this space.
    - Special report content
    - Send report by special means
    - Special safety precautions - all samples are considered potentially hazardous, however, if specific hazards are known they are indicated.

23. Job # - Each ASRF is assigned a unique number such as 89-1000. The first two (2) digits indicate the year the samples were received. The next digits are assigned in chronological order as received. These numbers begin at one (1) each calendar year. For example, the first job of 1990 will be 90-001. Occasionally related samples will

be received over the course of several days or weeks. In these cases the job numbers also contain a letter designation (example: 89-1000A, 89-1000B, etc.) to indicate they are related samples for reporting purposes.

24. Job Date - Date the job number was assigned.

25. Samples Received - Date samples were received.

26. Quote # - If known, quote number is listed to aid in pricing of job. A.S.D. - indicates, analytical services department use only.

27. Customer Service Representative Signature - Once the ASRF is checked for accuracy the Customer Service Representative signs the form to document the same.

28. Sample Controller Signature - Once the ASRF is checked for accuracy the Sample Controller signs the form to document the same.

3.4 Sample Inventory Log

The sample inventory log is filled out by the Sample Controller and is used to record information related to sample receipt. A blank page from the analytical sample inventory log is presented in Figure 6. The following items are entered or checked by the Sample Controller:

1. Date Received - Self-explanatory.
2. Project # - Each client is assigned a unique project number by the Accounting Department for billing purposes.
3. Client - Self-explanatory.
4. Job # - Each ASRF is assigned a unique job number such as 89-1000. The first two (2) digits indicate the year the samples were

received. These numbers begin at one (1) each calendar year. For example, the first job of 1990 will be 90-001. Occasionally related samples will be received over the course of several days or weeks. In these cases the job numbers also contain a letter designation (example: 89-1000A, 89-1000B, etc.) to indicate they are related samples for reporting purposes.

5. Radiation Check - All incoming samples are screened for radiation. This box is checked to indicate the screen has been performed.

6. Preservation - The appropriate box is checked depending upon whether the samples were preserved in the field or will be preserved in the laboratory.

7. Delivery - Indicates the method of delivery for the samples. "Field" indicates that Recra personnel delivered the samples.

8. Cool - Indicates whether the samples were received in a cooled condition. Appropriate box is checked.

9. Sample I.D. - The identification for each sample is listed in this location.

10. Sampling Date - If provided, the date of sampling is recorded.

11. Bottle Description - Comments - This section records the number and type of bottles received for each sample. The abbreviations listed represent the following bottle types:

FS = French Square (available only in glass)

P = Polyethylene

AG = Amber Glass

GW = Glass Wide-Mouth

VOA = Standard 40 ml Volatile Vial

The first blank is used for the number of bottles received of a particular type while the second blank indicates the size in ounces. For example, if four (4) sixteen (16) ounce french square bottles were received for a particular sample, the blanks would be filled in as follows:

(4 x 16 FS).

Any pertinent comments would also be listed under this heading. Any field blank received with samples is listed as a separate sample.

3.5 Radiation Check

Due to the possible potential for low level radioactivity to be present in incoming samples, all samples are screened using a Geiger Counter at the time of sample receipt.

The radiation screen is performed by the Sample Controller and is documented in the sample inventory log (See Figure 6).

The procedure which is followed is presented below.

3.5.1 Radiation Screen

1. A Model E-120 Geiger Counter manufactured by the Eberline Instrument Company is used to conduct the radiation screen.
2. The speaker switch on the right hand side of the instrument is

placed in the "on" position.

3. The sensitivity switch is moved from the "off" position to the "BATT" position to check the battery. The needle must read in the Batt Ok range in order to proceed. If batteries are bad, see Lab Manager for replacements.
4. Once batteries have been determined to be OK, switch the range switch to the most sensitive position (X 0.1).
5. Remove the hand probe (sleeve closed) and take a background reading away from any samples. Average background reading is usually less than 0.04 mR/HR.
6. Hold the hand probe close to all sample containers and determine if readings appear higher than the background.
7. If readings are low (negative) (some counts are expected) process the samples and indicate the screen has been performed in the sample inventory log.
8. If readings are believed to be higher than background, the Sample Controller must notify his supervisor for appropriate action.
9. When screen is completed, be sure to turn both switches to the "off" position.

4.0 SAMPLE PRESERVATION

In order to generate reliable results many parameters must either be tested for immediately or preserved to prevent degradation. Whenever possible we encourage clients to preserve samples in the field; however, when this has not taken place the samples must be preserved upon receipt at the laboratory. The procedures which are employed are described in this section.

4.1 Sample Container Cleaning Procedure

All sample containers provided to clients or used by Recra field personnel are properly cleaned for the appropriate trace analysis. All sample bottles utilized for sample splitting are subjected to the same cleaning procedures listed below:

- All polyethylene bottles (for inorganic analysis) are:
  1. soap washed
  2. tap water rinsed
  3. nitric acid washed 25% volume/volume nitric acid/deionized water
  4. rinsed with copious quantities of deionized water (at least four (4) rinsings
- All glass bottles except volatile vials (for organic analysis) are:
  1. soap washed
  2. tap water rinsed
  3. rinsed with acetone (pesticide grade)
  4. rinsed with copious quantities of deionized water (at least six (6) rinsings and two (2) complete fillings of bottle to overflowing).
- All volatile vials are:
  1. soap washed
  2. rinsed with copious quantities of deionized water (at least six (6) rinsings)
  3. thiosulfate added (two (2) drops of a 10% solution)
  4. dried for one (1) hour in a 103 C° oven (without caps and septa)
  5. cooled and capped with precleaned septa (soap washed and rinsed with deionized water, dried at 103°C for one (1) hour.)

All sample containers are discarded after their initial use to eliminate the possibility of contaminating samples. Volatile field blanks are provided on a routine basis to check for sample contamination in the field and during sample storage. All volatile vials contain sodium thiosulfate for quenching of residual chlorine unless specified otherwise by the client. Clients are discouraged from providing their own sampling containers due to the possibility of sample contamination.

4.2 Preservation Methods

Preservation of samples is performed according to recommendations presented in the EPA publication, Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Revised March 1983 (Table 1).

For organic analyses, preservation is conducted according to the EPA publication, "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act" 40 CFR Part 136, October 1984.

Table 1 also lists the sample volumes required for each parameter in order to obtain specified detection limits in the methods.

4.3 Sample Filtration

Occasionally clients request that filtration of the sample be performed prior to conducting various analyses, such as soluble metals. The following procedure is utilized when incoming samples require such filtration.

4.3.1 Sample Filtration Procedure

Filtering flask and filtering funnel must be thoroughly cleaned before use utilizing the following steps:

A. Wash all items with soap, warm water and brush.

B. Rinse items with large quantities of tap water.

C. Rinse items with 25% Nitric Wash (Caution)

D. Rinse items with copious quantities of deionized water.

E. Assemble base of filtering apparatus to vacuum source, making sure that filter support is of plastic type and not metal.

   Note: Samples high in organic material (oil or solvent) may require the use of the metal filter support since such samples can dissolve the plastic supports. If such a situation arises, the supervisor should be notified before filtration proceeds.

F. Pre-wet the filter paper which is a 0.45 um membrane filter (Gelman GN-6) with a small amount of deionized water and center on filtration support. Turn on vacuum at this point.

G. Place the filtration funnel over the filter making sure the filter remains centered.

H. Pass approximately 200 ul of deionized water through filter and discard contents of collection flask.

I. Pass a small amount of sample (25 ul minimum) through the filter and swirl to rinse collection flask and discard.

   Note: Do not allow air to be drawn through filter for more than approximately thirty (30) seconds. Turn off vacuum pump to avoid drying of filter and collection of airborn dust.

J. The vacuum at the pump should be set at least fifteen (15) in. of Hg vacuum with sample going through the filter. The pump cannot be accurately set with air being drawn through filter.

K. Thoroughly mix sample by shaking and place in filtration funnel. Turn on vacuum pump. Add small increments of sample so that you can anticipate when a filter is becoming clogged. Try to avoid large amounts of sample in funnel with a clogged filter situation. If filter becomes clogged, turn off vacuum, discard remaining sample in funnel, discard clogged filter being careful to avoid particulates getting on filter support. Place new filter on support using residual sample on support to wet filter and continue filtration procedure. Continue filtration until sufficient filtrate is collected for required tests.

Note: If filtration is very slow, various larger pore size prefilters may be employed before final 0.45 um filtration. See supervisors for specifics.

L. Transfer collected filtrate into appropriate sample bottles which have been precleaned (see bottle cleaning section) and preserved as necessary (see preservation section).

M. If more samples need filtration repeat procedure to step A.

4.4 Sample Splitting and Preservation Procedures

Occasionally samples are received which have not been preserved in the field for the various parameters which are to be determined. In such cases sample splitting (subsampling) and preservation is performed in the laboratory.

Since requested parameters vary with each sample or set of samples (job) each preservation scheme may be slightly different.

All solid or liquid samples requiring volatile analysis which have not been received in volatile vials are transferred to such vials upon sample receipt. Clients are discouraged from submitting volatile samples in containers other than VOA vials.

The preservation of all samples is accomplished according to the criteria presented in Table 1 taken from the E.P.A. publication, Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, Revised March 1983.

During all preservation operations the following procedures are followed:

1. All nitric acid used for preservation purposes is special metals grade acid, certified to be low in trace metal content.
2. In all cases where polyethylene or glass sample bottles are considered acceptable, polyethylene bottles are employed.
3. pH is checked by placing a drop of sample onto pH indicator paper. Indicator paper is never placed in the sample container due to the potential for sample contamination.
4. All cyanide samples are checked for residual chlorine and if positive, ascorbic acid is added according to the methodology.
5. All subsample bottles used are cleaned according to the same procedure employed for sample bottles (see Section 4.1).

6. Sample bottles are thoroughly mixed by shaking just before transfer to subsample bottles. Once the appropriate preservations are added the subsample bottle is labelled with the following information. A typical sample/subsample label is presented in Figure 7.

- Job #
- Sample I.D.
- Parameters to be tested from the particular subsample bottles
- Preservation Code

The preservaton code is a four (4) digit code which indicates how the subsample has been processed. The coding system is as follows:

1. The first digit indicates whether the subsample has been filtered. A zero (0) is entered for no filtration and a one (1) is entered if filtration was performed.
2. The second digit indicates whether the subsample requires refrigeration. A zero (0) if it doesn't, a one (1) if it does.
3. The last two (2) digits indicate what reagents have been added if any.

00 = none

01 = HNO_3 pH <2

02 = H_2SO_4 pH <2

03 = HCL pH <2

05 = NAOH pH >12

06 = 2ml zinc acetate/100 ml + NAOH >pH9

For example, a subsample for total metals analysis would be coded 0001, since it has not been filtered, does not require refrigeration and has nitric acid added.

5.0 SAMPLE AND EXTRACT STORAGE

5.1 General Storage

Once sample splitting and preservation is completed as required, the Sample Controller transfers the samples to the following secure locations:

Cooler #1, known as the "interior cooler," is 4'X 15'X 9' and is maintained at 4°C ± 2°C with a separate cabinet for volatile samples located in the cooler.

Cooler #2, known as the "exterior cooler," is 12'X 14'X 9' and is maintained at 4°C ± 2°C.

The walk-in coolers are maintained at 4°C ± 2°C and are checked daily and recorded. The coolers have special equipment to prevent a refrigerator malfunction.

Volatile samples are stored in the separate explosion-proof refrigerator located next to the Sample Custodian's office.

Metal samples are stored in a separate sample room. The metals sample room is at room temperature.

All other samples are stored in walk-in Cooler #1 or Cooler #2. All samples are stored based upon job number which is assigned when the samples are initially received. Older jobs are stored in Cooler #1 while more recent ones are stored in Cooler #2. Each cooler contains boxes which are labelled with the job numbers in that box. All job numbers are arranged in consecutive order. For example, samples from Job 89-500 will be located after 89-499 and before 89-501.

5.2 EPA Contract Samples

Semi-volatile samples are given a job number and stored in a segregated section of Cooler #1.

Volatile samples are given a job number and stored in a segregated section of the volatile cabinet located in Cooler #1.

Metal samples are given a job number and stored in a segregated section of the metals sample room.

5.3 Extract Samples

EPA extract samples are stored by job number in a segregated area of Refrigerator #1, which is maintained at 4°C ± 2°C.

All other extract samples are stored in Refrigerator #1 or #2 by job number.

Base Neutral Acid Phenolic extracts are transferred to the Hazelwood GC/MS laboratory via the following procedure:

1. Samples to be transferred must be identified and properly labeled (based on NEIC policies and procedures: EPA33019-78-001-R).
2. Using the "Intra Company Chain of Custody" log located in the Sample Controller's room, the following items will be entered:

   A) The job number(s)

   B) Vial number(s)

   C) Destination

   D) Type of analysis

E) Date and time

F) Signature of transferee

G) Signature of Sample Controller

3. The samples to be transferred will be placed into a lockable cooler on ice.
4. A copy of the corresponding preparation log will be prepared and transferred with the samples.
5. Upon arrival, a representative of the Receiving Department will sign the "Intra Company Chain of Custody" (ICOC) Log and place the samples into a dedicated refrigeration device for storage until analyses
6. The transferee will make a copy of the ICOC log for the Receiving Department and return the ICOC log to the Sample Controller.
7. All extracts are stored in a refrigerator maintained at 4°C$\pm$2°C.

5.4 Security of Laboratory and Samples

The two (2) coolers, the VOA regrigerator, and the Metals Sample Room are locked at all times. The Sample Controller has the keys to each of the sample storage areas. The shift supervisors also have a key. A log book is maintained for each storage area and is located on the door front of, or immediately adjacent to, the storage area.

The building is secured and the security system is monitored by Wells Fargo Corporation.

The confidentiality of our client base and the necessity of sample integrity dictates that all visotors sign in and be escorted when viewing any area of Recra Environmental, Inc.

1. Visitor(s) will enter their name(s), address, date (mo./day/yr.), time and company (in remarks column) upon entry.
2. The Recra employee who is conducting the tour of the facility will:
   A) Initial the visitor's entry in the remarks column.
   B) Issue safety glasses to visitors which require them.
   C) Insure that visitors are aware of security requirements and remain with a Recra employee at all times during their tour.
   D) Collect all safety glasses before leaving the facility.

6.0 ANALYTICAL METHODOLOGY

Recra Environmental, Inc. laboratories employs a large number of methodologies due to the wide variety of sample matrices experienced in environmental and hazardous waste analysis. Tables 2 and 3 list the common parameters performed on aqueous and solid samples, respectively, along with references and Recra method numbers. Environmental Protection Agency methodology is employed whenever applicable to the specific matrix sample. These tables list the official regulatory method number (i.e., of the E.P.A.) and the appropriate reference publication. A separate Recra method number is assigned to each of the methods for internal purpose. Any pertinent comments or deviations from the referenced methodologies listed. The analytical methods specific to the CLP program can be found in Appendix II.

7.0 QUALITY ASSURANCE AND QUALITY CONTROL

This section deals with general QA/QC procedures. For specific procedures pertaining to CLP samples, see Appendix III.

7.1 Logbooks and Recordkeeping

7.1.1 Separations Laboratory Data

The sample processing for extractable organic analysis begins in the separations laboratory where a bound notebook is maintained for the purpose of recording all pertinent information regarding the extraction and clean-up (if required) for the samples. This logbook (see Figure #8) contains the following data:

- o analyst
- o extraction date
- o job #
- o sample I.D.
- o extracted volume or weight of sample
- o vial # (for extracts produced)
- o analysis type (BN, AP, Pest.)
- o glassware set

In addition:

- o initial and adjusted pH
- o emulsion level
- o method #
- o concentration date
- o clean-up date

The above information is required for either GC or GC/MS analyses. The addition of "glassware set" has proved most useful in Recra's experience. Within a laboratory such as Recra's, which is involved in the analysis of waste samples or contaminated aqueous samples, the glassware information allows for identification of one (1) specific area in which potential quality control problems may be found.

7.1.2 Gas Chromatography Data

After samples have been prepared for analysis by the separations group, the GC Department uses a series of logs and reporting forms to maintain the necessary data. The first is the bound injection log which contains the following: (see Figure #9)

- analyst
- injection date
- job #
- sample I.D./vial #
- instrument run number (auto #)
- analysis (method #)
- injection port

On the day that specific analyses are performed, a five (5) point standard curve is generated via both computer assisted raw data plotting and regression analyses, using the areas as integrated by the gas chromatograph. The integrations and the standard curves are reviewed by the analyst for consistency and accuracy, and if found acceptable (and approved by the supervisor) the sample concentrations are calculated and entered on the forms presented in Figure 10 for water, and Figure 11 for sediment. Special forms specific to CLP samples are used to record raw GC data. See Figure 12 for water and Figure 13 for soils. These forms will also contain information relative to field blanks, method blanks and solvent blanks associated with this analysis. Information/data required for these calculations are acquired from both the separations and the injection logbooks. All chromatographs, standards information, QA/QC results, copies of separations and injection logbook pages and other project specific information are permanently maintained by job # and client in separate files.

7.1.3 GC/MS Data

After samples have been prepared for analysis by the separations group the GC/MS Department uses a series of logs and reporting forms to maintain the necessary data.

The GC/MS Department records their initial sample information in a bound injection logbook (see Figure #14) which is maintained for each instrument. The log contains the following information:

- o date
- o time
- o analyst
- o file reference number - FRN
- o cartridge reference number - CRN
- o sample I.D.
- o vial #
- o job #
- o injection volume
- o extraction volume
- o final volume
- o G.C. prog.
- o EM voltage

- o threshold
- o A/D (ratio of scan rate/mass range)
- o ul of internal standard

Repeat for IS (Internal Standard) #2, 3 & 4

- o IS #1 retention time
- o IS #1 area
- o IS #1 % recovery
- o sample search - SS
- o hard copy - HC

Once the GC/MS has met EPA tuning requirements then a three (3) point calibration curve is generated, except for CLP where a five (5) point calibration curve is required. The data is recorded on log sheets such as Figures #15 and #16. Samples are then injected into the GC/MS instruments and this data is also recorded on the same log sheets. All the compounds detected are recorded on GC/MS search sheets (see Figures #17 and #18) which are used to determine the comparisons to known spectra for positive qualitative identification. Special search sheets are utilized for CLP samples (see Figure #19 and #20).

These forms will also contain information relative to blanks associated with the analysis. Information and data required for the calculations are acquired from both the GC/MS data system and the injection logbooks. All spectra, chromatograms, standards information, QA/QC results and injection log pages and other project specific information are permanently maintained by job # and client in separate files.

7.2 Standard Reference Materials (SRM's)

Standard Reference Materials (SRM's) are used for all applicable analysis. Sources of SRM's include the U.S. Environmental Protection Agency, commercially available material from EPA and/or laboratory produced solutions. SRM's, when available and appropriate, are processed and analyzed on a frequency of one (1) per set of samples, regardless of the number of samples in a set.

7.2.1 Standard Solutions

Stock and working standard solutions and separate spiking solutions are prepared from materials supplied by the U.S. EPA repository or purchased from commercially available sources. Standard curves are generated and/or verified daily for all organic procedures as opposed to simply verifying "working standard curve". Standard curves are produced once per working shift/day and/or are verified by re-analysis of mid-range standards at least every tenth sample. Standard curves are also reviewed for consistency to help identify problems that could be associated with the applicable instruments and/or the standard solutions.

7.3 Laboratory Reagent Quality

The quality of reagents used in conducting analytical determinations is continuously monitored by the laboratory staff.

All standards and reagents are prepared with chemicals that meet the American Chemical Society "Analytical Reagent Grade" standards. Special reagents are utilized for procedures which require purity beyond reagent grade. For example, nitric acid which is specially prepared to be low in trace metals is utilized as a preservation reagent and for metals digestion.

All reagent solutions are labelled as to their contents, date prepared, and the analyst's initials. In addition to analyzing method blanks to check for reagent contamination, the reagents are continuously observed for signs of degradation, such as precipitation, change in color, or mold formation. Unstable reagents, such as various titrants, are standardized each day they are used.

7.4 Laboratory Water

The laboratory water used for making reagents and rinsing of glassware is constantly monitored by an in-line meter to meet and exceed the electrical conductivity requirements of TYPE I water described in the EPA Quality Control Handbook, March 1979.

7.5 Solvents

All laboratory solvents utilized for sample extractions are pesticide grade. Solvents are checked for purity on a continuing basis for compounds which may interfere with the specific analysis being performed.

7.6 Gases

Gases used for chromatographic procedures are high purity or ultra high purity and are equipped with in-line scrubbers to remove trace constituents. These scrubbers take the form of oxygen traps, molecular sieves, and moisture traps. Each is useful for specific applications in gas chromatography. Various combinations of the above scrubbers are employed depending on the particular instrument requirements.

7.7 Laboratory Glassware

Whenever possible, disposable glassware is employed to reduce the possibility of cross-contamination of samples. Glassware used for metals analyses is cleaned according to the following procedure:

1. Glassware is rinsed with a 1:1 nitric acid-water mixture
2. Thorough rinsing with tap water
3. Final rinsing is accomplished with copious quantities of deionized water

Organic glassware is cleaned according to the following procedure:

1. Rinsed with last solvent used
2. Rinsed with reagent grade acetone
3. Tap water rinsed
4. Detergent washed
5. Tap water rinsed
6. Nitric acid rinsed (25% v/v)
7. Deionized water rinsed
8. Rinsed with reagent grade acetone
9. Rinsed with pesticide grade hexane

7.8 Specific Quality Control Procedures

The Quality Control Program in effect at Recra is based upon recommendations contained in the EPA Handbook for Analytical Quality Control in Water and Wastewater Laboratories.

7.8.1 Duplicates

A minimum of ten (10) percent of all samples analyzed by the laboratory are analyzed in duplicate. A duplicate analysis is performed for every set regardless of the number of samples in each set. The information from duplicate analyses is used to indicate the precision or reproducibility of the sample data generated and is recorded on a precision quality control chart (Figure 21). The precision chart presented is typical charts used to monitor laboratory precision and is developed based upon information presented in Section 6 of the EPA Handbook of Analytical Quality Control in Water and Wastewater Laboratories, (March 1979), 600/5-79-019. All precision charts are approved by the Corporate Quality Assurance Officer and are reviewed at least semi-annually.

For informational purposes, a detailed description of how the chart was developed follows. In order for this type of chart to be effective, a separate precision chart must be developed for various concentration levels. The chart presented in Figure 21 was developed for Total Chromium determinations in the range of 0-0.5 mg/l. A series of twenty-five (25) replicate Total Chromium determinations were employed to develop the chart. The range (R) represents the difference between two (2) replicate determinations.

The mean R value that was determined utilizing the data set was 0.006 ($\bar{R}$ = 0.006).

The Upper Control Limit (UCL) was calculated as follows:

$$UCL = D_4R$$
$$= 3.27\ (0.006)$$
$$= 0.0196$$

Where D_4 = Shrewhart factor for ranges based upon duplicate analyses.

R = The mean range of multiple replicate determinations.

The critical R value R_C is the upper control limit rounded off to an operationally feasible number. Therefore, the R_C = 0.020.

This R_C or critical R value is the maximum allowable difference between replicate determinations on a single sample in the 0-0.5 mg/l concentration range. The R value is plotted every day analyses are performed and the points are reviewed for trends. If an R value exceeds the R_C value, the data is invalid and the cause for such performance is investigated and corrected before analyses are resumed.

7.8.2 Known Constituent Addition (Spikes)

A minimum of ten (10) percent of all samples analyzed by the laboratory are spiked with known amounts of the compounds being analyzed. The amount of the compound recovered from the sample compared to the amount added is expressed as percent recovery. The percent recovery of an analyte is an indication of the accuracy of an analysis. A spiked sample is determined on all sets of greater than five (5) samples.

Percent recovery is calculated as follows:

$$\%\ Recovery = \frac{Spiked\ Sample - Background}{Known\ Value\ of\ Spike} \times 100\%$$

The standard deviation of the recoveries was calculated utilizing the formula presented in Section 7.8.4 entitled, "Statistical Reporting". The upper and lower warning limits are set at plus and minus two (2) standard deviations. The upper and lower control limits are set at plus and minus three (3) standard deviations.

The acceptance criteria for this chart as as follows:

The quality assurance value indicates acceptable analysis values when it falls between the lower warning limit (LWL) and the upper warning limit (UWL).

If the quality control value falls between the control limit and warning limit (UCL and UWL or LCL and LWL), the analysis should be scrutinized as possibly out of control. The sample results are still acceptable at this point.

If the quality control value falls outside the control limits (UCL or LCL), this indicates an out-of-control situation. The analysis must be stopped until the reason for the problem has been identified and resolved. After it has been corrected, the problem must be documented in the procedure book, with its solution noted. As will be noted in later sections of this document, all corrective action activities are completed in concert with the Laboratory Operations Manager and the Corporate Quality Assurance Officer.

7.8.3 Blanks

An analyst must always be aware of the potential problems associated with contamination of glassware, reagents, solvents, etc. which are especially critical during trace level analyses. The method used to monitor possible contamination problems is the analysis of blanks. There are generally three (3) types of blanks that are routinely analyzed. The first is the method blank which consists of analyzing deionized water in exactly the same fashion as a sample. This type of blank points out problems, such as contaminated glassware and reagents. A method blank is performed with each set of analyses in the laboratory regardless of the number of samples in the set.

A second type of blank is a reagent/solvent blank which is utilized to check the purity of the new batches or lots of reagents or solvents. This type of blank is performed as necessary.

A third blank is a field/trip blank. This provides information on possible contamination of samples in the field during collection or transport to or while in storage at the laboratory. Trip blanks are generally used for volatile organics analyses only.

7.8.4 Statistical Reporting

When quality control information is generated on a particular sample or set of samples, this information is reported in the final data report.

This precision is a result of replicate determination and is expressed as the percent coefficient of variation. The percent coefficient of variation is determined by the formula:

$$\% \text{ C of V} = \frac{100S}{\bar{X}}$$

Where S is the standard deviation of the replicate determinations and X is the mean of the obtained values.

The mean ($\overline{X}$) and standard deviation (S) are calculated according to the formulas:

$$\text{Mean: } \overline{X} = \frac{\sum_{i=1}^{n} X_i}{n}$$

$$\text{Standard Deviation: } S = \sqrt{\frac{\sum_{i=1}^{n} (X_i - \overline{X})^2}{n-1}}$$

where X_i is a result of one (1) analysis (the i th) and N is the total number of replicate analyses.

The accuracy data is generated from spiking of samples with selected compounds and is expressed as a percent recovery. The percent recovery is calculated by the formula:

$$\% \text{ Recovery} = 100 \times \frac{\text{Observed-Background}}{\text{Spike}}$$

Where observed equals the concentration of the sample after spiking, background is the concentration before spiking, and spike is the concentration of known material added to the sample.

7.9 Performance and System Audits

By NEIC definition, an audit is a systematic check to determine the quality of operation of some function or activity. Audits are further defined as being of two (2) basic types; performance and system audits.

A performance audit is one (1) in which quantitative or qualitative data are independently obtained for comparison with routinely obtained data from a measurement system. Performance audits are completed at Recra Environmental, Inc. via a number of mechanisms including the New York State Department of Health Laboratory Certification Program as well as the analysis of EPA check samples and EPA's quality assurance check sample program. The New York State Department of Health (NYSDOH) samples are analyzed for all drinking water parameters on a semi-annual basis. Recra Environmental, Inc. is currently certified by the New York State Department of Health for the determination of metals and metalloids in potable water, the wet chemical examination of potable water, the determination of herbicides and pesticides in potable water and the determination of volatile organic halogens in potable water. In addition, the commercially available check samples and/or the EPA's check samples are processed through the laboratory on a frequency of at least monthly per department. The routine use of all available applicable SRM's also provides for a more or less continuous performance audit.

Systems audits, as opposed to performance audits, are strictly qualitative and consist of an on-site review of a laboratory's quality assurance system and physical facilities for calibration and measurement. System audits are routinely performed (approximately once per year) by the New York State Department of Conservation (NYSDEC), DOH and EPA as an element of our participation in their certification programs. The New York State Department of Environmental Conservation has also audited our facility on numerous occasions relative to our analytical services contracts and our New York State Superfund contract. The New York State Department of Environmental Conservation personnel are also anticipated as being the initiators of additional audits as a part of their management of the Superfund program. Additionally, detailed internal audits are performed on a semi-annual basis by the Corporate Quality Assurance Officer. On an annual basis, or as required by contracts held by Recra, system audits of subcontractor laboratories are performed by the Corporate Quality Assurance Officer in order to assure quality data from the subcontractors whose data is ultimately reported with results obtained by the Recra laboratories. Health and Safety audits are also performed by the Corporation's Internal Environmental Health and Safety Officer. A copy of the Recra Environmental, Inc. audit form is attached as Appendix IV.

Internal, as well as subcontractor audit results, are maintained in a permanent file. The findings of these audits are submitted to the Laboratory Director or the subcontractor laboratory. Necessary corrective action based upon these audits are responded to in writing and are also maintained in a permanent file.

8.0 SAMPLE TRACKING AND REPORTING

The sample tracking process begins once a sample or set of samples is received and an analytical service request form (ASRF) is completed by the Sample Controller.

Once completed, the original ASRF is transferred to the Sample Controller and the samples are logged into the sample inventory log. Once complete, the original ASRF is stapled to any Chain of Custody forms or paperwork that accompanied the samples. At this point several copies of the original ASRF are made and distributed to the following areas as appropriate:

- Laboratory Operations Manager
- Customer Service Representative
- Inorganic Manager
- Organic Manager
- GC/MS Supervisor
- GC Supervisor
- Metals Supervisor
- Laboratory Director
- Analytical Program Manager
- Waste Laboratory Supervisor
- Sample Controller
- Accounting
- Project Manager(s)
- Field Services Manager
- Central File

The original ASRF, sign-off form, and accompanying paperwork is placed in the job folder located in the Laboratory Operations Manager's Office. Regularly scheduled meetings are held between the Laboratory Operation's Manager, Area Supervisors, Analytical Program Manager, and the Customer Service Representative. The Laboratory Operations Manager sets priorities and defines completion schedules to the supervisors when conflicts occur while the Customer Service Representative provides any input and special requests from the client. Individual analysts review and initial the results of their work and submit these to the Department Supervisor/ Manager for review. The individual department managers provide raw data to the Analytical Project Managers for calculation and subsequent review. The completion dates for tasks are entered into the laboratory computer on a daily basis. The computer allows the Laboratory Operations Manager and the Analytical Program Manager to monitor the progress of jobs in relation to the projected completion date.

As the work progresses in the laboratory, data is reviewed for quality by the analyst and/or supervisor and entered onto a data sheet. An example of such a data sheet utilized in the water quality area is presented in Figure 22.

The data sheet lists the following information:

1. Job #
2. Analysts Initials
3. Parameter Tested
4. Date Analysis Performed
5. Sample Data
6. Replicate Data/Parameter
7. Spike Data/Parameter
8. Blank Data/Parameter
9. SRM (Standard Reference Material Date/Parameter)

Once all the raw data has been generated and approved by the appropriate Supervisor and Department Manager, the raw data is forwarded to the Report Writer/Analytical Project Manager. The Report Writer formats all required data and information into the report format and submits the report (or a portion of it) for typing.

Where necessary, the typed reports from the individual laboratory departments are collated into a final report. This collation will also include any raw data, Chain of Custody documents, field reports, and any appendices. The Analytical Program Managers, in concert with the Department Managers, are responsible for the final review of all analytical data and resolution of any and all suspect data with the Laboratory Operations Manager, the Laboratory Director, and the Corporate Quality Assurance Officer.

The final, typed report is approved by the Project Manager and submitted to the Laboratory Operations Manager and Laboratory Director for final approval and signature. Accompanying the final report is the job folder which contains all pertinent information regarding the job; i.e., chain of custody, raw data, etc. Final approval of the report results in the Laboratory Director's signature on the cover letter of the report. The job folder-with all pertinent information, signatures, and a copy of the final report is filed and maintained in permanent storage.

In order to facilitate communication with clients, the job number of the report is listed at the lower right hand corner of the cover letter. In addition, each data sheet has the job number listed in the lower left hand corner. If a client has a question concerning a particular report, providing the job number allows us to locate the proper report in a matter of minutes.

9.0 ANALYTICAL/CLP DOCUMENT CONTROL

Essential to our business and clients is a systematic approach to our handling of the large amount of data we generate. The term "document control," as it applies to analytical and CLP data generated by Recra Environmental, Inc., refers to the system established to allow for rapid information recovery, access, confidentiality, security, data maintenance and storage of analytical and CLP data.

All analytical/CLP project files are maintained by the Document Control Clerk (DCC). All finalized documents are kept in the analytical/CLP project files which are located in locked, fireproof filing cabinets. Documents contained in the project files include, but are not limited to the following:

- Finalized analytical and/or CLP report;
- Chain-of-Custody records;
- Analytical Services Request Form (ASRF);
- Copies of associated cover letters and memoranda relative to the specific project and/or job; and
- Copies of any Change Orders or other specific instructions relayed by the client concerning change of scope.

All analytical/CLP project files are legibly identified with the following information:

- o Client name;
- o Project number; and
- o Job number.

Analytical/CLP project files are purged on an annual basis and maintained in permanent storage by the DCC.

The DCC assures that analytical/CLP filing cabinets are locked at all times. Keys are maintained in a locked key box for which only two (2) keys exist. One (1) key is kept by the DCC and the other is maintained by the Manager of New York Testing.

At no time shall unauthorized individuals have access to the analytical/CLP project files. All files will be removed only by the DCC or an appropriate designate.

Should an employee require access to an analytical/CLP project file, the following steps are required:

- o Complete a Document Request Form (see Figure 1);
- o Indicate the client name, project number (if known) and job number (if known);
- o Indicate requester's name and approximate amount of time file will be checked out; and
- o Give Document Request Form to DCC for file retrieval.

NOTE: Once received, the individual checking out the file is responsible for the care and custody of the file until same is returned to the DCC.

Specific duties of the DCC include the following:

- o Assures that all analytical/CLP project files are correctly labelled with appropriate information such as client name, project number and job number.
- o Files all analytical/CLP project files alphabetically by client name. Within the client file, specific projects and jobs are filed chronologically by date.
- o Responsible for assuring that project files are locked at all times.
- o Responsible for signing out files to authorized individuals and refiling them upon their return.
- o Maintains a Document Control Log (Attachment 3) of all outstanding files indicating the name of the individual signing out the file, date checked out and anticipated return date. The DCC also assures that checked out files are returned in a timely fashion by reviewing the log periodically and contacting individuals to determine the status of the checked out file.
- o Upon removing the requested file, the DCC is responsible for placing an "out" card (Attachment 4) in the project file indicating that a file is missing. The DCC also records the file name, requester's name and date on the "out" card prior to filing.

10.0 LABORATORY SAFETY

The Laboratory Safety Program in effect at Recra Environmental, Inc. laboratories is presented in detail in another document referred to as the Recra Environmental Health and Safety Manual. This section will describe the main points of the program; however, the safety manual should be consulted for those requiring greater detail. The main points of the program are as follows:

1. Medical Surveillance Program - All employees receive a yearly physical which is quite extensive. Employees in high potential exposure situations such as the field crew, are examined every six (6) months. All employees are provided a pre-employment and post-employment medical exam.
2. Safety meetings are held on a monthly basis. The purpose of these meetings is to provide safety awareness and training to all employees on a regular basis.
3. The laboratory is equipped with a professionally operated burglar and fire alarm system.
4. Fire extinguishers are located throughout the laboratories and their proper operation is monitored on a monthly basis.
5. Eyewashes and overhead safety showers are located in strategic areas and monitored monthly for proper performance.
6. Respiratory protection is provided throughout the laboratory.
7. One (1) self contained breathing unit is available for emergency rescue situations and its proper operation is monitored on a monthly basis.
8. Two (2) first aid kits are provided at strategic locations and supplies are monitored on a monthly basis.
9. Spill cleanup kits are available in the event of an emergency spill in the laboratory. Contents are verified each month.
10. Chipped or broken glassware is not to be used in the laboratory. A program of quick repair and/or replacement prevents the use of unsafe glassware.

11. Fume hood performance is monitored on a monthly basis and documented.
12. All incoming samples are screened for radioactivity upon receipt.
13. A make-up air system is operational which provides 6,000 ft^3 of air per minute to the building. This provides a theoretical change of air in the building every ten minutes.
14. All laboratory waste is segregated and placed into special waste containers in the laboratory. Every day these containers are emptied into the appropriate waste drums for eventual disposal at an approved treatment/disposal facility.
15. Safety glasses are mandatory in all laboratories.
16. Lab coats and disposable gloves are provided for all laboratory personnel.
17. Acids and solvents are to be transported only in safety containers in the laboratory.
18. All compressed gas cylinders must be secured when in use and carts must be used during transport.

The Recra Environmental Health and Safety Manual should be consulted for more detailed information (see Appendix V).

11.0 DESCRIPTION OF LABORATORY SPACE ALLOCATED TO CLP ANALYSIS

11.1 Sample Receipt and Storage

The CLP samples are received and logged in, in a 9' X 10' room with a hood, table, and storage area. It is located on the west side of the Wales Avenue building. The 4° C cooler is located across the hall, six (6) feet away.

11.2 Organic Preparation Laboratory #4

The CLP samples are prepared in a 10.5' X 25' lab located on the north side of the Wales Avenue building.

11.3 GC Laboratory #3

The gas chromatographs dedicated to CLP analysis are located in a 16' X 19' GC lab located near the center of the Wales Avenue building north of GC/MS Lab #5.

11.4 GC/MS VOA Laboratory #5

The GC/MS's dedicated to VOA CLP analysis are located in the 11' X 31' GC/MS Lab located near the southeast corner of the Wales Avenue building.

11.5 GC/MS BNA Laboratory

The GC/MS's dedicated to BNA CLP analysis are located in the 35' X 24' GC/MS Lab located in the rear of the Hazelwood facility.

12.0 LABORATORY EQUIPMENT LIST

Descriptions of the Laboratory Equipment and Analytical Instrumentation presently being utilized at Recra Environmental, Inc. Laboratories are listed in Table 5.

13.0 PREVENTIVE MAINTENANCE OF ANALYTICAL INSTRUMENTS

Preventive maintenance is performed contractually on the following laboratory equipment:

Mettler Analytical Balances

These balances are under service agreements with the manufacturer to provide emergency service, preventive maintenance and calibration on an annual basis.

Hewlett Packard Gas Chromatograph/Mass Spectrometers

These systems are under service agreements with Hewlett Packard Corporation which covers all repair parts, extended parts, labor and travel, and two (2) annual preventive maintenance service visits. These visits involve cleaning, adjusting, inspecting, and testing procedures designed to reduce product failure and/or extend useful product life. Between visits, routine operator maintenance and cleaning is performed according to manufacturer's specifications.

Finnigan Gas Chromatograph/Mass Spectrometers

These systems are under a service agreement with Finnigan Corporation which covers all repair parts, extended parts, labor and travel, and three (3) preventive maintenance service visits per year. These visits involve cleaning, adjusting, inspecting, and testing procedures designed to reduce product failure and/or extend useful product life. Between visits, routine operator maintenance and cleaning is performed according to manufacturer's specifications.

Perkin-Elmer Atomic Absorption Spectrophotometers

The twelve (12) month emergency maintenance plan with Perkin-Elmer covering this system includes replacement parts required during emergency maintenance and all emergency maintenance visits. Routine operator maintenance and cleaning is performed by an experienced analyst or chemist according to manufacturer's specifications.

Hewlett Packard Gas Chromatographs

The twelve (12) month emergency maintenance plan with Hewlett Packard covering these systems includes replacement parts required during emergency maintenance and all emergency maintenance visits. Routine operator maintenance and cleaning is performed by an experienced analyst or chemist according to manufacturer's specifications.

14.0 QA/QC DATA REVIEW

14.1 Initial Review (analyst, supervisor)

As has been previously described, the initial review of sample and QA/QC data is performed by the analysts and their immediate supervisor.

This initial review process begins with the standards; their response factors (either absorbance or area units), retention times (for GC, GC/MS), curve linearity, and both short and long-term consistency of the response factors. These considerations allow for the assessment of instrumental conditions as well as the integrity of the actual stock and/or working standard solutions. For the GC and/or GC/MS data, the next step in the assessment process is to review the retention time match between standard and sample chromatographs as well as the comparability of sample and standard/library mass spectra for GC/MS data. This step of the process can also employ the review of peak geometry and peak integration techniques. Finally, within this initial review, the analyst will determine whether or not possible sample and/or background interference as a function of method, field and/or solvent blanks, exists within the analyses reported. Apparent deviations from established controls and/or warning limits are at least initially defined during this review phase.

14.2 Secondary Review (Department Manager, Analytical Project Manager)

The Department Manager and Analytical Project Manager further review the data relative to the above variables as required and continue the assessment process by reviewing the calculated values, duplicate results (relative to % C of V and the established control charts), percent relative and/or absolute recoveries (based upon established limits and control charts), SRM results when available relative to the actual recovered concentrations and the established control charts. It is during this process that a final assessment of completeness is also made. Completeness, by definition, is a measure of the amount of valid data obtained from a measurement system compared to the amount that would be expected to be obtained under correct normal conditions. As an example, the determination of volatile priority pollutants involves the addition of three (3) surrogate compounds to every sample undergoing analysis. The analysis would be considered valid in the completeness category if two (2) of the three (3) surrogates met the acceptance criteria.

The Department Manager and Analytical Project Manager then decide as to the overall quality of the data. If necessary, because of the circumstances surrounding the particular analysis of a given sample or set of samples, the Laboratory Operations Manager, Laboratory Director, and Corporate Quality Assurance Officer will also participate in this decision process.

14.3 Final QA/QC Review and Evaluation/Decision Process (Laboratory Director, Laboratory Operations Manager and/or the Corporate Quality Assurance Officer)

The final step of evaluation and review includes examination of all QA/QC data and associated analytical results by the Laboratory Operations Manager and the Laboratory Director. The Corporate Quality Assurance Officer is also included in the review process, when necessary, to resolve QA/QC questions and issues. Routine QA/QC performance is evaluated by review of QA/QC exception reports as described in Section 13.5 of this document.

Assuming that the completeness test, where appropriate, is successful, a number of data quality scenarios can present themselves. These scenarios and Recra's decision processes relative to these situations are outlined below.

a.) If precision, accuracy and SRM (if available) data are all within the established warning limits; proceed with final issuance of data report including all QA/QC results.

b.) If precision, accuracy and SRM (if available) are within control limits but one (1) or all of these parameters exceed the warning limits, the source(s) of bias/error needs to be evaluated, but proceed with final issuance of data report including all QA/QC results, and the results of the evaluation of bias/error as part of the report.

Source of error/bias may be found in the following:

- o calculation errors
- o transcription errors
- o sample matrix (i.e., high suspended solids in water sample; oily sediment, etc.)
- o sample homogenity
- o level of contaminant measured (validity of the precision measurement is a factor of concentration)
- o analyst error (warning/control limits exceeded for one (1) analyst more frequently than another)
- o appropriateness of method(s) based upon sample type (wastewater as opposed to drinking water)

c.) If precision, accuracy and/or SRM (if available) are out of control, one (1) of the following approaches to the problem will be used:

1.) SRM out-of-control whether or not precision or accuracy are controlled; method based errors are suggested and all data is suspect. If SRM is verified as out of control (i.e., standards are checked, etc.), all samples should be re-analyzed or data reported as out of control if no additional sample is available or cannot be obtained.

2.) SRM (if available) is in control but absolute recovery is out of control; method based error is suspected. If standards and spiking solutions are verified to be accurate as independent solutions, all data is suspect until reprocessing and re-analysis of absolute recovery sample is completed to prove only random error. If systematic error (constant out of control absolute recovery) is found, all samples require re-analysis after corrective action has been taken.

3.) SRM (if available), absolute recovery and precision are in control but relative recovery is out of control; matrix problem likely. Proceed to issue data report with appropriate qualifications as to possible matrix effects.

4.) SRM (if available), absolute recovery and relative recovery are in control but precision is out of control; matrix problem likely in the form of sample heterogenity. If sample appears homogeneous, re-analyze; if data is still out of control, issue data report with qualifications. If, on the other hand, data are in control, analyst error is suspected and all data in this sample set must be re-analyzed.

5.) SRM and absolute recovery are under control but both relative recovery and precision are out of control; matrix effects, sample homogenity problems and/or analyst error are suspected. If after re-analysis of a well-mixed homogeneous sample by different analyst(s) is still out of control, issue the data report and state data is out of control based upon sample matrix effects. If after re-analysis relative recovery is within control limits but precision is still uncontrolled, issue the data report and advise of potential errors relative to heterogenity of sample. If, in the last possible case, re-analysis indicates adequate precision but uncontrolled relative recovery, issue the final data report and again advise of possible sample matrix effects on this data.

14.4 Corrective Action

If a particular analysis is deemed "out of control" corrective action must be taken to insure continued data quality.

Precision limits are defined by a percent coefficient of variation which, when exceeded, indicates unacceptable analytical performance. Accuracy limits are expressed in percent recovery of spiked material. A recovery below or above the set criteria indicates a need for corrective action.

The following presents a number of corrective actions which may be employed, depending upon the particular situations.

a.) Calculations are rechecked.

b.) Sample handling; i.e., digestion, concentration, and/or extraction logs are checked for discrepancies in sample handling.

c.) Analyte concentration is reviewed to determine if it has severely influenced the reliability of the precision or recovery calculations.

d.) Instrument and method peformance is verified by inspecting data on standard reference materials processed in the same data set.

e.) Quality control data on the other samples in the data set, including surrogate recovery, internal standards, etc., are reviewed to determine if the problem is method related or sample related.

f.) If original sample is available, the sample is assessed for homogenity.

g.) If sample is unavailable and no explanation for poor quality control results can be determined, the client is notified and additional sample is obtained. If additional sample is unavailable, the results are issued with a qualification as to their accuracy.

The coordinator of each analytical section is responsible for initiating corrective action when necessary. The Laboratory Operation's Manager, Ms. D.J. Travis, is responsible for approving the appropriate corrective action.

14.5 Quality Assurance Reports

Quality assurance reports are a mechanism whereby management receives periodic information on the performance of the laboratory and subsequent data quality.

The internal program consists of laboratory supervisors and coordinators reporting on the QA/QC performance to the Laboratory QA/QC Manager on a per sampling event basis. The Laboratory Operations Manager, in turn, reports to the Laboratory Director/QC Officer on the same frequency.

Information which is contained in the Quality Assurance reports consists of the following:

- assessment of measurement data accuracy, precision and completeness;
- results of the performance and systems audits; and
- report of significant QA problems and recommended/implemented solutions.

REFERENCES

1. U.S. Environmental Protection Agency Manual, "Chemical Analysis of Water and Wastes", E.P.A.-600/4-79-020 Revised March 1983.

2. U.S. Environmental Protection Agency "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act", 40 CFR Part 136, October 1984.

3. U.S. Environmental Protection Agency "Pesticide Residue Analysis in Water", E.P.A.-430/1-76-015, November 1976.

4. U.S. Environmental Protection Agency "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods", SW-846, 2nd Edition, July 1982.

5. U.S. Environmental Protection Agency "Interim Methods for the Sampling and Analysis of Priority Pollutants in Sediment and Fish Tissue", E.P.A.-600/4-81-055, August 1977, Revised October 1980.

6. U.S. Environmental Protection Agency "Chemistry Laboratory Manual for Bottom Sediments and Elutriate Testing", PB-294 596, March 1979.

7. U.S. Environmental Protection Agency "Extraction and Analysis of Priority Pollutants in Sediment and Soil", PPS-10/83 Analytical Support Branch U.S. E.P.A., Athens, Georgia.

ATTACHMENT I

List of Tables

TABLE 1

PRESERVATION TECHNIQUES EMPLOYED AT

RECRA ENVIRONMENTAL LABORATORIES

(Taken from Chemical Analysis of Water and Wastes
EPA-600/4-79-020 Revised March 1983)

RECOMMENDATION FOR SAMPLING AND PRESERVATION OF SAMPLES ACCORDING TO MEASUREMENT[1]

Measurement	Vol. Req. (ml)	Container[2]	Preservative[3,4]	Holding Time[5]
100 Physical Properties				
Color	50	P,G	Cool, 4°C	48 Hrs.
Conductance	100	P,G	Cool, 4°C	28 Days
Hardness	100	P,G	HNO_3 to pH<2	6 Mos.
Odor	200	G only	Cool, 4°C	24 Hrs.
pH	25	P,G	None Req.	Analyze Immediately
Residue				
Filterable	100	P,G	Cool, 4°C	7 Days
Non-Filterable	100	P,G	Cool, 4°C	7 Days
Total	100	P,G	Cool, 4°C	7 Days
Volatile	100	P,G	Cool, 4°C	7 Days
Settleable Matter	1000	P,G	Cool, 4°C	48 Hrs.
Temperature	1000	P,G	None Req.	Analyze Immediately
Turbidity	100	P,G	Cool, 4°C	48 Hrs.
200 Metals				
Dissolved	200	P,G	Filter on site HNO_3 to pH<2	6 Mos.
Suspended	200		Filter on site	6 Mos.[(6)]
Total	100	P,G	HNO_3 to pH<2	6 Mos.

TABLE 1 (Cont'd.)

Measurement	Vol. Req. (ml)	Container[2]	Preservative[3,4]	Holding Time[5]
Chromium[+6]	200	P,G	Cool, 4°C	24 Hrs.
Mercury				
Dissolved	100	P,G	Filter HNO_3 to pH < 2	28 Days
Total	100	P,G	HNO_3 to pH < 2	28 Days
O Inorganics, Non-Metallics				
Acidity	100	P,G	Cool, 4°C	14 Days
Alkalinity	100	P,G	Cool, 4°C	14 Days
Bromide	100	P,G	None Req.	28 Days
Chloride	50	P,G	None Req.	28 Days
Chlorine	200	P,G	None Req.	Analyze Immediately
Cyanides	500	P,G	Cool, 4°C NaOH to pH >12 0.6g ascorbic acid[6]	14 Days[7]
Fluoride	300	P,G	None Req.	28 Days
Iodide	100	P,G	Cool, 4°C	24 Hrs.
Nitrogen				
Ammonia	400	P,G	Cool, 4°C H_2SO_4 to pH < 2	28 Days
Kjeldahl, Total	500	P,G	Cool, 4°C H_2SO_4 to pH < 2	28 Days
Nitrate plus Nitrite	100	P,G	Cool, 4°C H_2SO_4 to pH < 2	28 Days
Nitrate[9]	100	P,G	Cool, 4°C	48 Hrs.
Nitrite	50	P,G	Cool, 4°C	48 Hrs.

TABLE 1 (Cont'd.)

Measurement	Vol. Req. (ml)	Container[2]	Preservative[3,4]	Holding Time[5]
Dissolved Oxygen				
Probe	300	G bottle and top	None Req.	Analyze Immediately
Winkler	300	G bottle and top	Fix on site and store in dark	8 Hours
Phosphorus				
Ortho-phosphate, Dissolved	50	P,G	Filter on site Cool, 4°C	48 Hrs.
Hydrolyzable	50	P,G	Cool, 4°C H_2SO_4 to pH<2	28 Days
Total	50	P,G	Cool, 4°C H_2SO_4 to pH<2	28 Days
Total, Dissolved	50	P,G	Filter on site Cool, 4°C H_2SO_4 to pH<2	24 Hrs.
Silica	50	P only	Cool, 4°C	28 Days
Sulfate	50	P,G	Cool, 4°C	28 Days
Sulfide	500	P,G	Cool, 4°C add 2 ml zinc acetate plus NaOH to pH >9	7 Days
Sulfite	50	P,G	None Req.	Analyze Immediately
400 Organics				
BOD	1000	P,G	Cool, 4°C	48 Hrs.
COD	50	P,G	Cool, 4°C H_2SO_4 to pH<2	28 Days
Oil & Grease	1000	G only	Cool, 4°C H_2SO_4 to pH<2	28 Days
Organic carbon	25	P,G	Cool, 4°C H_2SO_4 or HCl to pH<2	28 Days
Phenolics	500	G only	Cool, 4°C H_2SO_4 to pH <2	28 Days

TABLE 1 (Cont'd.)

Measurement	Vol. Req. (ml)	Container[2]	Preservative[3,4]	Holding Time[5]
MBAS	250	P,G	Cool, 4°C	48 Hrs.
NTA	50	P,G	Cool, 4°C	24 Hrs.

1. More specific instructions for preservation and sampling are found with each procedure as detailed in this manual. A general discussion on sampling water and industrial wastewater may be found in ASTM, Part 31, p. 72–82 (1976) Method D-3370.

2. Plastic (P) or Glass (G). For metals, polyethylene with a polypropylene cap (no liner) is preferred.

3. Sample preservation should be performed immediately upon sample collection. For composite samples each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.

4. When any sample is to be shipped by common carrier or sent through the United States Mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements of Table 1, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO_3) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); Sodium hydroxide ($NaOH$) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).

5. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still considered valid. Samples may be held for longer periods only if the permittee, or monitoring laboratory, has data on file to show that the specific types of sample under study are stable for the longer time, and has received a variance from the Regional Administrator. Some samples may not be stable for the maximum time period given in the table. A permittee, or monitoring laboratory, is obligated to hold the sample for a shorter time if knowledge exists to show this is necessary to maintain sample stability.

6. Should only be used in the presence of residual chlorine.

7. Maximum holding time is 24 hours when sulfide is present. Optionally, all samples may be tested with lead acetate paper before the pH adjustment in order to determine if sulfide is present. If sulfide is present, it can be removed by the addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.

8. Samples should be filtered immediately on-site before adding preservative for dissolved metals.

9. For samples from non-chlorinated drinking water supplies conc. H_2SO_4 should be added to lower sample pH to less than 2. The sample should be analyzed before 14 days.

Table IC—Organic Tests.[8]

13, 18–20, 22, 24–28, 34–37, 39–43, 45–47, 56, 66, 88, 89, 92–95, 97. Purgeable Halocarbons.	G, Teflon-lined septum.	Cool, 4°C, 0.008% $Na_2S_2O_3$.[5]	14 days.
6, 57, 90. Purgeable aromatic hydrocarbons	do	Cool, 4°C, 0.008% $Na_2S_2O_3$[5], HC1 to pH2[9].	Do.
3, 4, Acrolein and acrylonitrile	do	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]; Adjust pH to 4–5[10].	Do.
23, 30, 44, 49, 53, 67, 70, 71, 83, 86, 88. Phenols[11].	G, Teflon-lined cap.	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	7 days until extraction, 40 days after extraction.
7, 38. Benzidines[11]	do	do	7 days until extraction.[13]
14, 17, 48, 50–52. Phthalate esters[11]	do	Cool, 4°C	7 days until extraction; 40 days after extraction.
72–74. Nitrosamines[11,14]	do	Cool, 4°C, store in dark, 0.008% $Na_2S_2O_3$[5].	Do.
76–82. PCBs[11] acrylonitrile	do	Cool, 4°C	Do.
54, 55, 65, 69. Nitroaromatics and isophorone[11]	do	Cool, 4°C, 0.008% $Na_2S_2O_3$[5] store in dark.	Do.
1, 2, 5, 8–12, 32, 33, 58, 59, 64, 68, 84, 85. Polynuclear aromatic hydrocarbons.[11]	do	do	Do.
15, 16, 21, 31, 75. Haloethers[11]	do	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	Do.
29, 35–37, 60–63, 91. Chlorinated hydrocarbons[11].	do	Cool, 4°C	Do.
87. TCDD[11]	do	Cool, 4°C, 0.008% $Na_2S_2O_3$[5]	Do.

TABLE 2

COMMON ANALYTICAL METHODOLOGIES EMPLOYED ON AQUEOUS SAMPLES AT

RECRA ENVIRONMENTAL LABORATORIES

WATER QUALITY GROUP

PARAMETER/COMPOUND CLASS	REFERENCE METHOD #	REFERENCE	RECRA METHOD #	COMMENTS AND/OR DEVIATIONS
Acidity	305.1	1	100	-
Alkalinity	310.1	1	101	Endpoint pH 4.5
Color	110.2	1	102	-
Specific Conductance	120.1	1	103	Samples adjusted to 25°C
Total Hardness	130.2	1	104	-
Odor	140.1	1	105	-
pH	150.1	1	106	Combination reference electrode employed
Total Residue (103°C)	160.3	1	107	-
Filterable Residue (180°C)	160.1	1	108	-
Non-Filterable Residue (103°C)	160.2	1	109	-
Volatile Residue (550°C)	160.4	1	110	-
Settleable Solids	160.5	1	111	-
Turbidity	180.1	1	112	-
Chloride	325.3	1	113	-
Total Cyanide	335.2	1	114	-
Amenable Cyanide	335.1	1	115	-
Fluoride	340.2	1	116	No distillation
Ammonia	350.3	1	117	No distillation
Total Kjeldahl Nitrogen	351.4	1	118	-
Nitrate	352.1	1	119	-
Nitrite	354.1	1	120	-
Total Phosphorous	365.2	1	121	-
Organic Phosphorous	365.2	1	122	-
Sulfate	375.4	1	123	-
Sulfite	377.1	1	124	-
Sulfide	376.1	1	125	-
Biochemical Oxygen Demand (Carbonacous)	405.1	1	126	Nitrification inhibitor added
Chemical Oxygen Demand	410.1, .2 or .3	1	127	Depends on level
Oil and Grease	413.1	1	128	-
Total Organic Carbon - Direct	415.1	1	129	Acidified and purged
Total Organic Carbon - Difference	415.1	1	130	-
Total Recoverable Phenolics	420.1	1	131	-
Methylene Blue Active Substances	425.1	1	132	-

TABLE 2

COMMON ANALYTICAL METHODOLOGIES EMPLOYED ON AQUEOUS SAMPLES AT

RECRA ENVIRONMENTAL LABORATORIES

METALS GROUP

PARAMETER*	REFERENCE METHOD #	REFERENCE	RECRA METHOD #	COMMENTS AND/OR DEVIATIONS
Aluminum	202.1	1	200	-
Antimony	204.2	1	201	-
Arsenic	206.2	1	202	-
Barium	208.1	1	203	-
Beryllium	210.1	1	204	-
Boron	-	See Method	205	-
Cadmium	213.1	1	206	-
Calcium	215.1	1	207	-
T-Chromium	218.1	1	208	-
Chromium (+6)	218.5	1	209	Determined by flame
Cobalt	219.1	1	210	-
Copper	220.1	1	211	-
Iron	236.1	1	212	-
Lead	239.2	1	213	-
Magnesium	242.1	1	214	-
Manganese	243.1	1	215	-
Mercury	245.1	1	216	-
Molybdenum	246.1	1	217	-
Nickel	249.2	1	218	-
Potassium	258.1	1	219	-
Selenium	270.2	1	220	-
Silver	272.1	1	221	-
Sodium	273.1	1	222	-
Strontium	-	See Method	223	-
Thallium	279.2	1	224	-
Tin	282.1	1	225	-
Titanium	283.1	1	226	-
Vanadium	286.1	1	227	-
Zinc	289.1	1	228	-
Zirconium	-	See Method	229	-
Digestion	200.4.1.3	1	200D	-

*If total metals are required, digestion is performed according to Section 200, part 4.1.3 of EPA manual Chemical Analysis of Water and Wastes except that Erlenmeyer flasks are used in place of Griffin beakers. If soluble metals are requested, the sample is filtered through a 0.45 um filter prior to acidification and analysis.

TABLE 2

COMMON ANALYTICAL METHODOLOGIES EMPLOYED ON AQUEOUS SAMPLES AT

RECRA ENVIRONMENTAL LABORATORIES

CHROMATOGRAPHY GROUP

PARAMETER/COMPOUND CLASS	REFERENCE METHOD #	REFERENCE	RECRA METHOD #	COMMENTS AND/OR DEVIATIONS*
Purgeable Halocarbons	601	2	300	Coulson's detector employe
Purgeable Aromatics	602	2	301	Flame ionization detector employed
Acrolein & Acrylontrile	603	2	302	-
Phenols	604	2	303	-
Phthalates	606	2	304	-
Pesticides and PCB's	608	2	305	-
Polynuclear Aromatic Hydrocarbons	610	2	306	UV-detector employed
Chlorinated Hydrocarbons	612	2	307	-
Halogenated Organic Scan - ECD	-	See Method	308	Electron capture detector employed
Halogenated Organic Scan - Coulson's	-	See Method	309	Coulson's detector emplo
Volatile Halogenated Organic Scan	-	See Method	310	Coulson's detector emplo
Volatile Organic Scan - FID	-	See Method	311	Flame ionization detecto employed
Organic Scan - FID	-	See Method	312	Flame ionization detector employed
Herbicides - GC	-	3-See Method	313	-
Herbicides - LC	-	See Method	314	-
Trihalomethanes	501.1	-	315	Coulson's detector emple

*Unless specifically requested, all analyses are performed utilizing single chromatographic column techniques.

TABLE 2

COMMON ANALYTICAL METHODOLOGIES EMPLOYED ON AQUEOUS SAMPLES AT

RECRA ENVIRONMENTAL LABORATORIES

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GAS CHROMATOGRAPHY/MASS SPECTROMETRY GROUP

PARAMETER/COMPOUND CLASS	REFERENCE METHOD #	REFERENCE	RECRA METHOD #	COMMENTS AND/OR DEVIATIONS
Purgeables	624	2	400	-
AP/BN Extractables	625	2	401	Capillary column employed (DB-5 fused silica)
Broad Spectrum Scan	-	-	402	Unknown peaks are library searched
2,3,7.8- TCDD	613	2	403	

1

TABLE 3

COMMON ANALYTICAL METHODOLOGIES EMPLOYED ON SOLID SAMPLES AT

RECRA ENVIRONMENTAL LABORATORIES

WATER QUALITY GROUP

PARAMETER/COMPOUND CLASS	REFERENCE METHOD #	REFERENCE	RECRA METHOD #	COMMENTS AND/OR DEVIATIONS
pH	9040	4	S-106	-
Dry Weight (103°C)	HAN-3.1.2	5	S-107	-
Total Cyanide	SCN-1 to SCN-3	5	S-114	-
Ammonia	324; 350.3	6, 1	S-117	-
Total Kjeldahl Nitrogen	351.4	1	S-118	0.5 grams of sample used
Nitrate	-	See Method	S-119	-
Total Phosphorus	365.2	1	S-121	1.0 grams of sample used
Sulfide	376.1	See Method	S-125	Leaching (S-132) Procedure used
Chemical Oxygen Demand	410.1, 2, 3	1	S-127	1.0 grams of sample used
Oil and Grease	#739	6	S-128	-
Total Organic Carbon - Direct	415.1	1	S-129	Leaching (S-132) Procedure used
Total Recoverable Phenolics	SPH-1 to SPH-3	5	S-131	-
Leaching Procedure prior to method S-125 & S-129	-	See Method	S-132	-

RECRA ENVIRONMENTAL, INC.

TABLE 3

COMMON ANALYTICAL METHODOLOGIES EMPLOYED ON SOLID SAMPLES AT

RECRA ENVIRONMENTAL LABORATORIES

METALS GROUP

PARAMETER	REFERENCE METHOD #	REFERENCE	RECRA METHOD #	COMMENTS AND/OR DEVIATIONS[A]
Aluminum	202.1	1	S-200	-
Antimony	7041	4	S-201	-
Arsenic	7060	4	S-202	-
Barium	7080	4	S-203	-
Beryllium	210.1	1	S-204	-
Boron	-	See Method	S-205	-
Cadmium	7130	4	S-206	-
Calcium	215.1	1	S-207	-
T-Chromium	7190	4	S-208	-
Chromium (+6)	7191	4	S-209	Digestion 3060 employed
Cobalt	219.1	1	S-210	-
Copper	220.1	1	S-211	-
Iron	236.1	1	S-212	-
Lead	7421	4	S-213	-
Magnesium	242.1	1	S-214	-
Manganese	243.1	1	S-215	-
Mercury	245.5	1	S-216	-
Molybdenum	246.1	1	S-217	-
Nickel	7521	4	S-218	-
Potassium	258.1	1	S-219	-
Selenium	7740	4	S-220	-
Silver	7760	4	S-221	-
Sodium	273.1	1	S-222	-
Strontium	-	See Method	S-223	-
Thallium	279.2	1	S-224	-
Tin	282.1	1	S-225	-
Titanium	283.1	1	S-226	-
Vanadium	286.1	1	S-227	-
Zinc	289.1	1	S-228	-
Zirconium	-	See Method	S-229	-
Digestion	3050	4	S-200D	-

[A] Digestion #3050 from reference 4 is employed for all metals except where indicated otherwise. Solid samples are not dried at 60°C but rather digested as received.

TABLE 3

COMMON ANALYTICAL METHODOLOGIES EMPLOYED ON SOLID SAMPLES AT

RECRA ENVIRONMENTAL LABORATORIES

CHROMATOGRAPHY GROUP

PARAMETER/COMPOUND CLASS	REFERENCE METHOD #	REFERENCE	RECRA METHOD #	COMMENTS AND/OR DEVIATION
Purgeable Halocarbons	8010	4	S-300	Coulson's detector employed
Non-Halogenated Volatile Organics	8015	4	S-314	Coulson's detector employ
Non-Halogenated Aromatics	8020	4	S-301	Flame ionization detector employed
Acrolein & Acrylontrile	8030	4	S-302	-
Phenols	8040	4	S-303	-
Phthalates	8060	4	S-304	-
Pesticides and PCB's	8080	4	S-305	-
Polynuclear Aromatic Hydrocarbons	8100	4	S-306	UV-detector employed
Chlorinated Hydrocarbons	8120	4	S-307	-
Halogenated Organic Scan - ECD	-	See Method	S-308	Electron capture detector employed
Halogenated Organic Scan - Coulson's	-	See Method	S-309	Coulson's detector employ
Volatile Halogenated Organic Scan	-	See Method	S-310	Coulson's detector employed
Volatile Organic Scan - FID	-	See Method	S-311	Flame ionization detector employed
Organic Scan - FID	-	See Method	S-312	Flame ionization detector employed
Herbicides - GC	8150	4	S-313	-
Nonhalogenated Volatile Organics	8015	4	S-314	-
Sediment Extraction - Olin Project	-	See Method	S-315	Extraction procedure only

*Unless specifically requested, all analysis are performed utilizing single chromatographic column techniques.

TABLE 3

COMMON ANALYTICAL METHODOLOGIES EMPLOYED ON SOLID SAMPLES AT

RECRA ENVIRONMENTAL LABORATORIES

GAS CHROMATOGRAPHY/MASS SPECTROMETRY GROUP

PARAMETER/COMPOUND CLASS	REFERENCE METHOD #	REFERENCE	RECRA METHOD #	COMMENTS AND/OR DEVIATIONS
Purgeables	PPS-10/83 5030	See Method-7 4	S-400 S-400A	Low Level-direct purge High Level-methanol extraction
AP/BN Extractables	8270	See Method-7	S-401	Capillary column employed
Broad Spectrum Scan	-	See Method	S-402	-
PCDD's & PCDF's	8280	4	S-403	

TABLE 4

RECRA ENVIRONMENTAL, INC.

LABORATORY EQUIPMENT LIST

ITEM/DESCRIPTION	MANUFACTURER/MODEL NUMBER
Gas Chromatograph/Mass Spectrometer (GC/MS) o Super INCOS data system 5.6 o Computer controlled gas chromatograph o Heated electron ionization source (SP) o Capillary/packed column injector o Archival data storage o Subambient GC oven temperature control o Nine track magnetic tape drive o High speed printer o NBS/EPA Mass Spectral Library (42,000 compounds)	Finnigan Model 5100 SP (3 Units) (Assigned to CLP)
Gas Chromatograph/Mass Spectrometer (GC/MS) o Super INCOS data system o Electron ionization source o Capillary/packed column injector o Purge and trap sampler o Archival data storage o Nine track magnetic tape storage o High speed printer o NBS/EPA Mass Spectral Library (42,000 compounds)	Finnigan Model 3200
Gas Chromatograph/Mass Spectrometer (GC/MS) o Super INCOS data system o Computer controlled gas chromatograph o Heated electron ionization source o Capillary/packed column injector o Archival data storage o Subambient GC oven temperature control o Purge and trap sampler (2 units) o Nine track magnetic tape drive o High speed printer o NIH/EPA Mass Spectral Library (42,000 compounds)	Finnigan Model INCOS 50 (3 Units) (Assigned to CLP)

TABLE 4
(continued)

ITEM/DESCRIPTION	MANUFACTURER/MODEL NUMBER
Gas Chromatograph/Mass Spectrometer (GC/MS) o Computerized data systems o Computer controlled gas chromatograph o Electron ionization source o Capillary/packed column injector o Purge and trap sampler o Archival data storage o Subambient GC oven temperature control o Nine track magnetic tape drive o High speed printer o NIH/EPA MSDC Mass Spectral Library (31,000 compounds)	Hewlett Packard Model 5993B (Assigned to CLP)
Gas Chromatograph/Mass Spectrometer (GC/MS) o Computerized data system o Computer controlled gas chromatograph o Electron ionization source o Capillary/packed column injector o Subambient GC oven temperature control o Purge and trap sampler o Archival data storage (nine track tape) o NIH/EPA MSDC Mass Spectral Library (31,000 compounds)	Hewlett Packard Model 5993C (Assigned to CLP)
High Performance Liquid Chromatograph (HPLC) o HPLC with ultraviolet detector at 254 and 280 nonometers o Gradient programing o Micro processor data system	Waters Model 0 440/6000A
Gas Chromatograph-(GC) o Capillary/packed column injector o Automatic liquid sampler o Electron capture (ECD) detector o Flame ionization (FID) detector computer integration of peaks	Hewlett Packard Model 5840A

TABLE 4
(continued)

ITEM/DESCRIPTION	MANUFACTURER/MODEL NUMBER
Gas Chromatograph (GC) o Capillary/packed column injector o Dual column capabilities o Dual column automatic liquid sampler o Electron capture (ECD) detector o Flame ionization (FID) detector o Computer integration of peaks o Basic programing capability	Hewlett Packard Model 5880#1 (Assigned to CLP)
Gas Chromatograph (GC) o Capillary/packed column injector o Dual column capabilities o Dual column automatic liquid sampler o Electron capture (ECD) detector o Flame ionization (FID) detector o Computer integration of peaks o Basic programing capability	Hewlett Packard Model 5880#2 (Assigned to CLP)
Gas Chromatograph (GC) o Capillary/packed column injector o Dual column capabilities o Dual column automatic liquid sampler o Electron capture (ECD) detector o Flame ionization (FID) detector o Computer integration of peaks o Basic programing capability	Hewlett Packard Model 5880
Gas Chromatograph (GC) o Packed column injector o Electron capture detector o Automatic integration of peaks o Automatic liquid sampler	Hewlett Packard Model 5890
Gas Chromatograph (GC) o Packed column injector o Automatic liquid samples o Dual electron capture detectors o Automatic integration of peaks	Hewlet Packard Model 5890 (Assigned to CLP)

TABLE 4
(continued)

ITEM/DESCRIPTION	MANUFACTURER/MODEL NUMBER
Chromatography Data Management System o Automatic integration of peaks o Autoquantitation o Interfaces with Finnegan Formsmaster software o Production of diskette deliverables and EPA format hard copy	Perkin Elmer/Nelson Turbo-chrome (Assigned to CLP)
Gas Chromatograph (GC) o Packed column injector o Electron capture detector o Automatic integration of peaks o Volatile headspace autosampler	Hewlett Packard Model 5790
Gas Chromatograph (GC) o Packed column injector o Electron capture detector o Automatic integration of peaks	Hewlett Packard Model 5790
Gas Chromatograph (GC) o Packed column injector o Hall's detector o Photoionization (PID) detector o Flame ionization (FID) detector o Automatic purge and trap sampler o 10 Units ALS autosampler	Perkin-Elmer Model 2000
Gas Chromatograph (GC) o Packed column injector o Electron capture detector (ECD) o Flame ionization detector (FID) o Automatic liquid sampler	Perkin-Elmer Model 2000

TABLE 4
(continued)

ITEM/DESCRIPTION	MANUFACTURER/MODEL NUMBER
Gas Chromatograph (GC)	Perkin-Elmer Model Sigma 1
o Packed column injector	
o Electron capture detector (ECD)	
o Flame ionization detector (FID)	
o Nitrogen-phosphorous detector (NPD)	
o Computer integration of peaks	
o Data console	
o Basic programing capability	
o Automatic purge and trap sampler	
Gas Chromatograph (GC)	Perkin-Elmer Model Sigma 3
o Packed column injector	
o Coulson's electrolytic conductivity detector	
o Computer integration of peaks	
o Automatic purge and trap sampler	
Gas Chromatograph (GC)	Gow-Mac Model 550
o Packed column injector	
o Thermal conductivity detector (TCD)	
Atomic Absorption Spectrophotometer (AA)	Perkin-Elmer Model 5000 (2 units)
o Six lamp turret for automatic determination of six elements per sample	
o Graphite furnace (2)	Perkin-Elmer Model-HGA-500
o Automatic sampler for graphite furnace (2)	Perkin-Elmer Model-AS-40
o Automatic sampler for flame analyses	Perkin-Elmer Model-AS-50
o Deuterium and tungsten background correction	
o Electrodeless discharge lamps (EDL) power supply	
o Printer	
o Gas control box	
Atomic Absorption Spectrophotometer (AA)	Perkin-Elmer Model 603
o Deuterium background correction	
o Graphite furnace	
o Flame analysis capability	
o Data handling systems	
o Gas control box	

TABLE 4
(continued)

ITEM/DESCRIPTION	MANUFACTURER/MODEL NUMBER
Inductively Coupled Argon Plasma Spectrometer (ICP)	Perkin-Elmer Plasma 40
o Czerny-Turner monochromator (160-800 nm with two gratings) o Grating selections controlled by microprocessor o Automatic background correction o RF generator - 40 MHZ and nominal operating power at 1,000 watts o Automatic sample introduction (AS-51) o IEEE-488 computer interface o Epson Equity III and Computer 40 megabyte hard disk drive and 1.2 Mbyte floppy disk drive and other accessors	
Word Processing System	CPT Model 8525
o 2 disk drives o Letter quality printer	
Muffle Furnace (2 Units)	Thermodyne Model 1500 Lindberg Model 51894
Soxhlet Heating Banks (8 Units)	Precision
Centrifuge	Damon Model HNS Clay Adams Dynac II
Laboratory Ovens	Blue M Model 100A American Model DX-58 American Model H9620 GCA - Model 16EG American Model N8620 Blue M Model SW17TA Blue M Model SW17TA Blue M Model OV8A Blue M Model OV12A GCA Boekel

TABLE 4
(continued)

ITEM/DESCRIPTION	MANUFACTURER/MODEL NUMBER
U.V. Visible Spectrophotometer o Dual cell for blank correction o Capable of automatic scan o Recorder and/or digital readout	Perkin-Elmer Model 200
UV-Visible Spectrophotometer o Dual beam for blank correction o Micro processor memory o Printer and digital readout	Milton Roy Speckrontix 1201
Spectrophotometer	Bausch and Lomb Model 20
Infrared Spectrophotometer	Perkin-Elmer Model 567
Carbon Analyzer o Capable of determining total, inorganic or organic carbon on aqueous matrices	Beckman Model 915A
Sonic Homogenizer (Polytron)	Brinkman Model PT 10/35
Oxygen Meter	Yellow Springs Model 57
Conductivity Bridge	Yellow Springs Model 31
Specific Ion/pH Meters o Specific ion electrodes include chloride, fluoride, ammonia and cyanide	Orion Model 701 Orion Model 901 Fisher Model 630
Specific Ion/pH Meters o Digital Readout o Microprocessor controlled	Accumet 925

TABLE 4
(continued)

ITEM/DESCRIPTION	MANUFACTURER/MODEL NUMBER
Fume Removal Hoods	(4) Labconco Model 5900
o Total or nine fume hoods	(2) Hemco
o Several have make-up air	(3) kewanee
Computer System	Apple Model 2e
o 128K of random access memory	
o 2 disk drives	
o Plotter	
o Dot matrix printer	
Aqua Tester	Hellige Model 611A
Water Baths	Blue M Model MW1130A Polytherm Model PY6 Tecam Model IIB
Kjeldahl Digestion Units	Labconco
Bio-Oxidation Systems	Horizon
o Includes bio-oxidation tanks and reactor vessels	
Bomb Calorimeter (2 Units)	Parr Model 1341
Autoclave	Ashcroft
Water Systems	Barnstead Model 4 (Still) Penpure Millipore Model Milli Q
Vacuum Pumps	Vac Torr Model 20 Gast Model 0211
Wrist Action Shaker	Burrell Model 75

TABLE 4
(continued)

ITEM/DESCRIPTION	MANUFACTURER/MODEL NUMBER
Melting Point Apparatus	Electrothermal
Refrigerator/Incubators	
o 5' x 15" walk-in cooler #1	(Assigned to CLP)
o 12' x 11' walk-in cooler #2	-
o Refrigerator-Flammable Storage	Labline Model - Frigid-Cab (5 units)
o General Storage Refrigerator (6 Units)	
o Refrigerator	Labline
o Incubator	GCA Model 815
o Freezer	Whirlpool
o Freezer	Admiral
o Freezer	Admiral
Pressure Filtration Apparatus	Millipore Model YT30 (2 units)
Manometric BOD Apparatus	Hach
Closed Cup Flash Point Tester	Pensky Martens (2 Units) Fisher Model - Tag
Open Cup Flash Point Tester	Fisher Model - Tag
N.A.C.E. Corrosion Testing Apparatus	
Rotary Evaporator	Brinkman
Hotplates	Thermolyne Model 2200 Lindberg (3 Units)
Vortex Mixer	American
Viscometer	Brookfield Model LVF

TABLE 4
(continued)

ITEM/DESCRIPTION	MANUFACTURER/MODEL NUMBER
Balance	
o Toploading Balance	Sartorius Model 1103
o Toploading Balance	Mettler Model PC440
o Toploading Balance	Fisher Model 7204
o Analytical Balance	Mettler Model AE160
o Analytical Balance	Mettler Model AE160
o Analytical Balance	Mettler Model H31AR
TEP Extractor	Manufactured to EPA Specifications
o 10 Unit System	
Sonic Disruptor	Tekmar Model TM500 Heat Systems Model W375 (3 Units)
Laboratory Information Management System (LIMS)	
o 1 Mb RAM	Apple (MacIntosh) S.E.
o 2 800 K floppy drive	
o 1 Imagewriter printer	
o 1 Plotter	
o Misc. software	
Prime 2755 Computer System	
o 1 Mg RAM	
o 496 Mg hard disk	
o 1 Modem cabinet	
o 2 Laser printers	
o 1 Printax line printer	
o Misc. software	
IBM AT Personal Computer (512 K RAM)	
o 30 Mb Hard disk and 1.2 Mb disk drive	
o Genoa graphics card	
o Amdek monitor	
o FX 100 Epson printer	
o Hayer modem	
o Various software packages	
o Froms/data master (Finnigan Matt Software)	

TABLE 4
(continued)

ITEM/DESCRIPTION	MANUFACTURER/MODEL NUMBER
Apple IIe (3 Units) o 128K RAM o 2 - 5¼ floppy disk drive o 1 - MX100 printer o 1 - Hays Modem o 1 - Apple monitor	
PT200 - Prime Terminal	
TEP Extractor o 10 unit system	Manufactured to EPA Specifications
Sonic Disruptor	Tekmar Model - TM500 Heat Systems - Model W375 Heat Systems - Model W375 Heat Systems - Model W375
Laboratory Information Management System (LIMS)	Prime 2755 Supermini Computer utilizing ESE's Chemical Laboratory Analysis and Scheduling System (CLASS) Software

Table 5

SAMPLE CONTAINERS

BOTTLE CODE	APPROX. VOLUME IN LITERS	DESCRIPTION
A	1	32 oz. Amber Glass
B	2	1/2 Gal. Plastic
C	.5	16 oz. Poly Boston Rd. (plastic)
D	.1	4 oz. Poly Modern Rd. (plastic)
E	.04	(2) 40 ml Vials w/Teflon Seal
F	.5	16 oz. Glass (Olive-Paragon)
G	.1	4 oz. French Square Glass
H	1	32 oz. Wide Mouth Glass
I	1	32 oz. French Square Glass
J	.5	16 oz. Wide Mouth Amber Glass
K	N/A	Cooler Chest Rental
L	.1	Disposable Sterile Plastic Bag
M	.3	8 oz. Amber Glass
-		Closure of various sizes for above bottles

Bottle orders and cooler chests are normally shipped via Federal Express, or other overnight courier.

Table 6

Organics - Contract Required Quantitation Limits
Task IV

Volatiles		CAS Number	Contract Required Quantitation Limits** Water ug/L	Soil/Sediment[a,b] ug/Kg
1.	Chloromethane	74-87-3	10	10
2.	Bromomethane	74-83-9	10	10
3.	Vinyl Chloride	75-01-4	10	10
4.	Chloroethane	75-00-3	10	10
5.	Methylene Chloride	75-09-2	5	5
6.	Acetone	67-64-1	10	10
7.	Carbon Disulfide	75-15-0	5	5
8.	1,1-Dichloroethene	75-35-4	5	5
9.	1,1-Dichloroethane	75-34-3	5	5
10.	1,2-Dichloroethene (total)	540-59-0	5	5
11.	Chloroform	67-66-3	5	5
12.	1,2-Dichloroethane	107-06-2	5	5
13.	2-Butanone	78-93-3	10	10
14.	1,1,1-Trichloroethane	71-55-6	5	5
15.	Carbon Tetrachloride	56-23-5	5	5
16.	Vinyl Acetate	108-05-4	10	10
17.	Bromodichloromethane	75-27-4	5	5
18.	1,1,2,2-Tetrachloroethane	79-34-5	5	5
19.	1,2-Dichloropropane	78-87-5	5	5
20.	trans-1,3-Dichloropropene	10061-02-6	5	5
21.	Trichloroethene	79-01-6	5	5
22.	Dibromochloromethane	124-48-1	5	5
23.	1,1,2-Trichlroethane	79-00-5	5	5
24.	Benzene	71-43-2	5	5
25.	cis-1,3-Dichloropropene	10061-01-5	5	5
26.	Bromoform	75-25-2	5	5
27.	2-Hexanone	591-78-6	10	10
28.	4-Methyl-2-pentanone	108-10-1	10	10
29.	Tetrachloroethene	127-18-4	5	5
30.	Toluene	108-88-3	5	5
31.	Chlorobenzene	108-90-7	5	5
32.	Ethyl Benzene	100-41-4	5	5
33.	Styrene	100-42-5	5	5
34.	Total Xylenes	133-02-7	5	5

Organics - Contract Required Quantitation Limits
Task IV (Continued)

Semi-Volatiles		CAS Number	Low Water ug/L	Low Soil/Sediment ug/Kg
35.	Phenol	108-95-2	10	330
36.	bis(2-Chloroethyl)ether	111-44-4	10	330
37.	2-Chlorophenol	95-57-8	10	330
38.	1,3-Dichlorobenzene	541-73-1	10	330
39.	1,4-Dichlorobenzene	106-46-7	10	330
40.	Benzyl Alcohol	100-51-6	10	330
41.	1,2-Dichlorobenzene	95-50-1	10	330
42.	2-Methylphenol	95-48-7	10	330
43.	bis(2-Chloroisopropyl) ether	108-06-1	10	330
44.	4-Methylphenol	106-44-5	10	330
45.	N-Nitroso-Dipropylamine	621-64-7	10	330
46.	Hexachloroethane	67-72-1	10	330
47.	Nitrobenzene	98-95-3	10	330
48.	Isophorone	78-59-1	10	330
49.	2-Nitrophenol	88-75-5	10	330
50.	2,4-Dimethylphenol	105-67-9	10	330
51.	Benzoic Acid	65-85-0	50	1600
52.	bis(2-Chloroethoxy)methane	111-91-1	10	330
53.	2,4-Dichlorophenol	120-83-2	10	330
54.	1,2,4-Trichlorobenzene	120-82-1	10	330
55.	Naphthalene	91-20-3	10	330
56.	4-Chloroaniline	106-47-8	10	330
57.	Hexachlorobutadiene	87-68-3	10	330
58.	4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
59.	2-Methylnaphthalene	91-57-6	10	330
60.	Hexachlorocyclopentadiene	77-47-4	10	330
61.	2,4,6-Trichlorophenol	88-06-2	10	330
62.	2,4,5-Trichlorophenol	95-95-4	50	1600
63.	2-Chloronaphthalene	91-58-7	10	330
64.	2-Nitroaniline	88-74-4	50	1600
65.	Dimethyl Phthalate	131-11-3	10	330
66.	Acenaphthylene	208-96-8	10	330
67.	3-Nitroaniline	99-09-2	50	1600
68.	Acenaphthene	83-32-9	10	330
69.	2,4-Dinitrophenol	51-28-5	50	1600
70.	4-Nitrophenol	100-02-7	50	1600
71.	Dibenzofuran	132-64-9	10	330
72.	2,4-Dinitrotoluene	121-14-2	10	330

Organics - Contract Required Quantitation Limits
Task IV (Continued)

Semi-Volatiles	CAS Number	Low Water ug/L	Low Soil/Sediment[b,c] ug/Kg
73. 2,6-Dinitrotoluene	606-20-2	10	330
74. Diethylphthalate	84-66-2	10	330
75. 4-Chlorophenyl Phenyl ether	7005-72-3	10	330
76. Fluorene	86-73-7	10	330
77. 4-Nitroaniline	100-01-6	50	1600
78. 4,6-Dinitro-2-methylphenol	534-52-1	50	1600
79. N-nitrosodiphenylamine	86-30-6	10	330
80. 4-Bromophenyl Phenyl ether	101-55-3	10	330
81. Hexachlorobenzene	118-74-1	10	330
82. Pentachlorophenol	87-86-5	50	1600
83. Phenanthrene	85-01-8	10	330
84. Anthracene	120-12-7	10	330
85. Di-n-butylphthalate	84-74-2	10	330
86. Fluoranthene	206-44-0	10	330
87. Pyrene	129-00-0	10	330
88. Butyl Benzyl Phthalate	85-68-7	10	330
89. 3,3'-Dichlorobenzidine	91-94-1	20	660
90. Benzo(a)anthracene	56-55-3	10	330
91. bis(2-ethylhexyl)phthalate	117-81-7	10	330
92. Chrysene	218-01-9	10	330
93. Di-n-octyl Phthalate	117-84-0	10	330
94. Benzo(b)fluoranthene	205-99-2	10	330
95. Benzo(k)fluoranthene	207-08-9	10	330
96. Benzo(a)pyrene	50-32-8	10	330
97. Indeno(1,2,3-cd)pyrene	193-39-5	10	330
98. Dibenz(a,h)anthracene	53-70-3	10	330
99. Benzo(g,h,i)perylene	191-24-2	10	330

Pesticides	CAS Number	Quantitation Limits** Water ug/L	Soil/Sediment[b,d] ug/Kg
100. alpha-BHC	319-84-6	0.05	8.0
101. beta-BHC	319-85-7	0.05	8.0
102. delta-BHC	319-86-8	0.05	8.0
103. gamma-BHC (Lindane)	58-89-9	0.05	8.0
104. Heptachlor	76-44-8	0.05	8.0
105. Aldrin	309-00-2	0.05	8.0
106. Heptachlor Epoxide	1024-57-3	0.05	8.0

Organics - Contract Required Quantitation Limits
Task IV (Continued)

Pesticides	CAS Number	Low Water ug/L	Low Soil/Sediment ug/Kg
107. Endosulfan I	959-98-8	0.05	8.0
108. Dieldrin	60-57-1	0.10	16.0
109. 4,4'-DDE	72-55-9	0.10	16.0
110. Endrin	72-20-8	0.10	16.0
111. Endosulfan II	33213-65-9	0.10	16.0
112. 4,4'-DDD	72-54-8	0.10	16.0
113. Endosulfan Sulfate	1031-07-8	0.10	16.0
114. 4,4'-DDT	50-29-3	0.10	16.0
115. Endrin Ketone	53494-70-5	0.10	16.0
116. Methoxychlor	72-43-5	0.5	80.0
117. Alpha-chlorodane	5301-71-9	0.5	80.0
118. Gama-chloradane	5301-74-2	0.5	80.0
119. Toxaphene	8001-35-2	1.0	160.0
120. AROCLOR-1016	12674-11-2	0.5	80.0
121. AROCLOR-1221	11104-28-2	0.5	80.0
122. AROCLOR-1232	11141-16-5	0.5	80.0
123. AROCLOR-1242	53469-21-9	0.5	80.0
124. AROCLOR-1248	12672-29-6	0.5	80.0
125. AROCLOR-1254	11097-69-1	1.0	160.0
126. AROCLOR-1260	11096-82-5	1.0	160.0

a Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Volatile TCL Compounds are 100 times the individual Low Soil/Sediment CRQL.

b Quanitation limits listed for soil/sediment are based on wet weight. The quanitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the contract, will be higher.

c Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Semi-Volatile TCL Compounds are 60 times the individual Low Soil/Sediment CRQL.

d Medium Soil/Sediment Contract Required Quanitation Limits (CRQL) for Pesticide TCL compounds are 15 times the individual Low Soil/Sediment CRQL.

** Specific quanitation limits are highly matrix dependent. The quanitation limits listed herein are provided for guidance and may not always be achievable.

Metals - Contract Required Detection Levels
Task IV

Element	Contract Required Detection Level *,H (ug/L)
Aluminum	200
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Calcium	5000
Chromium	10
Cobalt	50
Copper	25
Iron	100
Lead	5
Magnesium	5000
Manganese	15
Mercury	0.2
Nickel	40
Potassium	5000
Selenium	5
Silver	10
Sodium	5000
Thallium	10
Vanadium	50
Zinc	20

* Any analytical method specified the current IFB document may be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Level (CRDL) requirements. Higher detection levels may only be used in the following circumstance:

If the sample concentration exceeds two times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the contract required detection level. This is illustrated in the example below:

For lead:
Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample concentration = 85
Contract Required Detection Level (CRDL) = 5

The value of 85 may be reported even though instrument detection limit is greater than required detection level. The instrument or method detection limit must be documented as described in the current IFB document.

H These CRDL are the instrument detection limits obtained in pure water that must be met using the procedure in the current IFB document. The detection limits for samples may be considerably higher depending on the sample matrix.

Table 6

Miscellaneous Compounds - Contract Required Detection Limits
Task IV

Compound	Contract Required Detection Limit
Total Cyanide	10 ug/L*
Total Phenol	+
2,3,7,8-TCDD	0.002 ug/L (aqueous)** *** (non-aqueous)
Total polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans	Aqueous and Non-Aqueous TCDD/F 1.0 ppb PECDD/F 3.0 ppb HEXCDD/F 3.0 ppb HEPCDD/F 7.0 ppb OCTACDD/F 7.0 ppb

* This CRDL is the instrument detection limit obtained in pure water that must be met. The detection limits for samples may be considerably higher depending on the sample matrix.

If the sample concentration exceeds two times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the contract required detection level. The instrument or method detection limit must be documented.

\+ The method detection must be submitted by each individual laboratory.

*** The detection limit is set by the laboratory but must be less than 1.0 ug/kg (1.0 ppb).

** Specific detection limits are highly matrix dependent. The detection limits specified herein are provided for guidance and may not always be achievable.

Table 6

Organics - Contract Required Detection Limits
Tasks VI and VII

Volatiles	CAS Number	Contract Required Detection Limits** Water ug/L	Soil/Sediment** ug/Kg
Chloromethane	74-87-3	10	10
Bromomethane	74-83-9	10	10
Vinyl Chloride	75-01-4	10	10
Chloroethane	75-00-3	10	10
Methylene Chloride	75-09-2	5	5
1,1-Dichloroethene	75-35-4	5	5
1,1-Dichloroethane	75-34-3	5	5
trans-1,2-Dichloroethene	156-60-5	5	5
Chloroform	67-66-3	5	5
1,2-Dichloroethane	107-06-2	5	5
1,1,1-Trichloroethane	71-55-6	5	5
Carbon Tetrachloride	56-23-5	5	5
Bromodichloromethane	75-27-4	5	5
1,1,2,2-Tetrachloroethane	79-34-5	5	5
1,2-Dichloropropane	78-87-5	5	5
trans-1,3-Dichloropropene	10061-02-6	5	5
Trichloroethene	79-01-6	5	5
Dibromochloromethane	124-48-1	5	5
1,1,2-Trichlroethane	79-00-5	5	5
Benzene	71-43-2	5	5
cis-1,3-Dichloropropene	10061-01-5	5	5
2-Chloroethyl Vinyl Ether	110-75-8	10	10
Bromoform	75-25-2	5	5
Tetrachloroethene	127-18-4	5	5
Toluene	108-88-3	5	5
Chlorobenzene	108-90-7	5	5
Ethyl Benzene	100-41-4	5	5

Table 6

Organics - Contract Required Detection Limits
Tasks VI and VII (Continued)

Semi-Volatiles	CAS Number	Low Water ug/L	Low Soil/Sediment ug/Kg
Phenol	108-95-2	10	330
bis(2-Chloroethyl)ether	111-44-4	10	330
2-Chlorophenol	95-57-8	10	330
1,3-Dichlorobenzene	541-73-1	10	330
1,4-Dichlorobenzene	106-46-7	10	330
1,2-Dichlorobenzene	95-50-1	10	330
bis(2-Chloroisopropyl) ether	108-06-1	10	330
N-Nitroso-Dipropylamine	621-64-7	10	330
Hexachloroethane	67-72-1	10	330
Nitrobenzene	98-95-3	10	330
Isophorone	78-59-1	10	330
2-Nitrophenol	88-75-5	10	330
2,4-Dimethylphenol	105-67-9	10	330
bis(2-Chloroethoxy)methane	111-91-1	10	330
2,4-Dichlorophenol	120-83-2	10	330
1,2,4-Trichlorobenzene	120-82-1	10	330
Naphthalene	91-20-3	10	330
Hexachlorobutadiene	87-68-3	10	330
4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
Hexachlorocyclopentadiene	77-47-4	10	330
2,4,6-Trichlorophenol	88-06-2	10	330
2-Chloronaphthalene	91-58-7	10	330
Dimethyl Phthalate	131-11-3	10	330
Acenaphthylene	208-96-8	10	330
Acenaphthene	83-32-9	10	330
2,4-Dinitrophenol	51-28-5	50	1600
4-Nitrophenol	100-02-7	50	1600
2,4-Dinitrotoluene	121-14-2	10	330
2,6-Dinitrotoluene	606-20-2	10	330
Diethylphthalate	84-66-2	10	330
1,2-Diphenylhydrazine	122-66-7	10	330
4-Chlorophenyl Phenyl ether	7005-72-3	10	330
Fluorene	86-73-7	10	330
N-nitrosodimethylamine	62-75-9	10	330
4,6-Dinitro-2-methylphenol	534-52-1	50	1600
N-nitrosodiphenylamine	86-30-6	10	330
4-Bromophenyl Phenyl ether	101-55-3	10	330
Hexachlorobenzene	118-74-1	10	330
Pentachlorophenol	87-86-5	50	1600
Phenanthrene	85-01-8	10	330
Anthracene	120-12-7	10	330
Di-n-butylphthalate	84-74-2	10	330
Fluoranthene	206-44-0	10	330
Pyrene	129-00-0	10	330

Table 6

Organics - Contract Required Detection Limits
Tasks VI and VII (Continued)

Semi-Volatiles	CAS Number	Low Water ug/L	Low Soil/Sediment* ug/Kg
Butyl Benzyl Phthalate	85-68-7	10	330
3,3'-Dichlorobenzidine	91-94-1	20	660
Benzo(a)anthracene	56-55-3	10	330
bis(2-ethylhexyl)phthalate	117-81-7	10	330
Chrysene	218-01-9	10	330
Di-n-octyl Phthalate	117-84-0	10	330
Benzo(b)fluoranthene	205-99-2	10	330
Benzo(k)fluoranthene	207-08-9	10	330
Benzo(a)pyrene	50-32-8	10	330
Indeno(1,2,3-cd)pyrene	193-39-5	10	330
Dibenz(a,h)anthracene	53-70-3	10	330
Benzo(g,h,i)perylene	191-24-2	10	330

Pesticides	CAS Number	Detection Limits** Water ug/L	Soil/Sediment* ug/Kg
alpha-BHC	319-84-6	0.05	8.0
beta-BHC	319-85-7	0.05	8.0
delta-BHC	319-86-8	0.05	8.0
gamma-BHC (Lindane)	58-89-9	0.05	8.0
Heptachlor	76-44-8	0.05	8.0
Aldrin	309-00-2	0.05	8.0
Heptachlor Epoxide	1024-57-3	0.05	8.0
Endosulfan I	959-98-8	0.05	8.0
Dieldrin	60-57-1	0.10	16.0
4,4'-DDE	72-55-9	0.10	16.0
Endrin	72-20-8	0.10	16.0
Endosulfan II	33213-65-9	0.10	16.0
4,4'-DDD	72-54-8	0.10	16.0
Endosulfan Sulfate	1031-07-8	0.10	16.0
4,4'-DDT	50-29-3	0.10	16.0
Endrin Aldehyde	7421-93-4	0.10	16.0
Methoxychlor	72-43-5	0.5	80.0
Chlordane	57-74-9	0.5	80.0
Toxaphene	8001-35-2	1.0	160.0
AROCLOR-1016	12674-11-2	0.5	80.0
AROCLOR-1221	11104-28-2	0.5	80.0
AROCLOR-1232	11141-16-5	0.5	80.0
AROCLOR-1242	53469-21-9	0.5	80.0
AROCLOR-1248	12672-29-6	0.5	80.0
AROCLOR-1254	11097-69-1	1.0	160.0
AROCLOR-1260	11096-82-5	1.0	160.0

* Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the contract, will be higher.

** Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable.

RECRA ENVIRONM

Table 6

Metals - Contract Required Detection Levels
Tasks VI and VII

Element	Contract Required Detection Level (ug/L)
Antimony	60
Arsenic	10
Barium	200
Beryllium	5
Cadmium	5
Chromium	10
Copper	25
Iron	100
Lead	5
Manganese	15
Mercury	0.2
Nickel	40
Selenium	5
Silver	10
Thallium	10
Zinc	20

* If the sample concentration exceed two times the detection limit of the instrument or method in use, the value may be reported even though the instrument or method detection limit may not equal the contract required detection level. This is illustrated in the example below:

For lead:
Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample concentration = 85
Contract Required Detection Level (CRDL) = 5

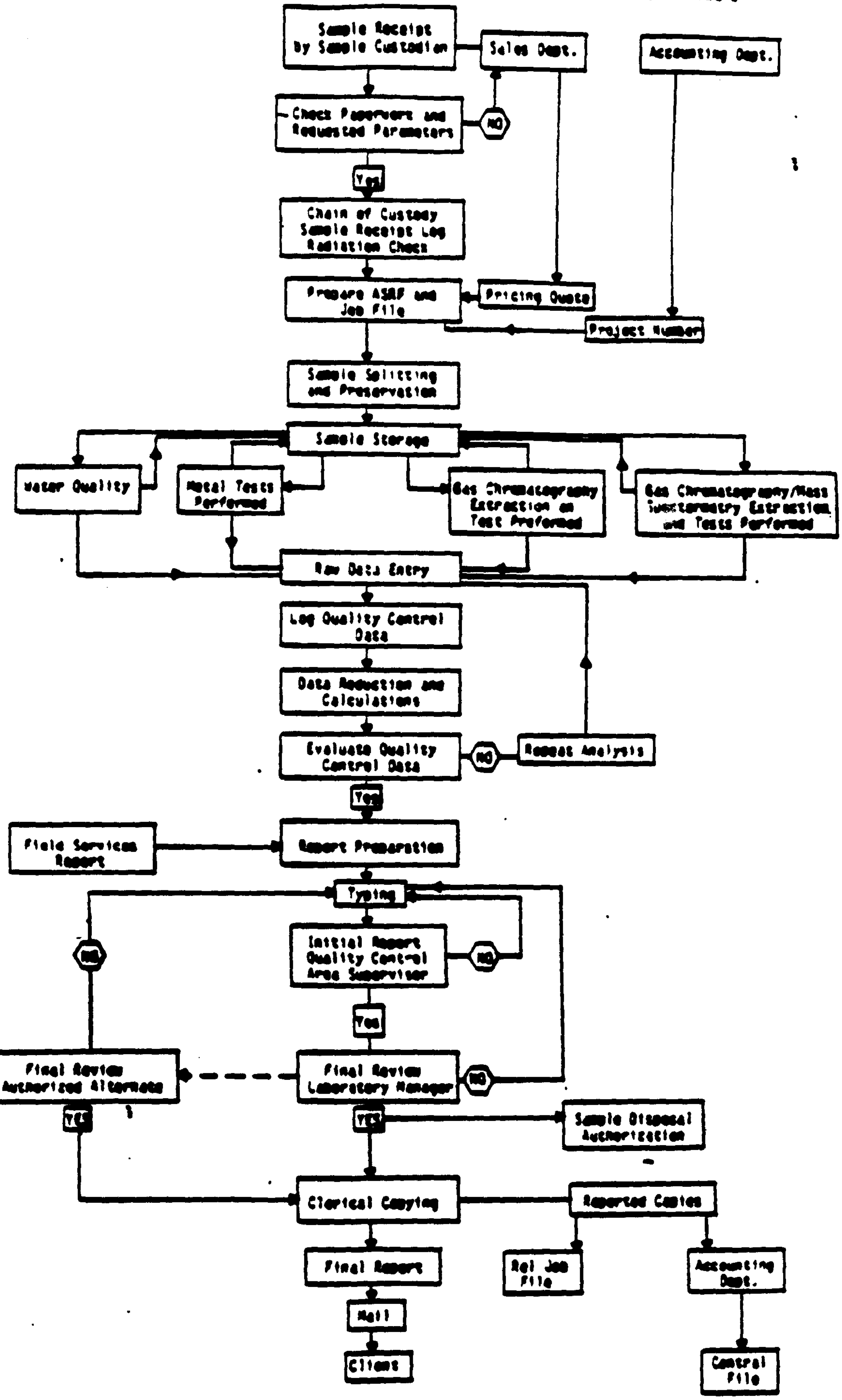
The value of 85 may be reported even though instrument detection limit is greater than required detection level. The instrument or method detection limit must be documented.

These CRDL are the instrument detection limits obtained in pure water that must be met. The detection limits for samples may be considerably higher depending on the sample matrix.

ATTACHMENT II

List of Figures

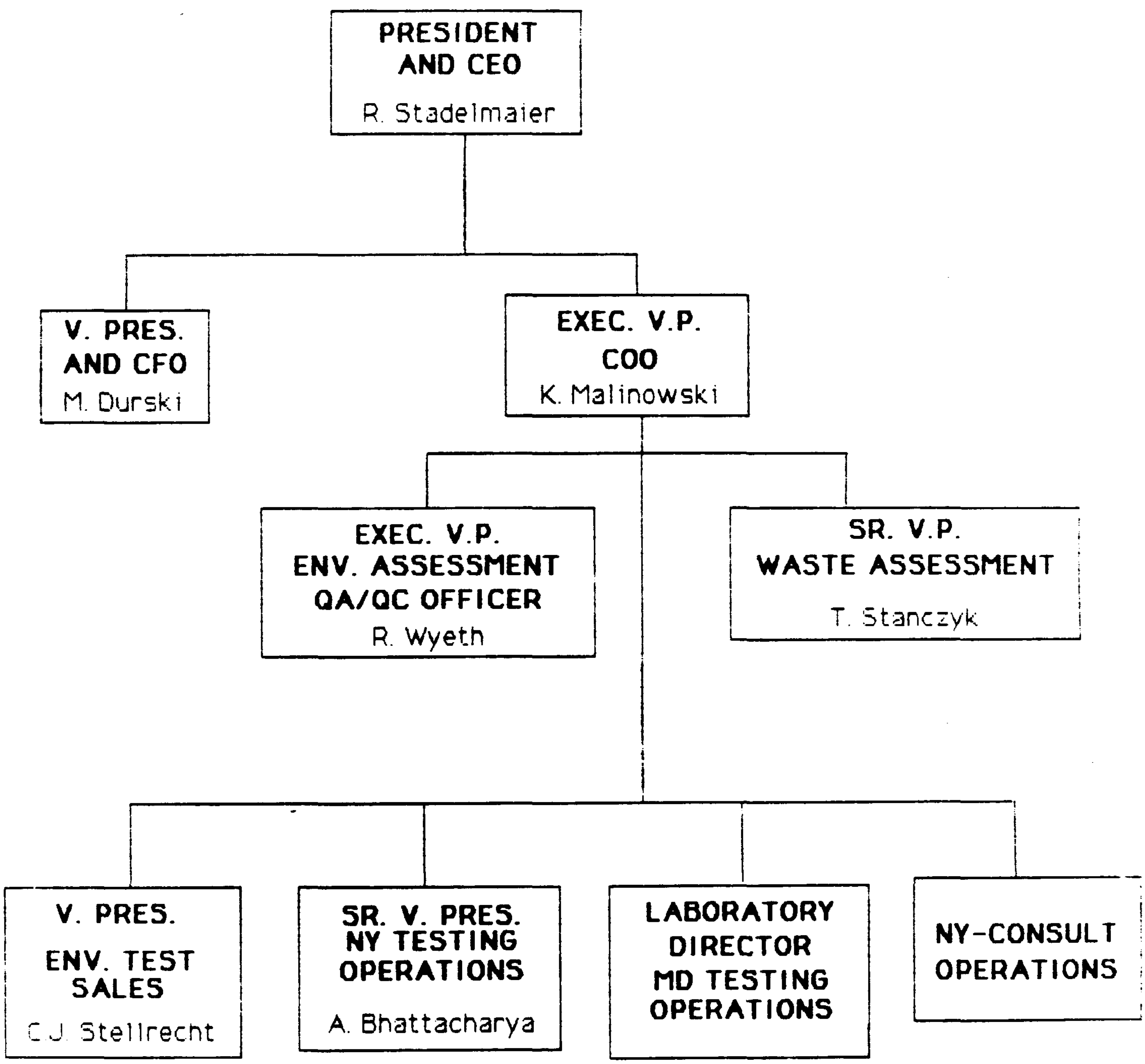
Figure 1
Recra Environmental Laboratory
STANDARD OPERATING PROCEDURES FLOW CHART



RECRA ENVIRONMENTAL, INC.

FIGURE 2

RECRA ENVIRONMENTAL, INC.
ORGANIZATIONAL STRUCTURE



03/10/89

FIGURE 3

RECRA ENVIRONMENTAL, INC.
NEW YORK ENVIRONMENTAL TESTING OPERATIONS
ORGANIZATIONAL STRUCTURE

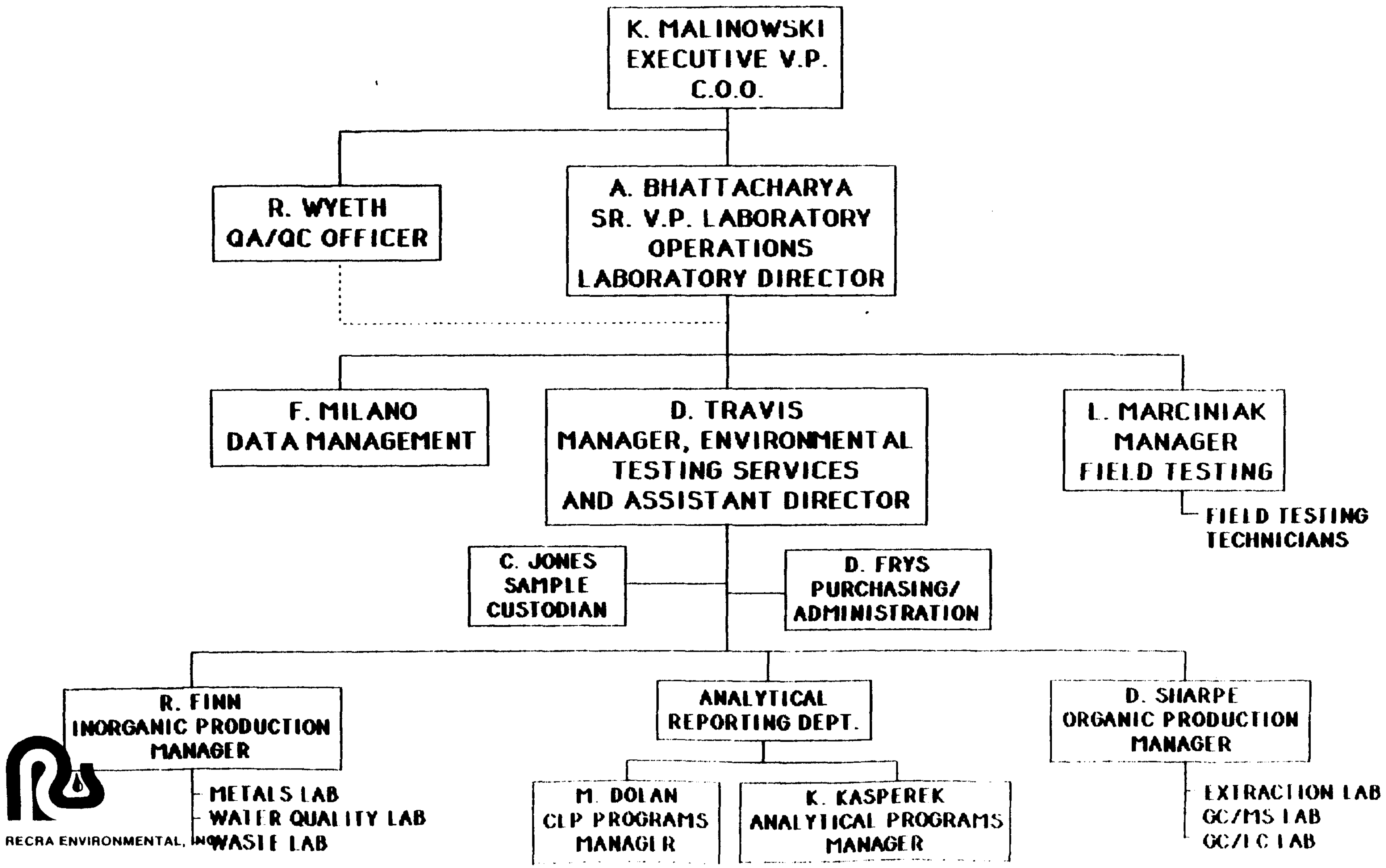


Figure 4

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO.:					SITE NAME:	NO OF CONTAINERS								REMARKS
SAMPLERS (SIGNATURE):														
STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION									

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE):	RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE / TIME	REMARKS	

Distribution: Original accompanies shipment; copy to coordinator field files.

ANALYTICAL SERVICES REQUEST FORM

1. Project #: ____
2. Initiator of Request: ____
3. Sales Contact: ____
4. Date of Request: ____
5. Required Completion Date: ____
6. Client Name and Address:

____
____
____
____

ATTN: ____

7. [ ] Carbon Copy ____
8. Telephone # (   ) ____
9. Chain of Custody [ ] Y [ ] N
10. Sample Date: ____
    ___ See Log for Sample Dates
11. ___ See Log for Full Sample I.D.
12. Preserved in Field [ ] Y [ ] N
17. Sample History ____

____
____
____

18. Anticipated # of Samples ____

23. Job #: ____
24. ASRF (Job) Date: ____
25. Samples Received: ____
26. Quote #: ____

R.E.I. USE ONLY

13. Collected By ___ Recra ___ Client
14. ___ Field Report
15. Sample Type ___ Soil ___ Sludge
    ___ Water ___ Oil ____
    ___ Other ____
16. Report Writer ____

Waste Lab	$

19. ANALYTICAL PARAMETERS | TOTAL $

WQ	$	Metals	$	GC/LC	$	GC/MS BN/AP	$

20. Sample I.D.: ______ Actual # of Samples
___ Sample I.D.'s apply to all parameters

GC/MS VOL	$

21. VOA Scheme
___ Actual # vials
___ # Field Blanks
___ pts x ___ Vial
In Duplicate ___ Yes
Lab Composited ___ Ye
___ # Vials/Point

22. Specific Requirements: ie. report content, special handling, safety, preserved or filtered in field, etc.

____
____
____
____

29. P.O. # ____

27. Signature (Customer Service Representative) ____
All Info. Checked for Accur

cc: Address:

____
____
____

28. Signature (Sample Custodian) ____
All Info. Checked for Accur

Figure 6

SAMPLE INVENTORY

RA 'ROI TAL ORA IES
ANALYTICAL 'LE INVENTORY

DATE REC.	PROJ #/ CLIENT	JOB #	PRES.	DELIVERY	REC. COOL	SAMPLE ID	SAMPLING DATE	BOTTLE DESCRIPTION - COMMENTS
								FS P AC VOA FS P AC FS P GW FS P GW
REC.	PROJ #/ CLIENT	JOB #	PRES.	DELIVERY	REC. COOL	SAMPLE ID	SAMPLING DATE	BOTTLE DESCRIPTION - COMMENTS
								FS P AC VOA FS P AC FS P GW FS P GW
REC.	PROJ #/ CLIENT	JOB #	PRES.	DELIVERY	REC. COOL	SAMPLE ID	SAMPLING DATE	BOTTLE DESCRIPTION - COMMENTS
								FS P AC VOA FS P AC FS P GW FS P GW
REC.	PROJ #/ CLIENT	JOB #	PRES.	DELIVERY	REC. COOL	SAMPLE ID	SAMPLING DATE	BOTTLE DESCRIPTION - COMMENTS
								FS P AC VOA FS P AC FS P GW FS P GW
REC.	PROJ #/ CLIENT	JOB #	PRES.	DELIVERY	REC. COOL	SAMPLE ID	SAMPLING DATE	BOTTLE DESCRIPTION - COMMENTS
								FS P AC VOA FS P AC FS P GW FS P GW
E REC.	PROJ #/ CLIENT	JOB #	PRES.	DELIVERY	REC. COOL	SAMPLE ID	SAMPLING DATE	BOTTLE DESCRIPTION - COMMENTS
								FS P AC VOA FS P AC FS P GW FS P GW
E REC.	PROJ #/ CLIENT	JOB #	PRES.	DELIVERY	REC. COOL	SAMPLE ID	SAMPLING DATE	BOTTLE DESCRIPTION - COMMENTS
								FS P AC VOA FS P AC FS P GW FS P GW
E REC.	PROJ #/ CLIENT	JOB #	PRES.	DELIVERY	REC. COOL	SAMPLE ID	SAMPLING DATE	BOTTLE DESCRIPTION - COMMENTS
								FS P AC VOA FS P AC FS P GW FS P GW
TE REC.	PROJ #/ CLIENT	JOB #	PRES.	DELIVERY	REC. COOL	SAMPLE ID	SAMPLING DATE	BOTTLE DESCRIPTION - COMMENTS
								FS P AC VOA

FIGURE 7

PREPRINTED SAMPLE IDENTIFICATION LABELS

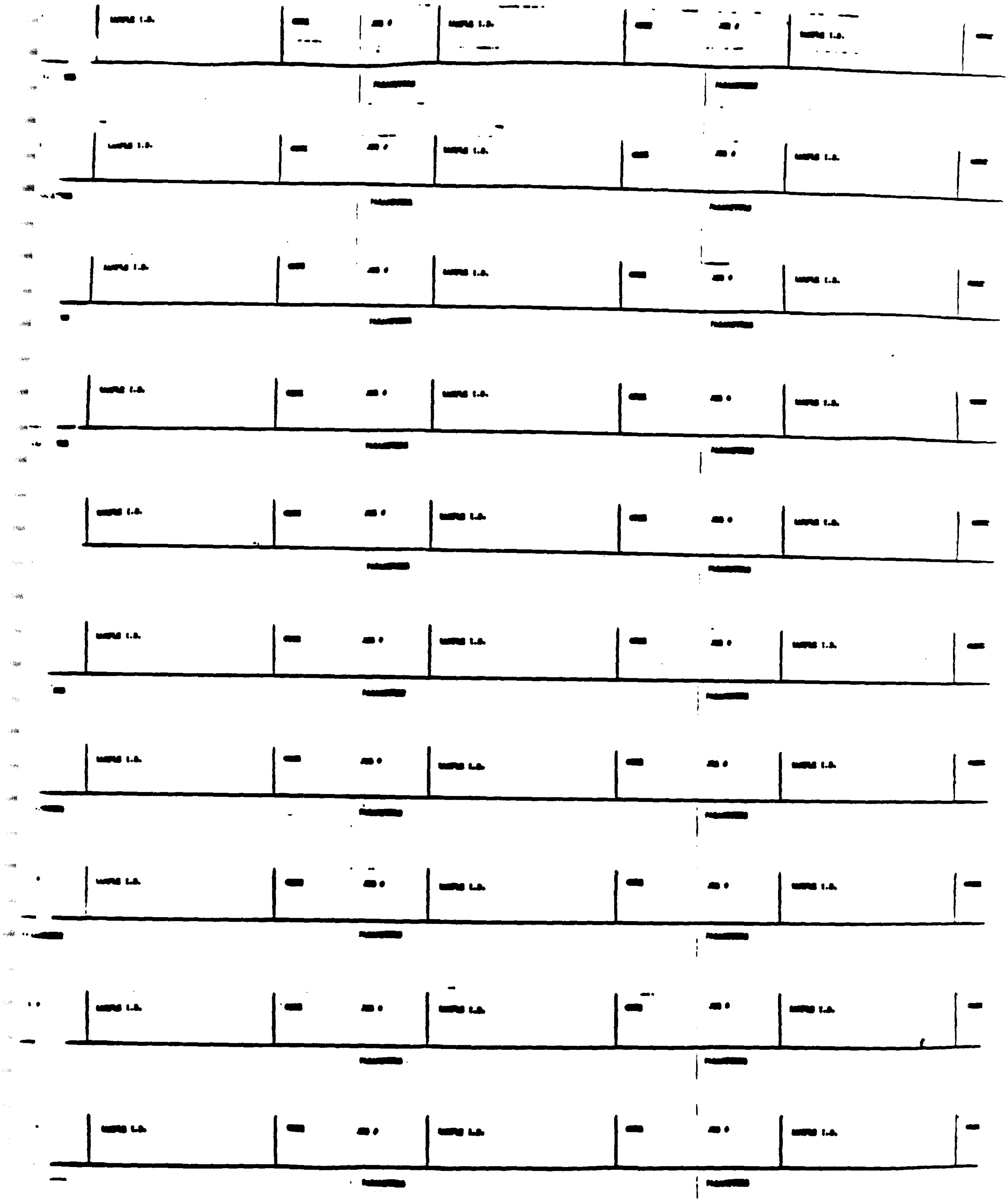


FIGURE 8

SAMPLE PREPARATION LOG FOR CLP WATERS - RECRA ENVIRONMENTAL, INC.

JOB # 89-	SAMPLE ID	VIAL NUMBER	TYPE OF ANALYSIS	SAMPLE VOLUME	INIT pH	ADJ. pH	EMUL-SION *	EXTRACTION DATE & INT	CONC. DATE&INT	GLASS WARE SET	FINAL VOLUME
		SW-									
		SW-									
		SW-									
		SW-									
		SW-									
		SW-									
		SW-									
		SW-									
		SW-									
		SW-									
		SW-									
		SW-									
		SW-									
		SW-									

COMMENTS: ______

*Emulsion: L = light; M = medium ; H = heavy

Reviewed by: ______ Date: ______

FIGURE 8A

SAMPLE PREPARATION LOG FOR CLP BN/AP - RECRA ENVIRONMENTAL, INC.

JOB #	SAMPLE ID	VIAL NUMBER	TYPE OF ANALYSIS	SAMPLE VOLUME	INIT pH	ADJ. pH	EMUL-SION *	EXTRACTION DATE & INT	CONC. DATE&INT	GLASS WARE SET		FINAL VOLUME
		BN-										
		BN-										
		BN-										
		BN-										
		BN-										
		BN-										
		BN-										
		BN-										
		BN-										
		BN-										
		BN-										
		BN-										
		BN-										
		BN-										

OMMENTS: ____

* Emulsion: L = light ; M = medium ; H = heavy ; N = none

Reviewed by: ______________ Date: ______________

FIGURE 8B

RECRA ENVIRONMENTAL, INC.

EXTRACTION SUMMARY								% DRY WEIGHT						CONCENTRATION & CLEANUP SUMMARY					
JOB NUMBER	SAMPLE ID	VIAL NUMBER	EXTRACT DATE	ANALYST	METHOD OF EXTRACT	SAMPLE WGT.	GLASS-WARE SET	DISH WGT.	WET + DISH	DRY + DISH	WET WGT.	DRY WGT.	%DRY	TYPE OF CLEAN UP	SPLITS ?	FINAL VOLUME	DATE PREP FINISHED	CLEANUP INITIALS	TYPE OF ANALYSIS

NOTES: ______________________________

METHOD OF EXTRACT: SOXLET, SONICATION, OR STEAM DISTILLATION

REVIEWED BY ______ DATE ______

GC LOG BOOK

Figure 9

& INITIALS	JOB #	VIAL #	AUTO #	CF/ DF	ANALYSIS	PORT	COMMENTS

Figure

RAW DATA - WATI SPECIFIC ANALYSES

Job #: Project #: Analysis: Instrument: Analyst: Date of Calc:

Sample Identification	Vol. Ext.	FV ml	Vial #	DF	µl Inj.	Date Inj.	STD Date	Area Units	RF	ng	Mean ng	µg/l	Compound

RAW [illegible]TA - [illegible] - [illegible]

Ext. date:

Job #: Project #: Analysis: Instrument: Analyst: Date of Calc:

Sample Identification	Wet Weight	% Dry	Dry Weight	FV ml	Vial #	µl Inj.	DF	Date Inj.	Sample RT	Area Units	Calc Factor	STD RF.	ng	µg/g	Compound

Figure [illegible]

RAW DATA – CLP – WATER

[illegible] ______________ AL# ______________ [illegible] ID. ______________

DATE [illegible] ______________ VOL. EXT. ______________ F[illegible]AL VOLUME ______________ VOL. INJ. ______________

QUANT COLUMN	DATE INJ ______		DF ______				CONF COLUMN	DATE INJ			DF ______	
COMPOUND	R.T.	AREA UNITS	R.F.	NG	ug/l		R.T.	AREA UNITS	R.F.	NG	ug/l	
alpha-BHC												
beta-BHC												
delta-BHC												
gamma-BHC												
Heptachlor												
Aldrin												
Heptachlor Epoxide												
Endosulfan I												
Dieldrin												
4,4'-DDE												
Endrin												
Endosulfan II												
4,4'-DDD												
Endrin Aldehyde												
Endosulfan Sulfate												
4,4'-DDT												
Methoxychlor												
Endrin Ketone												
Tech. Chlordane												
alpha-Chlordane*												
gamma-Chlordane*												
Toxaphene												
Aroclor – 1016												
Aroclor – 1221												
Aroclor – 1232												
Aroclor – 1242												
Aroclor – 1248												
Aroclor – 1254												
Ar[illegible] – [illegible]60												

Figure [illegible]

J-- # ____ VIAL # ____ ____ SAMPLE ID ____ ____ ____ ____ % ____ RAW DATA - CLP - SOIL

DATE EXT. ____________ GRAMS EXT. ____________ FINAL VOLUME ____________ VOL. INJ. ____________ DRY WT. ____________

QUANT COLUMN	DATE INJ. ________		DF ________				CONFIRMATION COL	DATE INJ. ________		DF ________		
COMPOUND	R.T.	AREA UNITS	R.F.	NG	µG/G		R.T.	AREA UNITS	R.F.	NG	µG/G	
alpha-BHC												
beta-BHC												
delta-BHC												
gamma-BHC												
Heptachlor												
Aldrin												
Heptachlor Epoxide												
Endosulfan I												
Dieldrin												
4,4'-DDE												
Endrin												
Endosulfan II												
4,4'-DDD												
Endrin Aldehyde												
Endosulfan Sulfate												
4,4'-DDT												
Methoxychlor												
Endrin Ketone												
Tech. Chlordane												
alpha-Chlordane*												
gamma-Chlordane*												
Toxaphene												
Aroclor - 1016												
Aroclor - 1221												
Aroclor - 1232												
Aroclor - 1242												
Aroclor - 1248												
Aroclor - 1254												
Aroclor - 1260												
DIBUTYL CHLORENDATE												

Figure ...

Figure .-

GC/MS LOG BOOK

[illegible]	[illegible]	[illegible]	FRN	[illegible]	SAMPLE ID	VIAL #	JOB #	INJ. VOL	EXT VOL	[illegible] VOL	G.C. PROG	EM VOLTS	[illegible]	[illegible] IS	IS RT	IS AREA	IS [illegible]	SS RT	SS01 AREA	SS [illegible]	[illegible] RT	SS02 AREA	[illegible]	SS0 3 RT	SS03 AREA	[illegible]	SS [illegible] RT	SS [illegible] AREA	[illegible]	3	NC

Figure [illegible]

FILE NAME ____________

SAMPLE NO. ____________

INSTRUMENT ____________

GC/MS

VOLATILE PRIORITY POLLUTANT QUANTIFICATION SHEET

$$R = \frac{Ac \cdot Ca}{As \cdot Cc}$$

$$C = \frac{Ac \cdot Ca}{As \cdot R}$$

ug/l = C / inj.vol.

$$ug/kg\ dry = \frac{C}{g \cdot decimal\ dry\ wt.}$$

COMPOUND	STANDARD				Resp. Factor R	SAMPLE			ug on col C	Inj. vol. (ml)	Dil. Factor	dry weight	ug /
	Compound area Ac	ug IS on col Ca	Area IS As	ug Cmpd. on col Cc		Compound area Ac	ug IS on col Ca	Area IS As					

FILE NAME ______________

SAMPLE NO. ______________

INSTRUMENT ______________

GC/MS

NB/AP PRIORITY POLLUTANT QUANTIFICATION SHEET

DATE ______________

$$K = \frac{Ac \cdot Ca}{As \cdot Cc}$$

$$C = \frac{Ac \cdot Ca}{As \cdot K}$$

$$\mu g/l = \frac{C \cdot fv}{Inj \cdot ext}$$

$$\mu g/g\ dry = \frac{C \cdot fv}{Inj \cdot g \cdot decimal\ dry\ wt}$$

	STANDARD					SAMPLE							
Compound	Compound area AC	ng IS on col Ca	Area IS As	ng Comp on col Cc	Resp Factor K	Compound area Ac	ng IS on col Ca	Area IS As	ng on col c	fv (ml)	Inj vol	ext vol (l) k	µg/

Figure

P.P. VOLATILES

FIGURE 17

FILE NAME ____________________

SAMPLE ID ____________________

JOB # ____________________

ANALYSIS DATE ____________________

ANALYST ____________________

SAMPLE VOLUME ____________________

PURGEABLE A VOL ____________________

PURGEABLE B VOL ____________________

PURGEABLE C VOL ____________________

VOLUME IS USED ____________________

COMPOUND NAME		SCAN #	ION AREA	CHARACTERISTC EI IONS (Rel. Int.)		
Chloromethane	C			50(100)	52(33)	
Bromomethane	C			94(100)	96(94)	
Chloroethene	C			62(100)	64(33)	
Chloroethane	C			64(100)	66(33)	
Methylene Chloride	A			84(86)	51(33)	
				49(100)	86(55)	
Trichlorofluoromethane				101( )	103( )	
1,1-Dichloroethylene	A			96(80)	61(100)	98(53)
				128(70)	130(88)	
Bromochloromethane	(IS)			49(100)	51(33)	
				63(100)	65(33)	83(13)
1,1-Dichloroethane	A			85(8)	98(7)	100(4)
Trans-1,2-Dichloroethylene	B			96(90)	61(100)	98(57)
Chloroform	A			83(100)	85(66)	
				62(100)	64(33)	
1,2-Dichloroethane	B			98(23)	100(15)	
				97(100)	99(66)	
1,1,1-Trichloroethane	B			117(19)	119(16)	
Carbon Tetrachloride	A			117(100)	119(96)	121(30)
Bromodichloromethane	B			83(100)	85(66)	
1,2-Dichloropropane	A			63(100)	65(33)	114(3)
Trans-1,3-Dichloropropene	B			75(100)	77(33)	
				130(90)	97(66)	
Trichloroethylene	A			95(100	132(85)	
Benzene	B			78(100)	77(19)	
Dibromochloromethane	A			129(100)	208(13)	206(10)
Cis-1,3-Dichloropropene	B			75(100)	77(33)	
				97(100)	85(60)	83(95)
1,1,2-Trichloroethane	A			99(63)	132(9)	134(8)
2-Chlorovinyl Ether	A			106(18)	65(32)	63(95)
1,4-Difluorobenzene	(IS)			114( )	63( )	88( )
				173(100)	171(50)	175(50)
Bromoform	B			252(11)	254(11)	
				164(78)	131(62)	
Tetrachloroethylene	A			129(64)	166(100)	
				83(100)	85(66)	131(
1,1,2,2-Tetrachloroethane	B			133( )	166( )	
Chlorobenzene D_5	(IS)			117( )	82( )	119(
Toluene	B			92(78)	91(100)	
Chlorobenzene	A			112(100)	114(33)	
Ethylbenzene	B			106(33)	91(100)	
Acrolein				56(83)	55(64)	
Acrylonitrile				53(99)	51(32)	52(75)
1,3-Dichlorobenzene				146(100	148(64)	113(12)
1,4-Dichlorobenzene				146(100)	148(64)	113(12)
1,2-Dichlorobenzene				146(100)	148(64)	113(12)

File Name ____________________

Sample I.D. ____________________

Job # ____________________

Vial I.D. ____________________

Analysis Date ____________________

Instrument ____________________

EXTRACTABLES

FIGURE 18

Final Volume ____________________

Initial Volume ____________________

Injection Volume ____________________

ng Internal STD ____________________

Dry Weight ____________________

COMPOUND	SCAN #	ION AREA	Characteristic EI Ions (Rel. Int.)		
phenol			94(100),	65(21),	66(25)
2-chlorophenol			128(100),	64(54),	130(31)
Bis-(2-chloroethyl)ether			93(100),	63(99),	95(31)
1,3-dichlorobenzene			146(100),	148(64),	113(12)
1,4-dichlorobenzene			146(100),	148(64),	113(11)
1,2-dichlorobenzene			146(100),	148(64),	113(11)
Bis-(2-chloroisopropyl)ether			45(100),	77(19),	79(12)
hexachloroethane			117(100),	199(61),	201(99)
N-nitroso-Di-Propylamine			70(100), 130(25),	42(63), 101(12)	
nitrobenzene			77(100),	123(50),	65(15)
Isophorone			82(100),	95(16),	138(18)
2-nitrophenol			139(100),	65(35),	109(8)
2,4-dimethylphenol			107(90),	122(100),	121(55)
Bis-(2-chloroethyoxy)methane			93(100),	95(32),	123(21)
2,4-dichlorophenol			162(100),	164(58),	98(61)
1,2,4-trichlorobenzene			180(100),	182(80),	145(52)
naphthalene			128(100),	127(10),	129(11)
hexachlorobutadiene			225(100),	223(63),	227(65)
4-chloro-3-methylphenol			107(80),	142(100),	144(32)
hexachlorocyclopentadiene			237(100),	235(63),	272(12)
2,4,6-trichlorophenol			196(100),	198(92),	200(26)
2-chloronaphthalene			162(100),	164(32),	127(31)
acenaphthylene			152(100),	153(16),	151(17)
dimethylphthalate			163(100),	164(10),	194(23)
2,6-dinitrotoluene			165(100),	63(72),	121(23)
acenaphthene			153(86),	152(41),	154(100)
2,4-dinitrophenol			184(100),	63(59),	154(53)
2,4-dinitrotoluene			165(100),	63(29),	182(10)
4-nitrophenol			109(31),	65(86),	139(100)
fluorene			166(100),	165(80),	167(14)
4-chlorophenyl-phenyl ether			204(100),	206(62),	141(14)
diethylphthalate			149(100),	177(29),	150(13)
N-nitrosdiphenylamine			169(98),	168(100),	167(98)
4,6-dinitro-2-methylphenol			198(100),	182(35),	77(28)
4-bromophenyl-phenyl ether			248(100),	250(99),	141(45)
hexachlorobenzene			284(100),	142(30),	249(24)
pentachlorophenol			266(100),	264(62),	268(63)
phenanthrene			178(100),	179(16),	176(15)
anthracene			178(100),	179(16),	176(15)
di-n-butylphthalate			149(100),	150(9),	104(3)
fluoranthene			202(100),	101(23),	100(14)

ANALYST ____________________

EXTRACTABLES

FIGURE 18 (CONT'D.)

COMPOUND	SCAN #	ION AREA	Characteristic EI Ions (Rel. Int.)		
pyrene			202(100),	101(26),	100(17)
butyl benzylphthalate			149(100),	91(50)	
benzo(a)anthracene			228(100),	229(19),	226(19)
chrysene			228(100),	229(19),	226(19)
3,3'-dichlorobenzidine			252(100),	254(66),	126(16)
bis(2-ethylhexyl)phthalate			149(100),	167(43),	279(18)
di-n-octylphthalate			149(100),		
benzo(b) & benzo(k)fluoranthene			252(100),	253(23),	125(15)
benzo(a) pyrene			252(100),	253(23),	125(21)
indeno(1,2,3-cd)pyrene			276(100),	138(28),	277(27)
dibenzo(a,h)anthracene			278(100),	139(24),	279(24)
benzo(g,h,i)perylene			276(100),	138(37),	277(25)
deuterated phenanthrene (d10) IS			188(100),	94(19),	80(18)
o-fluorophenol			112,	64,	63,
phenol-D6			99,	42,	71,
decafluorobiphenyl			334,	335,	
2-fluorobiphenyl			172,		

ANALYST ______________________________

VOLATILES

FIGURE 19

FILE NAME ______________________ SAMPLE VOLUME ______________________

SAMPLE ID ______________________ NG INTERNAL STANDARD ______________________

JOB # ______________________ NG SURROGATE ______________________

ANALYSIS DATE ______________________ NG MATRIX SPIKE ______________________

INSTRUMENT ______________________ ANALYST ______________________

COMPOUND NAME		SCAN #	ION AREA	RF	CHARACTERISTIC EI IONS (Rel. Int.)		
Chloromethane SPCC	C				50(100)	52(33)	
Bromomethane	C				94(100)	96(94)	
Vinyl Chloride CCC	C				62(100)	64(33)	
Chloroethane	C				64(100)	66(33)	
Methylene Chloride	A				84(86) 49(100)	51(33) 86(55)	
Acetone					43( )	58( )	
Carbon Disulfide					76( )	78( )	
1,1-Dichloroethene CCC	A				96(80)	61(100)	98(53)
Bromochloromethane	(IS)				128(70) 49(100)	130(88) 51(33)	
1,1-Dichloroethane SPCC	A				63(100) 85(8)	65(33) 98(7)	83(13) 100(4)
Trans-1,2-Dichloroethene	B				96(60)	61(100)	98(57)
Chloroform CCC	A				83(100)	85(66)	
2-Butanone					72( )	57( )	
1,2-Dichloroethane D4	(SURR)				65( )	102( )	
1,2-Dichloroethane	B				62(100) 98(23)	64(33) 100(15)	
1,1,1-Trichloroethane	B				97(100) 117(19)	99(66) 119(16)	
Carbon Tetrachloride	A				117(100)	119(96)	121(30)
Vinyl Acetate					43( )	86( )	
Bromodichloromethane	B				83(100)	85(66)	
1,2-Dichloropropane CCC	A				63(100)	65(33)	114(3)
Trans-1,3-Dichloropropene	B				75(100)	77(33)	
Trichloroethene	A				130(90) 95(100)	97(66) 132(85)	
Benzene	B				78(100)	77(19)	
Dibromochloromethane	A				129(100)	208(13)	206(10)
Cis-1,3-Dichloropropene	B				75(100)	77(33)	
1,1,2-trichloroethane	A				97(100) 99(63)	85(60) 132(9)	83(95) 134(8)
2-Chloroethylvinyl Ether	A				106(18)	65(32)	63(95)
1,4-Difluorobenzene	(IS)				114( )	63( )	88( )
Bromoform SPCC	B				173(100) 252(11)	171(50) 254(11)	175(50) 250( ) 256(
2-Hexanone					43( ) 57( )	58( ) 100( )	
Tetrachloroethene	A				164(78) 129(64)	131(62) 166(100)	
1,1,2,2-Tetrachloroethane SPCC	B				83(100) 133(7)	85(66) 166(5)	131(7)
Toluene D8	(SURR)				98( )	70( )	100(
4-Methyl-2-Pentanone					43( )	58( )	100(

FIGURE 19 (CONT'D)

HAZARDOUS SUBSTANCE LIST

VOLATILES

COMPOUND NAME	SCAN#	ION AREA	RF	CHARACTERISTIC EI I… (Rel. Int.)
Toluene CCC				92(78) 91(100)
Chlorobenzene D4 (IS)				117( ) 82( ) 119(
Chlorobenzene SPCC A				112(100) 114(33)
Ethylbenzene CCC B				106(33) 91(100)
4-Bromofluorobenzene (SURR)				95( ) 174( ) 176(
Styrene				104( ) 78( )
Ortho-Xylene				91( ) 106( )
Meta & Para-Xylene				91( ) 106( )

[illegible] File Name ______	EXTRACTABLES HSL CLP	Final Volume ______
Sample I.D. ______		Initial Volume ______
Job # ______		Injection Volume ______
Vial I.D. ______	FIGURE 20	ng Internal Std ______
Instrument ______		ng Matrix Spike ______
Analysis Date ______		Dry Weight ______

COMPOUND NAME		SCAN #	ION AREA	Characteristic EL Ions (Rel. Int.)		
Phenol	CCC			94(100)	65(21)	66(25)
Bis-(2-Chloroethyl)ether				93(100)	63(66)	95(32)
2-Chlorophenol				128(100)	64(52)	130(32)
1,3-Dichlorobenzene				146(100)	148(64)	113(12)
1,4-Dichlorobenzene	CCC			146(100)	148(64)	113(11)
Benzyl Alcohol				108(93)	79(100)	77(67)
1,2-Dichlorobenzene				146(100)	148(64)	113(12)
2-Methylphenol				108(100)	107(75)	
Bis-(2-Chloroisopropyl)ether				45(100)	77(4)	79(17)
4-Methylphenol				108(91)	107(100)	
N-Nitroso-Di-Propylamine	SPCC			70(100) 101(12)	42(63) 130(25)	
Hexachloroethane				117(76)	201(100)	199(61)
Nitrobenzene				77(100)	123(42)	65(14)
Isophorone				82(100)	95(6)	138([illegible]7)
2-Nitrophenol	CCC			139(100)	65(36)	109(8)
2,4-Dimethylphenol				107(92)	121(54)	122(100)
Benzoic Acid				122(89)	105(100)	77(73)
Bis-(2-Chloroethyoxy)Methane				93(100)	95(32)	123(21)
2,4-Dichlorophenol	CCC			162(100)	164(63)	98(38)
1,2,4-Trichlorobenzene				180(100)	182(96)	145(30)
Naphthalene				128(100)	129(11)	127(10)
4-Chloroaniline				127(100)	129(34)	
Hexachlorobutadiene	CCC			225(100)	223(63)	227(65)
4-Chloro-3-Methylphenol	CCC			107(80)	144(32)	142(100)
2-Methylnaphthalene				142(100)	141(79)	
Hexachlorocyclopentadiene	SPCC			237(100)	235(63)	272(12)
2,4,6-Trichlorophenol	CCC			196(100)	198(97)	200(31)
2,4,5-Trichlorophenol				196(100)	198(89)	200(31)
2-Chloronaphthalene				162(100)	164(32)	127(32)
2-Nitroaniline				65(100)	92(84)	138(11)
Dimethyl Phthalate				163(100)	194(12)	164(9)
Acenaphthylene				152(100)	151(20)	153(14)
3-Nitroaniline				138(90)	108(66)	92(96)
Acenaphthene	CCC			153(86)	152(41)	154(100)
2,4-Dinitrophenol	SPCC			184(100)	63(52)	154(83)
4-Nitrophenol	SPCC			109(31)	139(100)	65(86)
Dibenzofuran				168(100)	139(23)	
2,4-Dinitrotoluene				165(100)	63(31)	182(11)
2,6-Dinitrotoluene				165(100)	89(48)	121(21)
Diethylphthalate				149(100)	177(28)	150(13)
4- Chlorophenyl-phenylether				204(100)	206(34)	141(29)
Fluorene				166(100)	165(80)	167(15)
4-Nitroaniline				138(100)	92(50)	108(33)

ANALYST ______

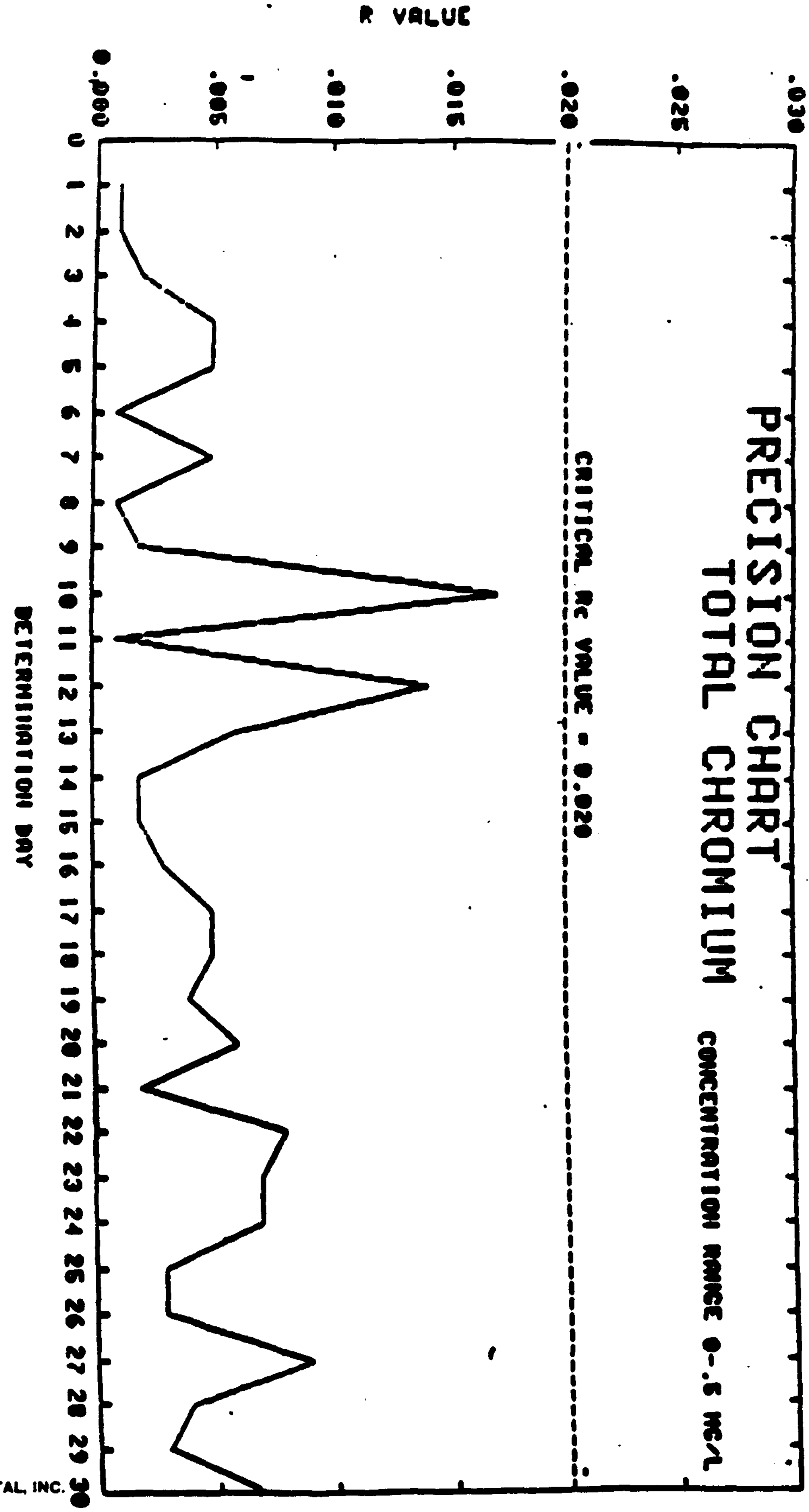
[illegible]
HSL
CLP

FIGURE 20 (CONT'D)

COMPOUND NAME		SCAN #	ION AREA	Characteristic EI Ions (Rel. Int.)		
4,6-Dinitro-2-Methylphenol				198(87)	182(4)	77(100)
N-Nitrosodiphenylamine	CCC			169(100)	168(69)	167(36)
4-Bromophenyl-phenylether				248(100)	250(99)	141(45)
Hexachlorobenzene				284(100)	142(30)	249(24)
Pentachlorophenol	CCC			266(100)	264(68)	268(70)
Phenanthrene				178(100)	179(23)	176(25)
Anthracene				178(100)	179(16)	176(17)
Di-N-Butylphthalate				149(100)	150(17)	104(17)
Fluoranthene	CCC			202(100)	101(14)	100(9)
Pyrene				202(100)	101(21)	100(15)
Butylbenzylphthalate				149(100)	91(61)	206(27)
3,3'-Dichlorobenzidine				252(100)	254(66)	126(16)
Benzo(a)Anthracene				228(100)	229(22)	226(22)
Bis(2-ethylhexyl)Phthalate				149(100)	167(29)	279(7)
Chrysene				228(100)	226(21)	229(20)
Di-N-Octyl Phthalate	CCC			149(100)		
Benzo(b) & Benzo(k)Fluoranthene				252(100)	253(23)	125(16)
Benzo(a)Pyrene	CCC			252(100)	253(21)	125(15)
Indeno(1,2,3-cd)Pyrene				276(100)	138(28)	277(27)
Dibenz(a,h)anthracene				278(100)	139(24)	279(24)
Benzo(g,h,i)Perylene				276(100)	138(37)	277(26)
Phenol-d6	SURR (1)			99(100)	42(25)	71(38)
2-Fluorophenol	SURR (1)			112(100)	64(80)	
Nitrobenzene-d5	SURR (2)			82(100)	128(46)	54(63)
2-Fluorobiphenyl	SURR (3)			172(100)	171(35)	
2,4,6-Tribromophenol	SURR (3)			330(100)	332(98)	141(72)
Terphenyl-d14	SURR (5)			244(100)	122(13)	212(6)
1,4-Dichlorobenzene-d4	IS			152(58)		115(40)
Naphthalene-d8	IS			136(100)	68(8)	
Acenaphthene-d10	IS			164(100)	162(82)	160(40)
Phenanthrene-d10	IS			188(100)	94(74)	80(14)
Chrysene-d12	IS			240(100)	120(10)	236(20)
Perelene-d12	IS			264(100)	260(18)	265(23)

ANALYST ______________________________

FIGURE 21



RÈCRA ENVIRONMENTAL, INC.

Figure 22

WATER QUALITY
DATA SHEET

ROJECT #:	INITIALS	INITIALS	INITIALS	INITIALS	INITIALS	INITIALS	INITIALS	INITIALS	INITIALS	INITIALS	INITIALS
ATE:	ANALYSIS DATE	ANALYSIS DATE	ANALYSIS DATE	ANALYSIS DATE	ANALYSIS DATE	ANALYSIS DATE	ANALYSIS DATE	ANALYSIS DATE	ANALYSIS DATE	ANALYSIS DATE	ANALYSIS DATE
ARAMETERS											
NITS:											
C RESULTS											
UPLICATE NALYSIS											
PIKE NALYSIS											
TANDARD EFERENCE ATERIAL											

(See Reverse Side for Instructions)

48-14-1 (9/88)—7f

FIGURE 23

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF SOLID AND HAZARDOUS WASTE

HAZARDOUS WASTE MANIFEST

P.O. Box 12820, Albany, New York 12212

Please print or type.

Form Approved. OMB No. 2050-0039. Expires 9-30-88

In case of emergency or spill immediately call the National Response Center (800) 424-8802 and the N.Y. Department of Transportation (518) 457-7362.

UNIFORM HAZARDOUS WASTE MANIFEST

GENERATOR

1. Generator's US EPA No. | Manifest Document No.
2. Page 1 of

Information in the shaded areas is not required by Federal Law.

3. Generator's Name and Mailing Address

4. Generator's Phone ( )

5. Transporter 1 (Company Name)
6. US EPA ID Number

7. Transporter 2 (Company Name)
8. US EPA ID Number

9. Designated Facility Name and Site Address
10. US EPA ID Number

11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol
a.				
b.				
c.				
d.				

J. Additional Descriptions for Materials Listed Above

K. Handling Codes for Wastes Listed Above

15. Special Handling Instructions and Additional Information

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations and state laws and regulations.

If I am a large quantity generator, I certify that I have program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name | Signature | Mo. Day Year

TRANSPORTER

17. Transporter 1 (Acknowledgement of Receipt of Materials)

Printed/Typed Name | Signature | Mo. Day Year

18. Transporter 2 (Acknowledgement of Receipt of Materials)

Printed/Typed Name | Signature | Mo. Day Year

FACILITY

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in item 19.

Printed/Typed Name | Signature | Mo. Day Year

ATTACHMENT 3

ATTACHMENT 3

NEW YORK TESTING OPERATIONS

DOCUMENT CONTROL REQUEST FORM

REQUESTER: ____________________ DATE: ____________________

CLIENT NAME: ____________________ PROJECT NUMBER: ____________

ANTICIPATED RETURN DATE: __________ JOB NUMBER: ____________

REASON NEEDED: ____

____

ENTIRE FILE: Yes ☐ No ☐

IF NO, STATE SPECIFIC INFORMATION REQUIRED: ____________________

____

____

SPECIAL INSTRUCTIONS, IF ANY: ________________________________

____

____

SIGNATURE OF REQUESTER: _____________________________________

For Use of Document Control Clerk Only:
Date Signed Out: ____________
File Drawer No: ____________
Document Control Log Entry No: ______
Signature of DCC: ____________

RECRA ENVIRONMENTAL, INC.

ATTACHMENT 4

ATTACHMENT 4

RECRA ENVIRONMENTAL, INC.

DOCUMENT CONTROL LOG

Log Entry Number	Checkout Date	Anticipated Return Date	Requester's Name	Client File Name	Project Number	Job Number	Return Date

APPENDIX D

LABORATORY STUDIES; METHODOLOGIES AND RESULTS

TABLE OF CONTENTS

1.0 SAMPLE COLLECTION

1.1 Soil Samples

Soil samples were collected continuously from Test Borings 1 and 2 and Monitoring Wells 1 and 2 using a split barrel sampling device. The manner in which this apparatus was employed is described in Appendix B. After the soil sample recovered in the split barrel was examined and logged by the field geologist on site, it was transferred as completely as possible to a pre-cleaned 32 ounce, glass, screw-cap bottle equipped with a Teflon cap liner. The bottle pre-cleaning procedure was as follows:

- o soap washed;
- o tap water rinsed;
- o nitric acid washed 25% v/v nitric acid/deionized water;
- o rinsed with copious quantities of deionized water (at least four rinsings); and
- o air dried.

Between samples the split barrel sampling apparatus was cleaned as follows:

- o soap and water wash;
- o rinsed with a dilute (1:10,000) HCl solution;* and
- o rinsed with potable water.

* Dilute hydrochloric acid was used rather than dilute nitric acid because nitrate was one of the parameters to be measured on the soil samples.

1.1 Groundwater Samples

Groundwater samples were collected from Monitoring Wells 1 and 2 using a PVC bailer as described in Appendix B. The bailer was cleaned prior to use and between wells as follows:

- o phosphate-free detergent wash;
- o tap water rinses;
- o dilute (1:10,000) HCl rinse,
- o deionized water rinses; and
- o air dried.

Groundwater samples were immediately transferred to pre-cleaned glass, screw-cap sample bottles equipped with Teflon cap liners which were cleaned as described in Section 1.1, above.

2.0 SAMPLE PRESERVATION

Soil samples were chilled and placed in picnic coolers while awaiting transportation to the laboratory for analysis. Upon arrival at the laboratory, the samples were stored at 4°C until they were analyzed.

Groundwater samples were chilled on collection, placed in picnic coolers with frozen "blue ice," and shipped overnight to the laboratory. The samples were subsampled and preserved in accordance with EPA recommendations upon arrival at the laboratory. Samples were analyzed in accordance with EPA holding time requirements. Sample preservation and holding time requirements along with analytical methods used for each parameter are summarized in Table C-1.

3.0 SAMPLE SHIPMENT

Soil samples were held in coolers on site in the custody of the Recra field crew while soil sampling activities were in progress and then were transported directly to the analytical laboratory at which time custody of the samples was transferred directly to the laboratory Sample Custodian.

Groundwater samples were shipped overnight to the laboratory in sealed picnic coolers with frozen "blue ice" accompanied by chain of custody documentation.

4.0 ANALYTICAL METHODS

Standard USEPA analytical methods appropriate for the parameters and sample matricies concerned were used throughout. The specific methods used are identified in Table C-1.

TABLE C-1

ANALYTICAL METHODS, SAMPLE PRESERVATION MEASURES, AND MAXIMUM HOLDING TIMES

PARAMETER	SOIL SAMPLES EPA METHOD NO.	WATER SAMPLES EPA METHOD NO.	PRESERVATION	MAXIMUM HOLDING TIME
Metals				
Cadmium	7130			
Chromium (Total)	7190	218.1	HNO_3 to pH <2	6 Months
Chromium (Hexavalent)	3060/7191	218.5	Cool, 4°C	24 Hours
Copper	7210	220.1	HNO_3 to pH <2	6 Months
Iron	7380			
Lead	7421			
Nickel	7521			
Selenium	7740			
Zinc	7950			
Inorganics				
Nitrate	Leachable 352.1	352.1	Cool, 4°C	48 Hours
Total Phosphorus	Leachable 365.2	365.2	Filter, Cool, 4°C	48 Hours
Sulfate	Leachable 375.4	375.4	Cool, 4°C	28 Days
Miscellaneous				
pH	9040	150.1	None	Analyze immediately
Total Solids	160.2			
EP Toxicity	1310			

RECRA ENVIRONMENTAL, INC.

5.0 ANALYTICAL REPORTS

All analytical results, including quality assurance and quality control data, and chain of custody documentation, are presented in the two (2) following sections.

5.1 Soil Samples

(see attached)

5.2 Groundwater Samples

(see attached)

1/79̈3.1

ANALYTICAL RESULTS

Prepared For

Deknatel

Prepared By

Recra Environmental, Inc.
10 Hazelwood Drive, Suite 106
Amherst, New York 14150

METHODOLOGIES

The specific methodologies employed in obtaining the enclosed analytical results are indicated on the specific data table. The method numbers presented refer to one of the following U.S. Environmental Protection Agency references.

- 40 CFR Part 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act" October 26, 1984 (Federal Register) U.S. Environmental Protection Agency.
- U.S. Environmental Protection Agency "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods". Office of Solid Waste and Emergency Response. July 1982, SW-846, Second Edition.

COMMENTS

Comments pertain to data on one or all pages of this report.

The values reported as "less than" (<) indicate the working detection limit for the particular sample and/or parameter.

Results of the analysis of soils are corrected for moisture content and reported on a dry weight basis.

SOIL MATRIX
METALS

PARAMETER (Units of Measure = μg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION MW-1/ 0-2'	MW-1/ 4-6'	MW-1/ 10-12'
Total Cadmium	7130	2/5/88	0.76	<0.6	<0.5
Total Chromium	7190	2/5/88	17	11	7.0
Hexavalent Chromium	7195	2/17/88	<0.09	<0.09	<0.09
Total Copper	7210	2/5/88	97	9.6	7.0
Total Iron	7380	2/5/88	8,710	7,840	4,350
Total Lead	7420	2/5/88	130	15	<5
Total Nickel	7520	2/5/88	12	15	12
Total Selenium	7740	2/5/88	<0.6	<0.6	<0.5
Total Zinc	7950	2/5/88	130	20	30

SOIL MATRIX
METALS

PARAMETER (Units of Measure = μg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION MW-1/ 14-16'	MW-1/ 20-22'	MW-1/ 24-26'
Total Cadmium	7130	2/5/88	<0.6	<0.6	<0.5
Total Chromium	7190	2/5/88	5.5	6.9	6.5
Hexavalent Chromium	7195	2/17/88	<0.09	<0.09	<0.09
Total Copper	7210	2/5/88	7.4	5.9	9.6
Total Iron	7380	2/5/88	5,960	3,890	6,360
Total Lead	7420	2/5/88	6.2	<6	<5
Total Nickel	7520	2/5/88	10	17	8.0
Total Selenium	7740	2/5/88	<0.6	<0.6	<0.5
Total Zinc	7950	2/5/88	11	11	29

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION		
			MW-1/ 30-32'	MW-1/ 34-36'	MW-1/ 40-42'
Total Cadmium	7130	2/5/88	<0.5	<0.5	<0.6
Total Chromium	7190	2/5/88	6.2	4.8	8.6
Hexavalent Chromium	7195	2/17/88	<0.09	<0.09	<0.09
Total Copper	7210	2/5/88	9.1	6.9	6.8
Total Iron	7380	2/5/88	7,180	6,380	7,410
Total Lead	7420	2/5/88	5.9	<5	<6
Total Nickel	7520	2/5/88	7.9	6.9	8.1
Total Selenium	7740	2/5/88	<0.5	<0.5	<0.6
Total Zinc	7950	2/5/88	34	14	30

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION		
			MW-1/ 44-46'	MW-1/ 50-52'	MW-1/ 54-56'
Total Cadmium	7130	2/5/88	<0.5	<0.6	<0.5
Total Chromium	7190	2/5/88	9.2	8.2	5.4
Hexavalent Chromium	7195	2/17/88	<0.09	<0.09	<0.09
Total Copper	7210	2/5/88	8.6	7.9	3.8
Total Iron	7380	2/5/88	7,440	6,320	5,530
Total Lead	7420	2/5/88	<5	<6	<5
Total Nickel	7520	2/5/88	5.8	12	5.0
Total Selenium	7740	2/5/88	<0.5	<0.6	<0.5
Total Zinc	7950	2/5/88	26	34	8.4

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION		
			MW-1/ 60-62'	MW-1/ 64-66'	MW-1/ 70-72'
Total Cadmium	7130	2/5/88	<0.5	<0.6	<0.6
Total Chromium	7190	2/5/88	7.8	9.2	5.4
Hexavalent Chromium	7195	2/17/88	0.32	0.44	0.28
Total Copper	7210	2/5/88	5.9	4.5	3.3
Total Iron	7380	2/5/88	8,000	4,960	3,460
Total Lead	7420	2/5/88	<5	<6	<6
Total Nickel	7520	2/5/88	5.8	<5	7.1
Total Selenium	7740	2/5/88	<0.5	<0.6	<0.6
Total Zinc	7950	2/5/88	22	16	8.5

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION		
			TB-2/ 0-2'	TB-2/ 4-6'	TB-2/ 10-12'
Total Cadmium	7130	2/5/88	1.4	<0.6	<0.6
Total Chromium	7190	2/5/88	260	3,580	340
Hexavalent Chromium	7195	2/17/88	4.3	29	2.0
Total Copper	7210	2/5/88	120	14	5.4
Total Iron	7380	2/5/88	12,700	18,900	5,560
Total Lead	7420	2/5/88	480	71	5.1
Total Nickel	7520	2/5/88	21	11	6.1
Total Selenium	7740	2/5/88	<0.6	<0.6	<0.6
Total Zinc	7950	2/5/88	360	35	21

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION TB-2/ 14-16'	TB-2/ 20-22'	TB-2/ 24-26'
Total Cadmium	7130	2/5/88	<0.6	<0.6	<0.5
Total Chromium	7190	2/5/88	210	410	380
Hexavalent Chromium	7195	2/17/88	2.3	2.4	0.53
Total Copper	7210	2/5/88	5.9	7.6	5.9
Total Iron	7380	2/5/88	4,080	6,810	5,360
Total Lead	7420	2/5/88	<6	<6	6.0
Total Nickel	7520	2/5/88	10	9.4	<4
Total Selenium	7740	2/5/88	<0.6	<0.6	<0.5
Total Zinc	7950	2/5/88	17	22	17

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION TB-2/ 30-32'	TB-2/ 34-36'	TB-2/ 40-42'
Total Cadmium	7130	2/5/88	<0.5	<0.6	<0.5
Total Chromium	7190	2/5/88	200	130	100
Hexavalent Chromium	7195	2/17/88	4.7	6.2	6.8
Total Copper	7210	2/5/88	10	18	8.8
Total Iron	7380	2/5/88	8,110	8,650	10,700
Total Lead	7420	2/5/88	6.6	<6	<5
Total Nickel	7520	2/5/88	<4	17	8.8
Total Selenium	7740	2/5/88	<0.5	<0.6	<0.5
Total Zinc	7950	2/5/88	21	17	29

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION TB-2/ 44-46'	TB-2/ 50-52'	TB-2/ 54-56'
Total Cadmium	7130	2/5/88	<0.5	<0.6	<0.5
Total Chromium	7190	2/5/88	100	51	18
Hexavalent Chromium	7195	2/17/88	3.0	1.7	0.32
Total Copper	7210	2/5/88	12	5.9	4.3
Total Iron	7380	2/5/88	10,800	5,540	4,410
Total Lead	7420	2/5/88	<5	<6	<5
Total Nickel	7520	2/5/88	8.9	4.0	4.8
Total Selenium	7740	2/5/88	<0.5	<0.6	<0.5
Total Zinc	7950	2/5/88	24	17	12

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION TB-2/ 60-62'	TB-2/ 64-66'	TB-2/ 70-72'
Total Cadmium	7130	2/5/88	<0.6	<0.6	<0.6
Total Chromium	7190	2/5/88	28	27	13
Hexavalent Chromium	7195	2/17/88	0.19	0.19	0.17
Total Copper	7210	2/5/88	6.3	7.1	6.7
Total Iron	7380	2/5/88	4,940	5,210	3,580
Total Lead	7420	2/5/88	<6	<6	<6
Total Nickel	7520	2/5/88	<5	4.1	<6
Total Selenium	7740	2/5/88	<0.6	<0.6	<0.6
Total Zinc	7950	2/5/88	11	18	17

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION MW-2/ 0-2'	MW-2/ 4-6'	MW-2/ 10-12'
Total Cadmium	7130	2/9/88	1.0	<0.5	<0.5
Total Chromium	7190	2/10/88	790	200	86
Hexavalent Chromium	7195	2/25/88	11	0.46	0.095
Total Copper	7210	2/9/88	120	8.3	5.5
Total Iron	7380	2/10/88	13,400	8,420	4,470
Total Lead	7420	2/9/88	590	4.0	<4
Total Nickel	7520	2/9/88	15	10	10
Total Selenium	7740	2/8/88	<0.6	<0.5	<0.5
Total Zinc	7950	2/10/88	150	18	13

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION MW-2/ 14-16'	MW-2/ 20-22'	MW-2/ 24-26'
Total Cadmium	7130	2/9/88	<0.5	<0.5	<0.5
Total Chromium	7190	2/10/88	71	36	30
Hexavalent Chromium	7195	2/25/88	0.14	0.31	0.22
Total Copper	7210	2/9/88	14	21	17
Total Iron	7380	2/10/88	7,510	7,610	5,110
Total Lead	7420	2/9/88	<4	<4	<4
Total Nickel	7520	2/9/88	13	11	8.0
Total Selenium	7740	2/8/88	<0.5	<0.5	<0.5
Total Zinc	7950	2/10/88	30	19	14

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION MW-2/ 30-32'	MW-2/ 34-36'	MW-2/ 40-42'
Total Cadmium	7130	2/9/88	<0.5	<0.5	<0.5
Total Chromium	7190	2/10/88	21	28	21
Hexavalent Chromium	7195	2/25/88	0.15	0.10	0.17
Total Copper	7210	2/9/88	7.9	11	10
Total Iron	7380	2/10/88	6,560	7,910	9,000
Total Lead	7420	2/9/88	<4	<4	<4
Total Nickel	7520	2/9/88	8.8	7.9	14
Total Selenium	7740	2/8/88	<0.5	<0.5	<0.5
Total Zinc	7950	2/10/88	18	20	18

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION MW-2/ 44-46'	MW-2/ 50-52'	MW-2/ 54-56'
Total Cadmium	7130	2/9/88	<0.5	<0.5	<0.6
Total Chromium	7190	2/10/88	17	6.5	12
Hexavalent Chromium	7195	2/25/88	0.10	<0.09	0.12
Total Copper	7210	2/9/88	12	4.0	5.1
Total Iron	7380	2/10/88	12,200	4,940	5,850
Total Lead	7420	2/9/88	<4	<4	<4
Total Nickel	7520	2/9/88	11	<4	7.0
Total Selenium	7740	2/8/88	<0.5	<0.5	<0.6
Total Zinc	7950	2/10/88	34	9.4	11

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION		
			MW-2/ 60-62'	MW-2/ 64-66'	MW-2/ 70-72'
Total Cadmium	7130	2/9/88	<0.6	<0.6	<0.6
Total Chromium	7190	2/10/88	7.8	5.6	7.3
Hexavalent Chromium	7195	2/25/88	<0.09	<0.09	0.17
Total Copper	7210	2/9/88	4.5	3.6	4.2
Total Iron	7380	2/10/88	5,220	4,440	3,930
Total Lead	7420	2/9/88	<4	<4	<4
Total Nickel	7520	2/9/88	6.9	7.7	6.8
Total Selenium	7740	2/8/88	<0.6	<0.6	<0.6
Total Zinc	7950	2/10/88	9.4	18	7.6

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION		
			TB-1/ 0-2'	TB-1/ 4-6'	TB-1/ 10-12'
Total Cadmium	7130	2/9/88	<0.6	<0.5	<0.5
Total Chromium	7190	2/10/88	900	1,220	1,760
Hexavalent Chromium	7195	2/25/88	8.2	16	19
Total Copper	7210	2/9/88	12	7.2	8.8
Total Iron	7380	2/10/88	6,140	6,600	12,600
Total Lead	7420	2/9/88	380	110	11
Total Nickel	7520	2/9/88	5.1	<4	14
Total Selenium	7740	2/8/88	<0.6	<0.5	<0.5
Total Zinc	7950	2/10/88	32	8.9	19

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION TB-1/ 14-16'	TB-1/ 20-22'	TB-1/ 24-26'
Total Cadmium	7130	2/9/88	<0.5	<0.5	<0.5
Total Chromium	7190	2/10/88	1,680	500	440
Hexavalent Chromium	7195	2/25/88	18	7.9	9.2
Total Copper	7210	2/9/88	7.1	5.8	5.2
Total Iron	7380	2/10/88	9,050	5,860	4,720
Total Lead	7420	2/9/88	31	5.0	<3
Total Nickel	7520	2/9/88	4.9	5.0	4.8
Total Selenium	7740	2/8/88	<0.5	<0.5	<0.5
Total Zinc	7950	2/10/88	8.1	7.0	7.2

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION TB-1/ 30-32'	TB-1/ 34-36'	TB-1/ 40-42'
Total Cadmium	7130	2/9/88	<0.5	<0.5	<0.5
Total Chromium	7190	2/10/88	370	380	380
Hexavalent Chromium	7195	2/25/88	7.0	13	9.6
Total Copper	7210	2/9/88	12	10	6.7
Total Iron	7380	2/10/88	8,790	9,140	10,400
Total Lead	7420	2/9/88	<3	<4	<3
Total Nickel	7520	2/9/88	7.0	6.0	5.8
Total Selenium	7740	2/8/88	<0.5	<0.5	<0.5
Total Zinc	7950	2/10/88	12	13	12

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION TB-1/ 44-46'	TB-1/ 50-52'	TB-1/ 54-56'
Total Cadmium	7130	2/9/88	<0.5	<0.5	<0.5
Total Chromium	7190	2/10/88	300	98	110
Hexavalent Chromium	7195	2/25/88	7.3	3.1	3.2
Total Copper	7210	2/9/88	7.6	4.9	6.2
Total Iron	7380	2/10/88	9,090	4,340	6,380
Total Lead	7420	2/9/88	<3	<3	<3
Total Nickel	7520	2/9/88	7.8	5.9	5.0
Total Selenium	7740	2/8/88	<0.5	<0.5	<0.5
Total Zinc	7950	2/10/88	11	8.8	9.9

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION TB-1/ 60-62'	TB-1/ 64-66'	TB-1/ 70-72'
Total Cadmium	7130	2/9/88	<0.6	<0.6	<0.6
Total Chromium	7190	2/10/88	59	26	15
Hexavalent Chromium	7195	2/25/88	2.8	0.26	0.32
Total Copper	7210	2/9/88	5.7	4.4	4.2
Total Iron	7380	2/10/88	3,930	3,090	2,810
Total Lead	7420	2/9/88	<4	<6	<4
Total Nickel	7520	2/9/88	5.3	5.5	5.5
Total Selenium	7740	2/8/88	<0.6	<0.6	<0.6
Total Zinc	7950	2/10/88	7.8	7.1	6.9

SOIL MATRIX
METALS

PARAMETER (Units of Measure = μg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION		
			TB-1/ 2-4'	TB-1/ 6-8'	TB-1/ 8-10'
Total Chromium	7190	2/10/88	2,010	1,770	1,440

SOIL MATRIX
METALS

PARAMETER (Units of Measure = μg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION		
			TB-1/ 12-14'	TB-1/ 16-18'	TB-1/ 18-20'
Total Chromium	7190	2/10/88	3,050	1,240	710

SOIL MATRIX

SAMPLE IDENTIFICATION	PARAMETER (UNITS OF MEASURE)		
	LEACHABLE NITRATE (µg/g dry)	LEACHABLE PHOSPHOROUS (µg/g dry)	LEACHABLE SULFATE (µg/g dry)
MW-1/0-2'	3.7	<0.9	58
MW-1/10-12'	2.0	<0.9	<41
MW-1/20-22'	<3	<0.9	<41
MW-1/30-32'	<3	<0.9	<42
MW-1/40-42'	3.1	<0.9	<42
MW-1/50-52'	3.5	<0.9	64
MW-1/60-62'	2.8	<0.9	<42
MW-1/70-72'	5.6	<0.9	<48
TB-2/0-2'	<3	61	120
TB-2/10-12'	<3	39	<42
TB-2/20-22'	<3	30	<42
TB-2/30-32'	<3	18	<42
TB-2/40-42'	<3	29	<42
TB-2/50-52'	2.4	16	<42
TB-2/60-62'	5.4	17	<43
TB-2/70-72'	3.4	6.1	<45
Analysis Date	2/16/88	2/20/88	2/23/88
Method Number	9200	365.2	9038

SOIL MATRIX

SAMPLE IDENTIFICATION	PARAMETER (UNITS OF MEASURE) LEACHABLE NITRATE (µg/g dry)	LEACHABLE PHOSPHOROUS (µg/g dry)	LEACHABLE SULFATE (µg/g dry)
MW-2/0-2'	9.6	66	78
MW-2/10-12'	<3	41	<42
MW-2/20-22'	5.3	43	<42
MW-2/30-32'	2.2	11	<42
MW-2/40-42'	5.5	28	110
MW-2/50-52'	3.3	13	73
MW-2/60-62'	4.3	7.5	<46
MW-2/70-72'	3.3	15	<48
TB-1/0-2'	54	79	69
TB-1/10-12'	16	400	<42
TB-1/20-22'	<3	48	<42
TB-1/30-32'	<3	22	<43
TB-1/40-42'	2.3	32	<42
TB-1/50-52'	<3	17	<42
TB-1/60-62'	2.7	17	<45
TB-1/70-72'	3.1	2.1	<46
Analysis Date	2/16/88	2/20/88	2/23/88
Method Number	9200	365.2	9038

1/7913.15

SOIL MATRIX

SAMPLE IDENTIFICATION	PARAMETER (UNITS OF MEASURE) DRY WEIGHT (103°C) (%)
MW-1/0-2'	88.2
MW-1/4-6'	95.3
MW-1/10-12'	97.5
MW-1/14-16'	95.6
MW-1/20-22'	97.4
MW-1/24-26'	96.8
MW-1/30-32'	96.4
MW-1/34-36'	96.6
MW-1/40-42'	97.1
MW-1/44-46'	96.6
MW-1/50-52'	96.0
MW-1/54-56'	95.9
MW-1/60-62'	93.8
MW-1/64-66'	88.3
MW-1/70-72'	83.6
TB-2/0-2'	80.2
TB-2/4-6'	89.6
TB-2/10-12'	96.8
TB-2/14-16'	96.7
TB-2/20-22'	95.8
TB-2/24-26'	96.5
TB-2/30-32'	95.6
TB-2/34-36'	95.5
TB-2/40-42'	95.2
TB-2/44-46'	95.0
TB-2/50-52'	95.4
TB-2/54-56'	96.1
TB-2/60-62'	91.3
TB-2/64-66'	88.8
TB-2/70-72'	88.0

SOIL MATRIX

SAMPLE IDENTIFICATION	PARAMETER (UNITS OF MEASURE) DRY WEIGHT (103°C) (%)
MW-2/0-2'	81.8
MW-2/4-6'	95.7
MW-2/10-12'	97.0
MW-2/14-16'	95.7
MW-2/20-22'	96.1
MW-2/24-26'	95.2
MW-2/30-32'	94.9
MW-2/34-36'	96.1
MW-2/40-42'	95.2
MW-2/44-46'	95.3
MW-2/50-52'	95.5
MW-2/54-56'	95.7
MW-2/60-62'	86.1
MW-2/64-66'	89.0
MW-2/70-72'	82.5
TB-1/0-2'	93.1
TB-1/2-4'	94.6
TB-1/4-6'	96.5
TB-1/6-8'	89.1
TB-1/8-10'	95.8
TB-1/10-12'	96.0
TB-1/12-14'	96.3
TB-1/14-16'	96.6
TB-1/16-18'	97.0
TB-1/18-20'	96.5
TB-1/20-22'	96.9
TB-1/24-26'	97.0
TB-1/30-32'	92.9
TB-1/34-36'	95.9
TB-1/40-42'	95.8
TB-1/44-46'	95.9
TB-1/50-52'	96.1
TB-1/54-56'	94.9
TB-1/60-62'	89.2
TB-1/64-66'	89.8
TB-1/70-72'	87.7

QUALITY CONTROL INFORMATION - PRECISION
SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Total Cadmium	7130	MW-1/44-46'	<0.5	<0.5	<0.5	-
Total Chromium	7190		8.6	9.8	9.2	0.85
Hexavalent Chromium	7195		<0.09	<0.09	<0.09	-
Total Copper	7210		7.9	9.2	8.6	0.92
Total Iron	7380		6,830	8,050	7,440	860
Total Lead	7420		<5	<5	<5	-
Total Nickel	7520		4.9	6.7	5.8	1.3
Total Selenium	7740		<0.5	<0.5	<0.5	-
Total Zinc	7950		26	26	26	0

QUALITY CONTROL INFORMATION - ACCURACY
SOIL MATRIX
METALS

PARAMETER	METHOD NUMBER	SAMPLE IDENTIFICATION	MICROGRAMS OF SPIKE	PERCENT RECOVERY
Total Cadmium	7130	MW-1/44-46'	500	101
Total Chromium	7190		500	101
Hexavalent Chromium	7195		500	97
Total Copper	7210		500	103
Total Iron	7380		500	100
Total Lead	7420		500	106
Total Nickel	7520		500	103
Total Selenium	7740		50	98
Total Zinc	7950		500	99

QUALITY CONTROL INFORMATION - PRECISION
SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Total Cadmium	7130	TB-2/20-22'	<0.6	<0.6	<0.6	-
Total Chromium	7190		410	410	410	0
Hexavalent Chromium	7195		1.9	2.8	2.4	0.64
Total Copper	7210		8.3	6.9	7.6	0.99
Total Iron	7380		8,190	5,430	6,810	2,000
Total Lead	7420		<6	<6	<6	-
Total Nickel	7520		10	8.8	9.4	0.85
Total Selenium	7740		<0.6	<0.6	<0.6	-
Total Zinc	7950		27	17	22	7.1

QUALITY CONTROL INFORMATION - ACCURACY
SOIL MATRIX
METALS

PARAMETER	METHOD NUMBER	SAMPLE IDENTIFICATION	MICROGRAMS OF SPIKE	PERCENT RECOVERY
Total Cadmium	7130	TB-2/20-22'	500	105
Total Chromium	7190		500	115
Hexavalent Chromium	7195		500	104
Total Copper	7210		500	101
Total Iron	7380		500	99
Total Lead	7420		500	105
Total Nickel	7520		500	102
Total Selenium	7740		50	98
Total Zinc	7950		500	82

QUALITY CONTROL INFORMATION - PRECISION
SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Total Cadmium	7130	TB-2/70-72'	<0.6	<0.6	<0.6	-
Total Chromium	7190		12	14	13	1.4
Hexavalent Chromium	7195		0.21	0.12	0.17	0.064
Total Copper	7210		6.7	6.7	6.7	0
Total Iron	7380		3,390	3,770	3,580	270
Total Lead	7420		<6	<6	<6	-
Total Nickel	7520		<6	<6	<6	-
Total Selenium	7740		<0.6	<0.6	<0.6	-
Total Zinc	7950		18	16	17	1.4

QUALITY CONTROL INFORMATION - ACCURACY
SOIL MATRIX
METALS

PARAMETER	METHOD NUMBER	SAMPLE IDENTIFICATION	MICROGRAMS OF SPIKE	PERCENT RECOVERY
Total Cadmium	7130	TB-2/70-72'	500	103
Total Chromium	7190		500	97
Hexavalent Chromium	7195		500	97
Total Copper	7210		500	98
Total Iron	7380		500	101
Total Lead	7420		500	101
Total Nickel	7520		500	98
Total Selenium	7740		50	96
Total Zinc	7950		500	83

RECRA ENVIRONMENTAL, INC.

1/7913.20

QUALITY CONTROL INFORMATION - PRECISION
SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Total Cadmium	7130	MW-2/0-2'	1.1	0.98	1.0	0.085
Total Chromium	7190		790	780	790	7.1
Hexavalent Chromium	7195		12	9.7	11	1.6
Total Copper	7210		93	140	120	33
Total Iron	7380		13,400	13,400	13,400	0
Total Lead	7420		540	630	590	64
Total Nickel	7520		14	15	15	0.71
Total Selenium	7740		<0.6	<0.6	<0.6	-
Total Zinc	7950		140	160	150	14

QUALITY CONTROL INFORMATION - ACCURACY
SOIL MATRIX
METALS

PARAMETER	METHOD NUMBER	SAMPLE IDENTIFICATION	MICROGRAMS OF SPIKE	PERCENT RECOVERY
Total Cadmium	7130	MW-2/0-2'	500	103
Total Chromium	7190		500	99
Hexavalent Chromium	7195		500	86
Total Copper	7210		500	100
Total Iron	7380		500	102
Total Lead	7420		500	95
Total Nickel	7520		500	99
Total Selenium	7740		50	96
Total Zinc	7950		500	103

I.D. #88-128

QUALITY CONTROL INFORMATION - PRECISION
SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Total Chromium	7190	TB-1/18-20'	720	700	710	14

QUALITY CONTROL INFORMATION - ACCURACY
SOIL MATRIX
METALS

PARAMETER	METHOD NUMBER	SAMPLE IDENTIFICATION	MICROGRAMS OF SPIKE	PERCENT RECOVERY
Total Chromium	7190	TB-1/18-20'	500	105

QUALITY CONTROL INFORMATION - PRECISION
SOIL MATRIX

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Leachable Nitrate	µg/g dry	MW-1/40-42'	3.9	2.2	3.1	1.2
		TB-2/20-22'	<3	<3	<3	-
		TB-1/20-22'	<3	<3	<3	-
Leachable Phosphorous	µg/g dry	MW-1/40-42'	<0.9	<0.9	<0.9	-
		MW-2/20-22'	53	33	43	14
		TB-1/20-22'	46	49	48	2.1
Leachable Sulfate	µg/g dry	MW-1/40-42'	<42	<42	<42	-
		MW-2/20-22'	<42	<42	<42	-
		TB-1/20-22'	<42	<42	<42	-

1/7913.23

QUALITY CONTROL INFORMATION - ACCURACY
SOIL MATRIX

PARAMETER	SAMPLE IDENTIFICATION	µg OF SPIKE	% RECOVERY
Leachable Nitrate	MW-1/40-42'	5.0	106
	MW-2/20-22'	5.0	116
	TB-1/20-22'	5.0	106
Leachable Phosphorous	MW-1/40-42'	50	102
	MW-2/20-22'	50	67
	TB-1/20-22'	50	87
Leachable Sulfate	MW-1/40-42'	20	103
	MW-2/20-22'	20	102
	TB-1/20-22'	20	105

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: 8C1076

SITE NAME: DEKNATEL

SAMPLERS (SIGNATURE): Robert E. Steiner

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	32 OZ (H₂S)		Lab test				REMARKS
W-1	1/14/88	AM		X	W-1 0-2'	1	X		M FO				COC # 4001
↓	↓	↓		↓	2-4'	↓	↓		H				3999
↓	↓	↓		↓	4-6'	↓	↓		M				3998
↓	↓	↓		↓	6-8'	↓	↓		H				3997
↓	↓	↓		↓	8-10'	↓	↓		H				3996
↓	↓	↓		↓	10-12'	↓	↓		M FO				3995
↓	↓	↓		↓	12-14'	↓	↓		H				
↓	↓	↓		↓	14-16'	↓	↓		M				
↓	↓	↓		↓	16-18'	↓	↓		H				
↓	↓	↓		↓	18-20'	↓	↓		H				
↓	↓	↓		↓	20-22'	↓	↓		M FO				
↓	↓	↓		↓	22-24'	↓	↓		H				
↓	↓	PM		↓	24-26'	↓	↓		M				
↓	↓	PM		↓	26-28'	↓	↓		H				

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)
Robert E. Steiner	1/29/88 1335	J. Calvert			

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE/TIME	REMARKS

Distribution: Original accompanies shipment, copy to coordinator field files

* M = Metals

H = Hollister tests [illegible]

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: 8C K76

SITE NAME: DEKNATEL

SAMPLERS (SIGNATURE): Robert E. Steiner

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	3202 Glass		Lab Test *				REMARKS
W-1	1/14/88	PM		X	28-30'	1	X		H				COC #
↓	↓	↓		↓	30-32'	↓	↓		M FO				
					32-34'				H				
					34-36'				M				
					36-38'				H				
					38-40'				H				
					40-42'				FO M				
					42-44'				H				
					44-46'				M				
					46-48'				H				
					48-50'				H				
													Cooler COC 2282

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
Robert E. Steiner	1/29/88	1335	J. Calant				
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE	TIME	REMARKS	

Distribution: Original accompanies shipment; copy to coordinator field files

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: 8C 1076

SITE NAME: DEKNATEL

SAMPLERS (SIGNATURE): Robert E. Steiner

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	3202 Glass		Lab test*				REMARKS
W-1	1/5/88	AM		X	50-52'	1	X		M FO				
↓	↓	↓		↓	52-54'	↓	↓		H				
↓	↓	↓		↓	54-56'	↓	↓		M				
↓	↓	↓		↓	56-58'	↓	↓		H				
↓	↓	↓		↓	58-60'	↓	↓		H				
↓	↓	↓		↓	60-62'	↓	↓		M FO				
↓	↓	↓		↓	62-64'	↓	↓		H				
↓	↓	↓		↓	64-66'	↓	↓		M				
↓	↓	↓		↓	66-68'	↓	↓		H				
↓	↓	↓		↓	68-70'	↓	↓		H				
↓	↓	↓		↓	70-72'	↓	↓		M FO				
													Cooler COC 3994

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
Robert E. Steiner	1/24/88	1335	J. Calvert				

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE / TIME	REMARKS

Distribution: Original accompanies shipment; copy to coordinator field file

* M = metals   H = Hold, no analysis now

FO = [illegible]

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: 8C1076

SITE NAME: DEKNATEL

SAMPLERS (SIGNATURE): Robert E. Steiner

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	8207(glass)					REMARKS
												Lab tests.
B-2	1/21/88	PM		X	0-2'	1	X					Metals, Inorganics (M, IO)
					2-4'							Hold, no tests (H)
					4-6'							Metals (M)
					6-8'							H
					8-10'							H
					10-12'							M, IO
					12-14'							H
					14-16'							M
					16-18'							H
					18-20'							H
					20-22'							M, IO
					22-24'							H
					24-26'							M
↓		↓		↓	26-28'	↓	↓					H

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
Robert Steiner	1/24/88	1335	J. Calvert				
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE	TIME	REMARKS	

Distribution: Original accompanies shipment; copy to coordinator field files

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: 8C 1076

SITE NAME: PEK NATEL

SAMPLERS (SIGNATURE): Robert E. Steiner

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	3202G455					REMARKS
												Lab test
B-2	1/2[illegible]/88	PM		X	44-46'	1	X					Metals (M)
					46-48'							No Recovery
					48'-50'							No Recovery
					50-52'							M, Inorganics (IO)
					52-54'							H
					54-56'							M
					56-58'							H
					58-60'							H
					60-62'							M, IO
					62-64'							H
					64-66'							M
					66-68'							H
					68-70'							H
↓	↓	↓		↓	70-72'	↓	↓					M, IO

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
Robert Steiner	1/24/88	1335	J. Calvert				
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE / TIME		REMARKS	

Distribution: Original accompanies shipment; copy to coordinator field files

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO	SITE NAME
8C1076	DEKNATEL

SAMPLERS (SIGNATURE): Robert E. Steiner

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	32oz Glass						REMARKS
													Lab tests
B-1	1/22/88	AM		X	0-2'	1	X						Metals, Inorganics (M, IO)
					2-4'								~~H&H~~ (H) Total Chrome
					4-6'								M
					6-8'								* Tot. Chrome.
					8-10'								* Tot. Chrome
					10-12'								M, IO
					12-14'								* Tot. Chrome.
					14-16'								M
					16-18'								* Tot. Chrome
					18-20'								* Tot. Chrome
					20-22'								M, IO
					22-24'								H
					24-26'								M
					26-28'								H

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE TIME	RECEIVED BY (SIGNATURE)
Robert Steiner	1/24/88 1335	J. Cabrat			
RELINQUISHED BY (SIGNATURE)	**DATE TIME**	**RECEIVED BY (SIGNATURE)**	**RELINQUISHED BY (SIGNATURE)**	**DATE TIME**	**RECEIVED BY (SIGNATURE)**
RELINQUISHED BY (SIGNATURE)	**DATE TIME**	**RECEIVED FOR LABORATORY BY (SIGNATURE)**	**DATE/TIME**	**REMARKS**	

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: 8C076

SITE NAME: DEKNATEL

SAMPLERS (SIGNATURE): Robert E. Steinel

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	32oz. Glass						REMARKS
													Lab test
B-1	1/22/88	PM		X	28-30′	1	X						Hold (H)
					30-32′								Metals, Inorganics (M, IO)
					32-34′								H
					34-36′								M
					36-38′								H
					38-40′								H
					40-42′								M, IO
					42-44′								H
					44-46′								M
					46-48′								H
					48-50′								H
					50-52′								M, IO
↓		↓		↓	52-54′	↓	↓						H

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
Robert E. Steinel	1/29/88	13:35	J. Colbert				
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE / TIME	REMARKS		

Distribution: Original accompanies shipment; copy to coordinator field file

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: 8C1070

SITE NAME: DEKNATEL

SAMPLERS (SIGNATURE): Robert E. Steiner

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	32oz Glass						REMARKS
													Lab test
B-1	1/25/88	AM		X	54-56'	1	X						Metals (M)
↓	↓	↓		↓	56-58'	↓	↓						Hold (H)
↓	↓	↓		↓	58-60'	↓	↓						H
↓	↓	↓		↓	60-62'	↓	↓						M, Inorganics (IO)
↓	↓	↓		↓	62-64'	↓	↓						H
↓	↓	↓		↓	64-66'	↓	↓						M
↓	↓	↓		↓	66-68'	↓	↓						H
↓	↓	↓		↓	68-70'	↓	↓						H
↓	↓	↓		↓	70-72'	↓	↓						M, IO

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
Robert E. Steiner	1/29/88	13:35	J. Calvert				

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE	TIME	REMARKS

Distribution: Original accompanies shipment, copy to coordinator field file

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: 3C 1076

SITE NAME: DEKNATEL

SAMPLERS (SIGNATURE): Robert E. Steiner

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	32oz Glass					REMARKS: Lab Test
OW2	1/27/88	AM		X	20-22'	1	X					Metals, Inorganics (M, IO)
					22-24'							Hold (H)
					24-26'							M
					26-28'							H
					28-30'							H
					30-32'							M, IO
					32-34'							H
					34-36'							M
					36-38'							H
					38-40'							H
					40-42'							M, IO
					42-44'							H
					44-46'							M
↓	↓	↓		↓	46-48'	↓	↓					H

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
Robert Steiner	1/29/88	1335	J. Calvert				

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE	TIME	REMARKS

Distribution: Original accompanies shipment; copy to coordinator field file

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: 8C1076

SITE NAME: DEKNatEL

SAMPLERS (SIGNATURE): Robert E. Steiner

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	8202 (TCLP)					REMARKS: Lab test
OW-2	11/24/88	PM		X	0-2'	1	X					Metals, Inorganics (M, IO)
↓	↓	↓		↓	2-4'	↓	↓					Hold (H)
					4-6'							M
					6-8'							H
					8-10'							H
					10-12'							M, IO
					12-14'							H
					14-16'							M
					16-18'							H
					18-20'							H
					Sidewalk							(2)

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)
Robert E. Steiner	11/29/88 13:35	J. Calvert			

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)

RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE / TIME	REMARKS

Distribution: Original accompanies shipment; copy to coordinator field file

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: 8C076

SITE NAME: DEKNATEL

SAMPLERS (SIGNATURE): Robert E. Steiner

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	32oz Glass					REMARKS
												Lab test
OW-2	1/27/88	PM		X	48-50'	1	X					Hold (H)
↓	↓	↓		↓	50 - 52'	↓	↓					M, Inorganics (Metals, IO)
					52 - 54'							H
					54 - 56'							M
					56 - 58'							H
					58 - 60'							H
					60 - 62'							M, IO
					62 - 64'							H
					64 - 66'							M
					66 - 68'							H
					68 - 70'							H
					70 - 72'							M, IO
					Field Blank							(?)

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
Robert E. Steiner	1/21/89	1335	J. Calvert				

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE / TIME	REMARKS

Distribution: Original accompanies shipment; copy to coordinator field files

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: 8C1076

SITE NAME: DEKNATEL

SAMPLERS (SIGNATURE): Robert E. Steiner

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	3202 Glass						REMARKS
													Lab tests
B-2	1/24/88	AM		X	28-30'	1	X						Hold (H)
↓	↓	↓		↓	30-32'	↓	↓						Metals, Inorganics (M, I)
					32-34'								H
					34-36'								M
					36-38'								H
					38-40'								H
					40-42'								M (?)
					42-44'								H
													Cooler Custody # 3992

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)
Robert Steiner	1/29/88	1335	J. Calvert				

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED BY (SIGNATURE)

RELINQUISHED BY (SIGNATURE)	DATE	TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE / TIME	REMARKS

Distribution: Original accompanies shipment; copy to coordinator field files

1/7988.1

ANALYTICAL RESULTS

Prepared For

Dekmatel

Prepared By

Recra Environmental, Inc.
10 Hazelwood Drive, Suite 106
Amherst, New York 14150

COMMENTS

Comments pertain to data on one or all pages of this report.

The values reported as "less than" (<) indicate the working detection limit for the particular sample and/or parameter.

Methods used for the EP Toxicity Test procedure as well as the analysis of the resulting extract are presented in U.S. Environmental Protection Agency publication, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods". July 1982, SW-846, Second Edition.

EP TOXICITY TEST EXTRACT - METALS

PARAMETER (Units of Measure = mg/l)	ANALYSIS DATE	EPA MAX. CONC.	SAMPLE IDENTIFICATION	
			COMP. 1	COMP. 2
Total Arsenic	3/9/88	5.0	<0.005	<0.005
Total Barium	3/18/88	100.0	<0.02	<0.02
Total Cadmium	3/17/88	1.0	<0.006	<0.006
Total Chromium	3/17/88	5.0	<0.006	<0.006
Total Lead	3/17/88	5.0	<0.02	<0.02
Total Mercury	3/4/88	0.2	<0.0005	<0.0005
Total Selenium	3/9/88	1.0	<0.005	<0.005
Total Silver	3/19/88	5.0	<0.005	<0.005

_X_ Standard Addition
___ Non-Standard Addition

EP TOXICITY TEST EXTRACT - METALS

PARAMETER (Units of Measure = mg/l)	ANALYSIS DATE	EPA MAX. CONC.	SAMPLE IDENTIFICATION	
			COMP. 3	COMP. 4
Total Arsenic	3/9/88	5.0	<0.005	<0.005
Total Barium	3/18/88	100.0	<0.02	0.22
Total Cadmium	3/17/88	1.0	<0.006	<0.006
Total Chromium	3/17/88	5.0	0.041	0.009
Total Lead	3/17/88	5.0	<0.02	<0.02
Total Mercury	3/4/88	0.2	<0.0005	<0.0005
Total Selenium	3/9/88	1.0	<0.005	<0.005
Total Silver	3/19/88	5.0	<0.005	<0.005

_X_ Standard Addition
___ Non-Standard Addition

I.D. #88-236

RECRA ENVIRONMENTAL, INC.

EP TOXICITY TEST EXTRACT - METALS

PARAMETER (Units of Measure = mg/l)	ANALYSIS DATE	EPA MAX. CONC.	SAMPLE IDENTIFICATION	
			COMP. 5	TB1:12-14'
Total Arsenic	3/9/88	5.0	<0.005	<0.005
Total Barium	3/18/88	100.0	<0.05	<0.02
Total Cadmium	3/17/88	1.0	<0.006	<0.006
Total Chromium	3/17/88	5.0	0.023	0.064
Total Lead	3/17/88	5.0	<0.02	<0.02
Total Mercury	3/4/88	0.2	<0.0005	<0.0005
Total Selenium	3/9/88	1.0	<0.005	<0.005
Total Silver	3/19/88	5.0	<0.005	<0.005

X Standard Addition
___ Non-Standard Addition

EP TOXICITY TEST EXTRACT - METALS

PARAMETER (Units of Measure = mg/l)	ANALYSIS DATE	EPA MAX. CONC.	SAMPLE IDENTIFICATION
			TB2:4-6'
Total Arsenic	3/9/88	5.0	<0.005
Total Barium	3/18/88	100.0	<0.02
Total Cadmium	3/17/88	1.0	<0.006
Total Chromium	3/17/88	5.0	<0.005
Total Lead	3/17/88	5.0	<0.02
Total Mercury	3/4/88	0.2	<0.0005
Total Selenium	3/9/88	1.0	<0.005
Total Silver	3/19/88	5.0	<0.005

X Standard Addition
___ Non-Standard Addition

QUALITY CONTROL INFORMATION - PRECISION
EP TOXICITY TEST EXTRACT - METALS

SAMPLE IDENTIFICATION COMP. 5

PARAMETER (Units of Measure = mg/l)	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Total Arsenic	<0.005	<0.005	<0.005	-
Total Barium	<0.05	<0.05	<0.05	-
Total Cadmium	<0.006	<0.006	<0.006	-
Total Chromium	0.022	0.023	0.023	0.00071
Total Lead	<0.02	<0.02	<0.02	-
Total Mercury	<0.0005	<0.0005	<0.0005	-
Total Selenium	<0.005	<0.005	<0.005	-
Total Silver	<0.005	<0.005	<0.005	-

X Standard Addition
___ Non-Standard Addition

1/7988.5

QUALITY CONTROL INFORMATION - ACCURACY
EP TOXICITY TEST EXTRACT - METALS

SAMPLE IDENTIFICATION COMP. 1

PARAMETER	µg OF SPIKE	% RECOVERY
Total Arsenic	25 50	104 98
Total Barium	2,500 5,000	98 98
Total Cadmium	250 500	102 100
Total Chromium	250 500	106 103
Total Lead	2,500 5,000	99 98
Total Mercury	0.2 0.4	114 105
Total Selenium	25 50	92 94
Total Silver	250 500	97 94

I.D. #88-236

QUALITY CONTROL INFORMATION - ACCURACY
EP TOXICITY TEST EXTRACT - METALS

SAMPLE IDENTIFICATION COMP. 2

PARAMETER	µg OF SPIKE	% RECOVERY
Total Arsenic	25 50	100 94
Total Barium	2,500 5,000	98 99
Total Cadmium	250 500	104 102
Total Chromium	250 500	106 104
Total Lead	2,500 5,000	98 95
Total Mercury	0.2 0.4	115 114
Total Selenium	25 50	92 88
Total Silver	250 500	92 93

QUALITY CONTROL INFORMATION - ACCURACY
EP TOXICITY TEST EXTRACT - METALS

SAMPLE IDENTIFICATION COMP. 3

PARAMETER	μg OF SPIKE	% RECOVERY
Total Arsenic	25 50	96 94
Total Barium	2,500 5,000	94 97
Total Cadmium	250 500	103 100
Total Chromium	250 500	103 100
Total Lead	2,500 5,000	100 98
Total Mercury	0.2 0.4	104 107
Total Selenium	25 50	92 92
Total Silver	250 500	92 92

QUALITY CONTROL INFORMATION - ACCURACY
EP TOXICITY TEST EXTRACT - METALS

SAMPLE IDENTIFICATION COMP. 4

PARAMETER	μg OF SPIKE	% RECOVERY
Total Arsenic	25 50	96 96
Total Barium	2,500 5,000	96 98
Total Cadmium	250 500	104 102
Total Chromium	250 500	101 100
Total Lead	2,500 5,000	99 95
Total Mercury	0.2 0.4	117 116
Total Selenium	25 50	92 92
Total Silver	250 500	94 93

1/7988.9

QUALITY CONTROL INFORMATION - ACCURACY
EP TOXICITY TEST EXTRACT - METALS

SAMPLE IDENTIFICATION COMP. 5

PARAMETER	µg OF SPIKE	% RECOVERY
Total Arsenic	25	104
	50	93
Total Barium	2,500	95
	5,000	94
Total Cadmium	250	102
	500	101
Total Chromium	250	104
	500	101
Total Lead	2,500	97
	5,000	97
Total Mercury	0.2	93
	0.4	99
Total Selenium	25	96
	50	92
Total Silver	250	94
	500	91

I.D. #88-236

QUALITY CONTROL INFORMATION - ACCURACY
EP TOXICITY TEST EXTRACT - METALS

SAMPLE IDENTIFICATION TB1:12-14'

PARAMETER	μg OF SPIKE	% RECOVERY
Total Arsenic	25 50	92 90
Total Barium	2,500 5,000	94 99
Total Cadmium	250 500	105 103
Total Chromium	250 500	104 103
Total Lead	2,500 5,000	100 100
Total Mercury	0.2 0.4	102 111
Total Selenium	25 50	96 94
Total Silver	250 500	96 97

QUALITY CONTROL INFORMATION - ACCURACY
EP TOXICITY TEST EXTRACT - METALS

SAMPLE IDENTIFICATION TB2:4-6'

PARAMETER	μg OF SPIKE	% RECOVERY
Total Arsenic	25	92
	50	92
Total Barium	2,500	98
	5,000	96
Total Cadmium	250	103
	500	96
Total Chromium	250	103
	500	97
Total Lead	2,500	101
	5,000	101
Total Mercury	0.2	96
	0.4	99
Total Selenium	25	92
	50	92
Total Silver	250	92
	500	94

1/8034.1

ANALYTICAL RESULTS

Prepared For

Deknatel

Prepared By

Recra Environmental, Inc.
10 Hazelwood Drive, Suite 106
Amherst, New York 14150

METHODOLOGIES

The specific methodologies employed in obtaining the enclosed analytical results are indicated on the specific data table. The method numbers presented refer to the following U.S. Environmental Protection Agency reference.

- U.S. Environmental Protection Agency "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods". Office of Solid Waste and Emergency Response. July 1982, SW-846, Second Edition.

COMMENTS

Comments pertain to data on one or all pages of this report.

The values reported as "less than" (<) indicate the working detection limit for the particular sample and/or parameter.

Results of the analysis of soils are corrected for moisture content and reported on a dry weight basis.

RECRA ENVIRONMENTAL, INC.

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE)	
			DP-2 (0-0.5') (2/19/88)	DP-2 (2.0-2.5') (2/19/88)
Total Cadmium	7130	3/22/88	1.1	<0.6
Total Chromium	7190	3/22/88	25,800	4,570
Hexavalent Chromium	7195	3/12/88	4,610	150
Total Copper	7210	3/22/88	220	17
Total Iron	7380	3/15/88	19,000	9,220
Total Lead	7420	3/17/88	53,200	570
Total Nickel	7520	3/18/88	29	4.6
Total Selenium	7740	3/4/88	<0.6	<0.6
Total Zinc	7950	3/22/88	200	20

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE)	
			DP-2 (4.0-4.5') (2/19/88)	DP-2 (4.5-5.0') (2/19/88)
Total Cadmium	7130	3/22/88	<0.6	<0.6
Total Chromium	7190	3/22/88	4,740	3,650
Hexavalent Chromium	7195	3/12/88	220	400
Total Copper	7210	3/22/88	18	15
Total Iron	7380	3/15/88	6,820	7,050
Total Lead	7420	3/17/88	1,600	7,050
Total Nickel	7520	3/18/88	5.1	<2
Total Selenium	7740	3/4/88	<0.6	<0.6
Total Zinc	7950	3/22/88	19	15

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE) DP-2 (5.0-5.5') (2/19/88)	DP-2 (6.0-6.5') (2/19/88)
Total Cadmium	7130	3/22/88	<0.6	<0.6
Total Chromium	7190	3/22/88	3,350	3,050
Hexavalent Chromium	7195	3/12/88	110	69
Total Copper	7210	3/22/88	10	11
Total Iron	7380	3/15/88	6,230	9,510
Total Lead	7420	3/17/88	830	750
Total Nickel	7520	3/18/88	<2	<2
Total Selenium	7740	3/4/88	<0.6	<0.6
Total Zinc	7950	3/22/88	11	9.9

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE) DP-2 (6.5-7.0') (2/19/88)	DP-2 (7.0-7.5') (2/19/88)
Total Cadmium	7130	3/22/88	<0.6	<0.6
Total Chromium	7190	3/22/88	3,200	3,110
Hexavalent Chromium	7195	3/12/88	130	87
Total Copper	7210	3/22/88	11	11
Total Iron	7380	3/15/88	4,350	4,010
Total Lead	7420	3/17/88	5,690	800
Total Nickel	7520	3/18/88	2.8	3.7
Total Selenium	7740	3/4/88	<0.6	<0.6
Total Zinc	7950	3/22/88	10	10

SOIL MATRIX

SAMPLE IDENTIFICATION	ANALYSIS DATE	PARAMETER (UNITS OF MEASURE) DRY WEIGHT (103°C) (%)
DP-2 (0-0.5')	3/5/88	89.0
DP-2 (2.0-2.5')	3/5/88	96.1
DP-2 (4.0-4.5')	3/5/88	96.7
DP-2 (4.5-5.0')	3/5/88	95.6
DP-2 (5.0-5.5')	3/5/88	96.0
DP-2 (6.0-6.5')	3/5/88	96.4
DP-2 (6.5-7.0')	3/5/88	95.7
DP-2 (7.0-7.5')	3/5/88	95.4

CRA ENVIRONMENTAL, INC.

QUALITY CONTROL INFORMATION - PRECISION
SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Total Cadmium	7130	DP-2 (0-0.5')	0.97	1.2	1.1	0.16
Total Chromium	7190		24,300	27,300	25,800	2,100
Hexavalent Chromium	7195		4,790	4,430	4,610	250
Total Copper	7210		210	220	220	7.1
Total Iron	7380		17,600	20,300	19,000	1,900
Total Lead	7420		48,800	57,600	53,200	6,200
Total Nickel	7520		25	32	29	4.9
Total Selenium	7740		<0.6	<0.6	<0.6	-
Total Zinc	7950		200	200	200	0

QUALITY CONTROL INFORMATION - ACCURACY
SOIL MATRIX
METALS

PARAMETER	METHOD NUMBER	SAMPLE IDENTIFICATION	MICROGRAMS OF SPIKE	PERCENT RECOVERY
Total Cadmium	7130	DP-2 (0-0.5')	500	100
Total Chromium	7190		500	103
Hexavalent Chromium	7195		500	107
Total Copper	7210		500	98
Total Iron	7380		500	98
Total Lead	7420		500	99
Total Nickel	7520		500	101
Total Selenium	7740		50	80
Total Zinc	7950		500	100

ROUX ASSOCIATES

CHAIN OF CUSTODY RECORD

Project No. 09001

Project Title RECRA Environmental - Dernatel

Sample Source Soil Sample

Collectors Name John Sheehan (print) [illegible] (signature)

Field Information

Method Of Shipping Federal Express

Relinquished By:		Received By:	
sign		sign	K. E. Kaspeck
for		for	RECRA
Date/Time		Date/Time	2/22/88 (1330)

Sample Designation	Sample Location	Date	Time	Analyte	No. Of Containers
DP-2	DP-2 (0-.5)	2/19/88	3:45	METALS	1
DP-2	DP 2 (2.0'-2.5')	2-19-88	3 45	METALS	1
DP-2	DP-2 (4.0'-4.5')	2-19-88	3 45	METALS	1
DP 2	DP2 (5.0-5.5')	2-19-88	3 45	METALS	1
DP-2	DP-2 (4.5'-5.0)	2-19-88	3 45	METALS	1
DP-2	DP-2 (6.0'-6.5')	2-19-88	3 45	METALS	
DP-2	DP-2 (6.5'-7.0')	2-19-88	3 45	METALS	
DP-2	DP-2 (7.0'-7.5')	2-19-88	3 45	METALS	

Comments:

DP-2 (Disposal Point 2)

ANALYTICAL RESULTS

Prepared For

Deknatel

Prepared By

Recra Environmental, Inc.
10 Hazelwood Drive, Suite 106
Amherst, New York 14150

METHODOLOGIES

The specific methodologies employed in obtaining the enclosed analytical results are indicated on the specific data table. The method numbers presented refer to one of the following U.S. Environmental Protection Agency references.

- 40 CFR Part 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act" October 26, 1984 (Federal Register) U.S. Environmental Protection Agency.
- U.S. Environmental Protection Agency "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods". Office of Solid Waste and Emergency Response. July 1982, SW-846, Second Edition.

COMMENTS

Comments pertain to data on one or all pages of this report.

The values reported as "less than" (<) indicate the working detection limit for the particular sample and/or parameter.

Results of the analysis of soils are corrected for moisture content and reported on a dry weight basis.

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE) DP-1/13-15' (3/22/88)	DP-1/15-17' (3/22/88)
Total Chromium	7190	4/23/88	69	62
Hexavalent Chromium	7195	4/28/88	1.3	0.59
Total Copper	7210	4/13/88	31	21
Total Iron	7380	4/23/88	6,510	6,710
Total Lead	7420	4/15/88	150	150
Total Zinc	7950	4/27/88	30	15

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE) DP-1/17-19' (3/22/88)	DP-1/19-21' (3/22/88)
Total Chromium	7190	4/23/88	34	13
Hexavalent Chromium	7195	4/28/88	0.81	0.13
Total Copper	7210	4/13/88	21	12
Total Iron	7380	4/23/88	7,810	4,020
Total Lead	7420	4/15/88	110	55
Total Zinc	7950	4/27/88	17	9.2

SOIL MATRIX
METALS

PARAMETER (Units of Measure = μg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE)	
			DP-1/21-23' (3/22/88)	DP-1/23-25' (3/22/88)
Total Chromium	7190	4/23/88	35	8.1
Hexavalent Chromium	7195	4/28/88	0.29	<0.08
Total Copper	7210	4/13/88	25	7.1
Total Iron	7380	4/23/88	13,600	2,920
Total Lead	7420	4/15/88	73	28
Total Zinc	7950	4/27/88	23	8.7

SOIL MATRIX
METALS

PARAMETER (Units of Measure = μg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE)	
			DP-1/25-27' (3/22/88)	DP-1/27-29' (3/22/88)
Total Chromium	7190	4/23/88	8.7	12
Hexavalent Chromium	7195	4/28/88	0.10	<0.08
Total Copper	7210	4/13/88	9.6	19
Total Iron	7380	4/23/88	5,080	20,900
Total Lead	7420	4/15/88	37	97
Total Zinc	7950	4/27/88	10	12

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE) DP-1/33-35' (3/22/88)
Total Chromium	7190	4/23/88	18
Hexavalent Chromium	7195	4/28/88	0.11
Total Copper	7210	4/13/88	14
Total Iron	7380	4/23/88	4,570
Total Lead	7420	4/15/88	39
Total Zinc	7950	4/27/88	10

I.D. #88-455

SOIL MATRIX
METHOD 9200

SAMPLE IDENTIFICATION	ANALYSIS DATE	PARAMETER (UNITS OF MEASURE) LEACHABLE NITRATE (µg/g dry)
DP-1/13-15'	4/15/88	1.3
DP-1/15-17'	4/15/88	1.7
DP-1/17-19'	4/15/88	6.2
DP-1/19-21'	4/15/88	3.7
DP-1/21-23'	4/15/88	3.2
DP-1/23-25'	4/15/88	1.7
DP-1/25-27'	4/15/88	1.9
DP-1/27-29'	4/15/88	1.4
DP-1/33-35'	4/15/88	1.6

SOIL MATRIX
METHOD 365.2

SAMPLE IDENTIFICATION	ANALYSIS DATE	PARAMETER (UNITS OF MEASURE) LEACHABLE PHOSPHOROUS (µg/g dry)
DP-1/13-15'	4/16/88	9.1
DP-1/15-17'	4/16/88	7.7
DP-1/17-19'	4/16/88	6.1
DP-1/19-21'	4/16/88	5.7
DP-1/21-23'	4/16/88	3.6
DP-1/23-25'	4/16/88	3.7
DP-1/25-27'	4/16/88	3.9
DP-1/27-29'	4/16/88	5.4
DP-1/33-35'	4/16/88	4.7

SOIL MATRIX
METHOD 9038

SAMPLE IDENTIFICATION	ANALYSIS DATE	PARAMETER (UNITS OF MEASURE) LEACHABLE SULFATE (µg/g dry)
DP-1/13-15'	4/22/88	28
DP-1/15-17'	4/22/88	<20
DP-1/17-19'	4/22/88	<20
DP-1/19-21'	4/22/88	<20
DP-1/21-23'	4/22/88	<20
DP-1/23-25'	4/22/88	<20
DP-1/25-27'	4/22/88	37
DP-1/27-29'	4/22/88	58
DP-1/33-35'	4/22/88	<20

SOIL MATRIX

SAMPLE IDENTIFICATION	ANALYSIS DATE	PARAMETER (UNITS OF MEASURE) DRY WEIGHT (103°C) (%)
DP-1/13-15'	4/27/88	93.7
DP-1/15-17'	4/27/88	92.4
DP-1/17-19'	4/27/88	93.5
DP-1/19-21'	4/27/88	94.4
DP-1/21-23'	4/27/88	95.7
DP-1/23-25'	4/27/88	95.0
DP-1/25-27'	4/27/88	96.5
DP-1/27-29'	4/27/88	96.0
DP-1/33-35'	4/27/88	96.3

QUALITY CONTROL INFORMATION - PRECISION
SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Total Chromium	7190	DP-1/23-25'	9.1	7.1	8.1	1.4
Hexavalent Chromium	7195		<0.08	<0.08	<0.08	-
Total Copper	7210		7.0	7.1	7.1	0.071
Total Iron	7380		2,710	3,130	2,920	300
Total Lead	7420		31	24	28	4.9
Total Zinc	7950		7.3	10	8.7	1.9

QUALITY CONTROL INFORMATION - ACCURACY
SOIL MATRIX
METALS

PARAMETER	METHOD NUMBER	SAMPLE IDENTIFICATION	MICROGRAMS OF SPIKE	PERCENT RECOVERY
Total Chromium	7190	DP-1/23-25'	500	92
Hexavalent Chromium	7195		500	91
Total Copper	7210		500	98
Total Iron	7380		500	98
Total Lead	7420		500	102
Total Zinc	7950		500	99

QUALITY CONTROL INFORMATION - PRECISION
SOIL MATRIX

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Leachable Nitrate	µg/g dry	DP-1/33-35'	1.6	1.6	1.6	0
Leachable Phosphorous	µg/g dry		4.7	4.7	4.7	0
Leachable Sulfate	µg/g dry		<20	<20	<20	-

QUALITY CONTROL INFORMATION - ACCURACY
SOIL MATRIX

PARAMETER	SAMPLE IDENTIFICATION	µg OF SPIKE	% RECOVERY
Leachable Nitrate	DP-1/33-35'	4.0	108
Leachable Phosphorous		20	97
Leachable Sulfate		20	103

ROUX ASSOCIATES

CHAIN OF CUSTODY RECORD

Project No. 09001

Project Title RECRA ENVIRONMENTAL INC

Sample Source SOIL SAMPLE

Collectors Name JOHN SHEEHAN / John C Sheehan
print / signature

Field Information

Method Of Shipping FEDERAL EXPRESS

Relinquished By:
sign John C Sheehan
for Roux Associates
Date/Time 3-22-88 / 4:30

Received By:
sign J. Calvert
for Recra Environmental
Date/Time 3/23/88 9:30 am

Sample Designation	Sample Location	Date	Time	Analyte	No. Of Containers
DP-1	DP-1 (13-15)	3-22-88		METALS	1
DP-1	DP-1 (15-17)	"		"	1
DP-1	DP-1 (17-19)	"		"	1
DP-1	DP-1 (19-21)	"		"	1
DP-1	DP-1 (21-23)	"		"	1
~~DP-1~~	~~DP-1 (23-25)~~	~~"~~		~~"~~	~~1~~
~~DP-1~~	~~DP-1 (25-27)~~	~~"~~		~~"~~	~~1~~

Comments:

TOTAL 5

HOUX ASSOCIATES

CHAIN OF CUSTODY RECORD

Project No. 09001

Project Title RECRA ENVIRONMENTAL INC.

Sample Source SOIL SAMPLE

Collectors Name John Sheehan (print) / John C. Sheehan (signature)

Field Information

Method Of Shipping FEDERAL EXPRESS

Relinquished By:

sign John C. Sheehan

for Houx Associates

Date/Time 3-22-88 / 4:30P

Received By:

sign J. Calvert

for Recra Environmental

Date/Time 3/23/88 9:30 AM

Sample Designation	Sample Location	Date	Time	Analyte	No. Of Containers
DP-1	DP-1 (23-25)	3-22-88		METALS	1
DP-1	DP-1 (25-27)	"		"	1
DP-1	DP-1 (27-29)	"		"	1
DP-1	DP-1 (33-35)	"		"	1

Comments:

TOTAL 4

1/8170

ANALYTICAL RESULTS

Prepared For

Deknatel

Prepared By

Recra Environmental, Inc.
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Amherst, New York 14150

METHODOLOGIES

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SOIL MATRIX
METHOD 8240 - VOLATILES AND ADDITIONAL COMPOUNDS

COMPOUND (Units of Measure = µg/g)	SAMPLE IDENTIFICATION		
	COMP. III	13-21' COMP.	21-29' COMP.
Acrolein	<40	<40	<40
Acrylonitrile	<40	<40	<40
Benzene	<0.5	<0.5	<0.5
Bromodichloromethane	<0.3	<0.3	<0.3
Bromoform	<0.5	<0.5	<0.5
Bromomethane	<1	<1	<1
Carbon tetrachloride	<0.3	<0.3	<0.3
Chlorobenzene	<0.7	<0.7	<0.7
Chloroethane	<1	<1	<1
2-Chloroethylvinyl ether	<1	<1	<1
Chloroform	<0.2	<0.2	<0.2
Chloromethane	<1	<1	<1
Dibromochloromethane	<0.4	<0.4	<0.4
1,2-Dichlorobenzene	<0.3	<0.3	<0.3
1,3-Dichlorobenzene	<0.3	<0.3	<0.3
1,4-Dichlorobenzene	<0.3	<0.3	<0.3
1,1-Dichloroethane	<0.5	<0.5	<0.5
1,2-Dichloroethane	<0.3	<0.3	<0.3
1,1-Dichloroethylene	<0.3	<0.3	<0.3
trans-1,2-Dichloroethylene	<0.2	<0.2	<0.2
1,2-Dichloropropane	<0.6	<0.6	<0.6
cis-1,3-Dichloropropene	<0.5	<0.5	<0.5
trans-1,3-Dichloropropene	<0.5	<0.5	<0.5
Ethylbenzene	24	<0.8	<0.8
Methylene chloride	0.43	0.43	0.37
1,1,2,2-Tetrachloroethane	<0.7	<0.7	<0.7
Tetrachloroethylene	1.6	<0.5	<0.5
Toluene	7.9	<0.7	<0.7
1,1,1-Trichloroethane	<0.4	<0.4	<0.4
1,1,2-Trichloroethane	<0.6	<0.6	<0.6
Trichloroethylene	<0.2	<0.2	<0.2
Vinyl chloride	<1	<1	<1

(continued)

SOIL MATRIX
METHOD 8240 - VOLATILES AND ADDITIONAL COMPOUNDS

	SAMPLE IDENTIFICATION		
	COMP. III	13-21' COMP.	21-29' COMP.
Additional Compounds			
Acetone	<1.0	<1.0	4.1
Analysis Date	4/1/88	4/1/88	4/1/88
Internal Standards			
Level Added = 0.05 μg/g			
(% Recovery)			
Bromochloromethane	82	91	38
1,4-Difluorobenzene	84	94	89
Chlorobenzene-D_5	91	98	92
Surrogates			
Level Added = 0.05 μg/g			
(% Recovery)			
4-Bromofluorobenzene	68	87	95
1,2-Dichloroethane-D_4	75	108	115
Toluene-D_8	74	89	79

1/8329.1

ANALYTICAL RESULTS

Prepared For

Deknatel

Prepared By

Recra Environmental, Inc.
10 Hazelwood Drive, Suite 106
Amherst, New York 14150

METHODOLOGIES

The specific methodologies employed in obtaining the enclosed analytical results are indicated on the specific data table. The method numbers presented refer to one of the following U.S. Environmental Protection Agency references unless noted otherwise in this report.

- 40 CFR Part 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act" October 26, 1984 (Federal Register) U.S. Environmental Protection Agency.

- U.S. Environmental Protection Agency "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods". Office of Solid Waste and Emergency Response. July 1982, SW-846, Second Edition.

COMMENTS

Comments pertain to data on one or all pages of this report.

The values reported as "less than" (<) indicate the working detection limit for the particular sample and/or parameter.

Petroleum products analysis is performed according to NYS DOH Method 310-13.

Results of the analysis of petroleum products are based on the matching of retention times between the sample and standards on a single gas chromatographic column.

Chromatograms of this analysis are included in this report.

The standards analyzed for comparison include: regular gasoline, white kerosene, fuel oil #2, fuel oil #6, S.A.E. 10, S.A.E. 20, S.A.E. 30 and S.A.E. 40.

Compounds reported as ND are "not detected".

Results of the analysis of soils are corrected for moisture content and reported on a dry weight basis.

The dry weights (103°C) are as follows:

Comp-1 - 63.8%
Comp-2 - 77.4%

1/8329.2

AQUEOUS MATRIX
DOH METHOD 310-13

SAMPLE IDENTIFICATION (DATE)	EXTRACTION DATE	ANALYSIS DATE	PARAMETER
			PETROLEUM PRODUCTS
MW-3 (3/15/88)	3/21/88	3/22/88	ND

I.D. #88-397

RECRA ENVIRONMENTAL, INC.

AQUEOUS MATRIX
METALS

PARAMETER (Units of Measure = mg/l)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE) MW-1 (3/15/88)	MW-2 (3/15/88)
Total Chromium	7190	4/7/88	0.097	0.10
Hexavalent Chromium	7195	3/16/88	<0.003	0.090
Total Copper	7210	4/8/88	0.096	0.11

AQUEOUS MATRIX
METALS

PARAMETER (Units of Measure = mg/l)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE) MW-10 (3/15/88)	MW-11 (3/15/88)
Total Chromium	7190	4/7/88	<0.005	<0.005
Hexavalent Chromium	7195	3/16/88	<0.003	<0.003
Total Copper	7210	4/8/88	<0.005	<0.005

SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE) COMP-1 (3/15/88)	COMP-2 (3/15/88)
Total Chromium	7190	4/8/88	4,100	1,700
Hexavalent Chromium	7195	4/9/88	9.5	0.28
Total Copper	7210	4/7/88	540	120
Total Iron	7380	4/12/88	17,000	14,000
Total Lead	7420	4/9/88	10,000	2,800
Total Zinc	7950	4/7/88	840	230

AQUEOUS MATRIX
WATER QUALITY TESTING

PARAMETER	METHOD NUMBER	UNITS OF MEASURE	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE) MW-1 (3/15/88)	MW-2 (3/15/88)
Nitrate	9200	mg NO_3-N/L	3/17/88	8.7	7.5
Total Phosphorous	365.2	mg P/l	4/16/88	0.12	<0.02
Sulfate	9038	mg/l	4/6/88	67	42

AQUEOUS MATRIX
WATER QUALITY TESTING

PARAMETER	METHOD NUMBER	UNITS OF MEASURE	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE) MW-10 (3/15/88)	MW-11 (3/15/88)
Nitrate	9200	mg NO_3-N/L	3/17/88	0.22	0.065
Total Phosphorous	365.2	mg P/l	4/16/88	<0.02	<0.02
Sulfate	9038	mg/l	4/6/88	<1	<1

SOIL MATRIX
METHOD 9200

SAMPLE IDENTIFICATION (DATE)	ANALYSIS DATE	PARAMETER (UNITS OF MEASURE) LEACHABLE NITRATE (µg/g dry)
COMP-1 (3/15/88)	4/15/88	9.8
COMP-2 (3/15/88)	4/15/88	1.8

SOIL MATRIX
METHOD 365.2

SAMPLE IDENTIFICATION (DATE)	ANALYSIS DATE	PARAMETER (UNITS OF MEASURE) LEACHABLE PHOSPHOROUS (µg/g dry)
COMP-1 (3/15/88)	4/16/88	8.0
COMP-2 (3/15/88)	4/16/88	<0.6

SOIL MATRIX
METHOD 9038

SAMPLE IDENTIFICATION (DATE)	ANALYSIS DATE	PARAMETER (UNITS OF MEASURE) LEACHABLE SULFATE (µg/g dry)
COMP-1 (3/15/88)	4/22/88	150
COMP-2 (3/15/88)	4/22/88	47

RECRA ENVIRONMENTAL, INC.

QUALITY CONTROL INFORMATION - PRECISION
AQUEOUS MATRIX
METALS

PARAMETER (Units of Measure = mg/l)	METHOD NUMBER	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Total Chromium	7190	MW-11	<0.005	<0.005	<0.005	-
Hexavalent Chromium	7195		<0.003	<0.003	<0.003	-
Total Copper	7210		<0.005	<0.005	<0.005	-

QUALITY CONTROL INFORMATION - ACCURACY
AQUEOUS MATRIX
METALS

PARAMETER	METHOD NUMBER	SAMPLE IDENTIFICATION	MICROGRAMS OF SPIKE	PERCENT RECOVERY
Total Chromium	7190	MW-11	500	98
Hexavalent Chromium	7195		500	86
Total Copper	7210		500	99

QUALITY CONTROL INFORMATION - PRECISION
SOIL MATRIX
METALS

PARAMETER (Units of Measure = µg/g dry)	METHOD NUMBER	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Total Chromium	7190	COMP-2	1,600	1,700	1,700	71
Hexavalent Chromium	7195		0.24	0.32	0.28	0.057
Total Copper	7210		110	130	120	14
Total Iron	7380		13,000	14,000	14,000	710
Total Lead	7420		2,500	3,000	2,800	350
Total Zinc	7950		200	250	230	35

QUALITY CONTROL INFORMATION - ACCURACY
SOIL MATRIX
METALS

PARAMETER	METHOD NUMBER	SAMPLE IDENTIFICATION	MICROGRAMS OF SPIKE	PERCENT RECOVERY
Total Chromium	7190	COMP-2	500	100
Hexavalent Chromium	7195		500	99
Total Copper	7210		500	98
Total Iron	7380		500	100
Total Lead	7420		500	93
Total Zinc	7950		500	101

RECRA ENVIRONMENTAL, INC.

QUALITY CONTROL INFORMATION - PRECISION
AQUEOUS MATRIX
WATER QUALITY TESTING

PARAMETER	METHOD NUMBER	UNITS OF MEASURE	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Nitrate	9200	mg NO_3-N/L	*	1.7	1.8	1.8	0.071
Total Phosphorous	365.2	mg P/l		0.11	0.11	0.11	0
Sulfate	9038	mg/l		47	46	47	0.71

QUALITY CONTROL INFORMATION - ACCURACY
AQUEOUS MATRIX
WATER QUALITY TESTING

PARAMETER	METHOD NUMBER	SAMPLE IDENTIFICATION	MICROGRAMS OF SPIKE	PERCENT RECOVERY
Nitrate	9200	*	4	96
Total Phosphorous	365.2		20	97
Sulfate	9038		20	109

*Quality control results were generated from a sample of similar matrix at the time of analysis.

I.D. #88-397

QUALITY CONTROL INFORMATION - PRECISION
SOIL MATRIX

PARAMETER	UNITS OF MEASURE	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Leachable Nitrate	µg/g dry	*	1.6	1.6	1.6	0
Leachable Phosphorous	µg/g dry		4.5	4.5	4.5	0
Leachable Sulfate	µg/g dry		<20	<20	<20	-

QUALITY CONTROL INFORMATION - ACCURACY
SOIL MATRIX

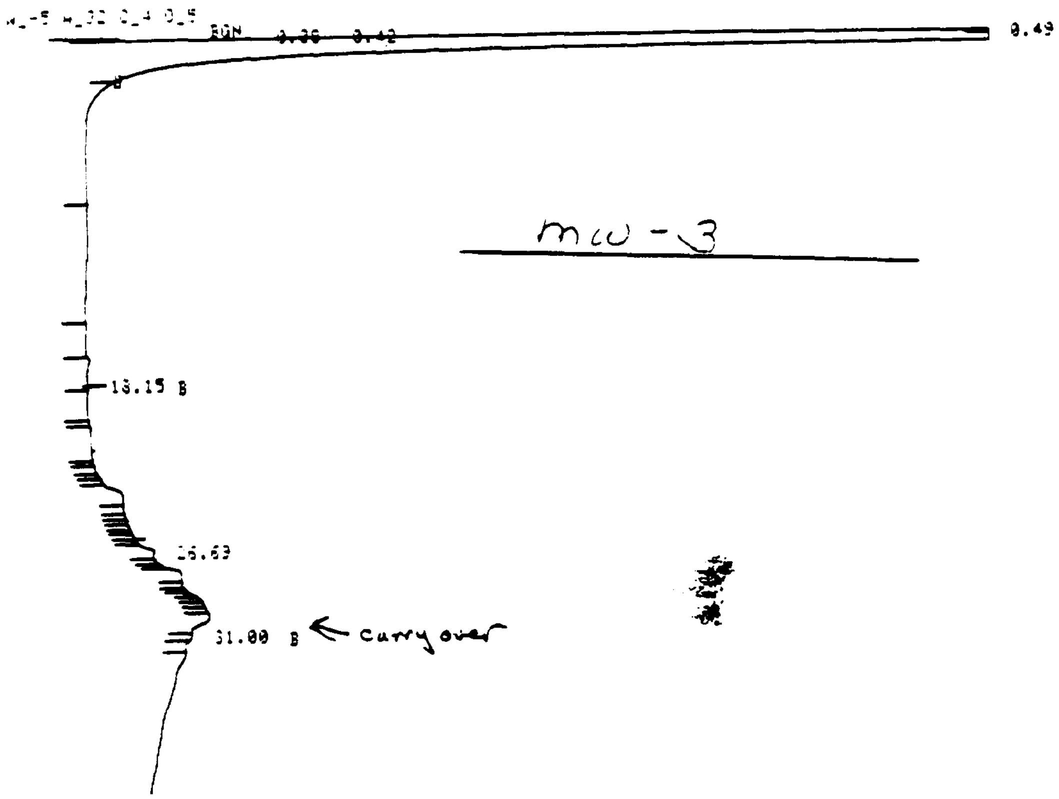
PARAMETER	SAMPLE IDENTIFICATION	µg OF SPIKE	% RECOVERY
Leachable Nitrate	*	8	108
Leachable Phosphorous		20	97
Leachable Sulfate		20	103

*Quality control results were generated from a sample of similar matrix at the time of analysis.

1/7166

SAMPLE CHROMATOGRAMS

FILE 792 Q202-1 STARTED 13:15.9 88/03/22 88-39?2 PETRO - W23707
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 88/02/10

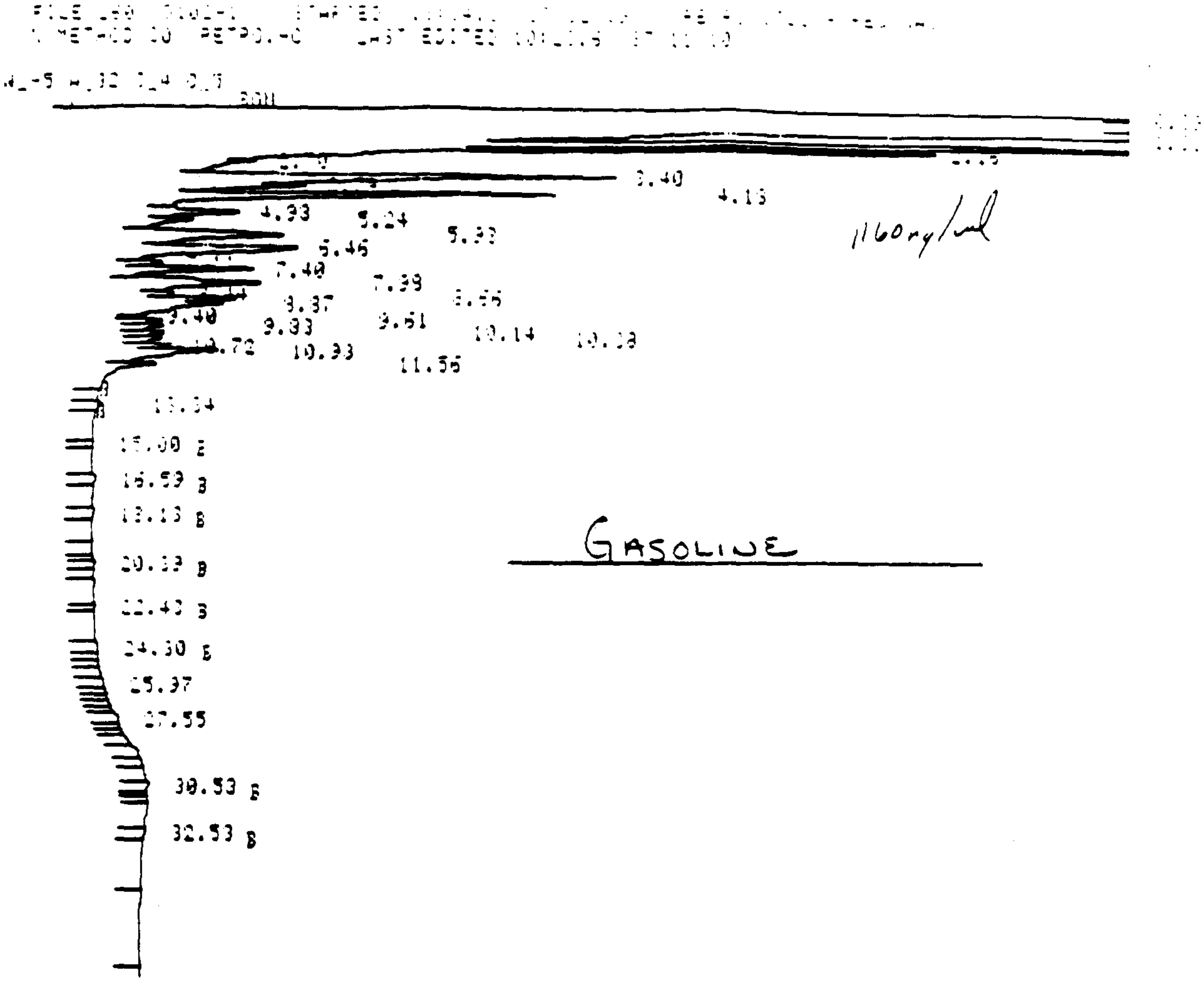


FILE 792 Q202-1 STARTED 13:15.9 88/03/22 88-39?2 PETRO - W23707
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 88/02/10

#?	AREA	HEIGHT	BC	AREA PERCENT	HEIGHT PERCENT
0.33	45006	16.9774	T	0.0218	0.0666
0.41	23246	11.2041	T	0.0113	0.0440
0.49	13749096	12911.0001	T	6.6610	50.6765
0.53	192523360	12534.0117		93.2716	49.1965
18.15	2635	0.6551		0.0013	0.0026
26.69	54038	2.7496	T	0.0262	0.0108
31.00	14127	0.7935		0.0068	0.0031

- PEAKS AREA REJECT 206411472 TOTAL AREA
- PEAKS HEIGHT REJECT 2.547747e+04 TOTAL HEIGHT

STANDARD CHROMATOGRAMS

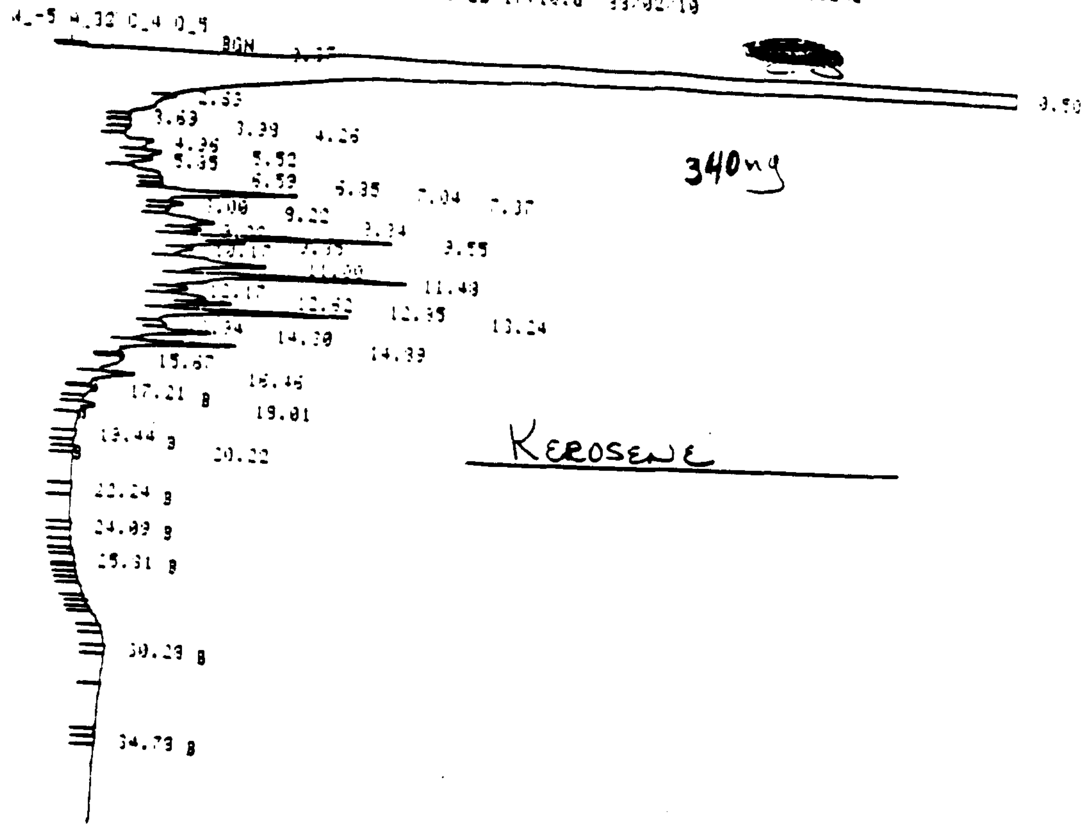


1.90⁻⁴

FILE 250 0102-1 STARTED 13:34.1 87/12/19 PETRO STDS - REG GAS
% METHOD 30 PETRO.HC LAST EDITED 10:23.6 87/11/10

RT	AREA	HEIGHT	BC	AREA PERCENT	HEIGHT PERCENT
0.39	3168716	2056.9304	T	1.0609	9.1980
0.43	3156325	3445.0173	T	3.0631	15.4051
0.50	239672256	12934.3076	T	50.2459	57.8335
1.06	12354673	1709.9635	T	4.3038	7.6465
1.31	5370771	335.0321	T	1.7982	1.4982
1.88	6128977	633.5137	T	2.0554	2.8329
2.16	3559931	247.4124	T	1.1919	1.1064
2.70	1416809	51.1991	T	0.4744	0.2289
3.40 ✗	2924123	154.4224	T	0.9455	0.6905
3.73	1038964	64.8596	T	0.3479	0.2900
4.13 ✗	2168346	136.2521	T	0.7260	0.6093
4.33	988716	45.0602	T	0.3310	0.2015
5.24	703772	31.4519	T	0.2356	0.1406
5.33 ✓	1476447	57.1336	T	0.4943	0.2558
5.46 ✗	1458876	60.8389	T	0.4884	0.2721
7.11	311335	21.5820	T	0.1042	0.0965
7.40	738430	47.9385	T	0.2472	0.2144
7.98	1198366	49.2524	T	0.4012	0.2202
8.44	322715	23.9976	T	0.1080	0.1073
8.66	466330	41.3053	T	0.1563	0.1874
8.87	885717	37.9751	T	0.2965	0.1698
9.40	137436	14.8233	T	0.0460	0.0663
9.61	230920	19.9418	T	0.0773	0.0892
9.93	287737	20.0770	T	0.0964	0.0899
10.14	279647	20.3387	T	0.0936	0.0909
10.23	234234	19.5163	T	0.0935	0.0872
10.72	300794	21.4201	T	0.1007	0.0958
10.93	757487	35.2477	T	0.2536	0.1576
11.56	346833	16.9503		0.1161	0.0758
13.34	24850	1.6901		0.0083	0.0076
15.00	3303	0.3413		0.0013	0.0015
16.59	17213	1.2022		0.0058	0.0054
18.13	11606	0.7404		0.0039	0.0033
20.39	4012	0.4613		0.0013	0.0021
22.43	4127	0.4574		0.0014	0.0020
24.30	7246	0.5245		0.0024	0.0023
25.97	4222	0.4625	V	0.0014	0.0021
27.55	10353	0.8923	T	0.0035	0.0039
30.53	12042	0.9839		0.0040	0.0044

FILE [illegible] STARTED [illegible]
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 88/02/10 PETRO STDS - KEROSENE



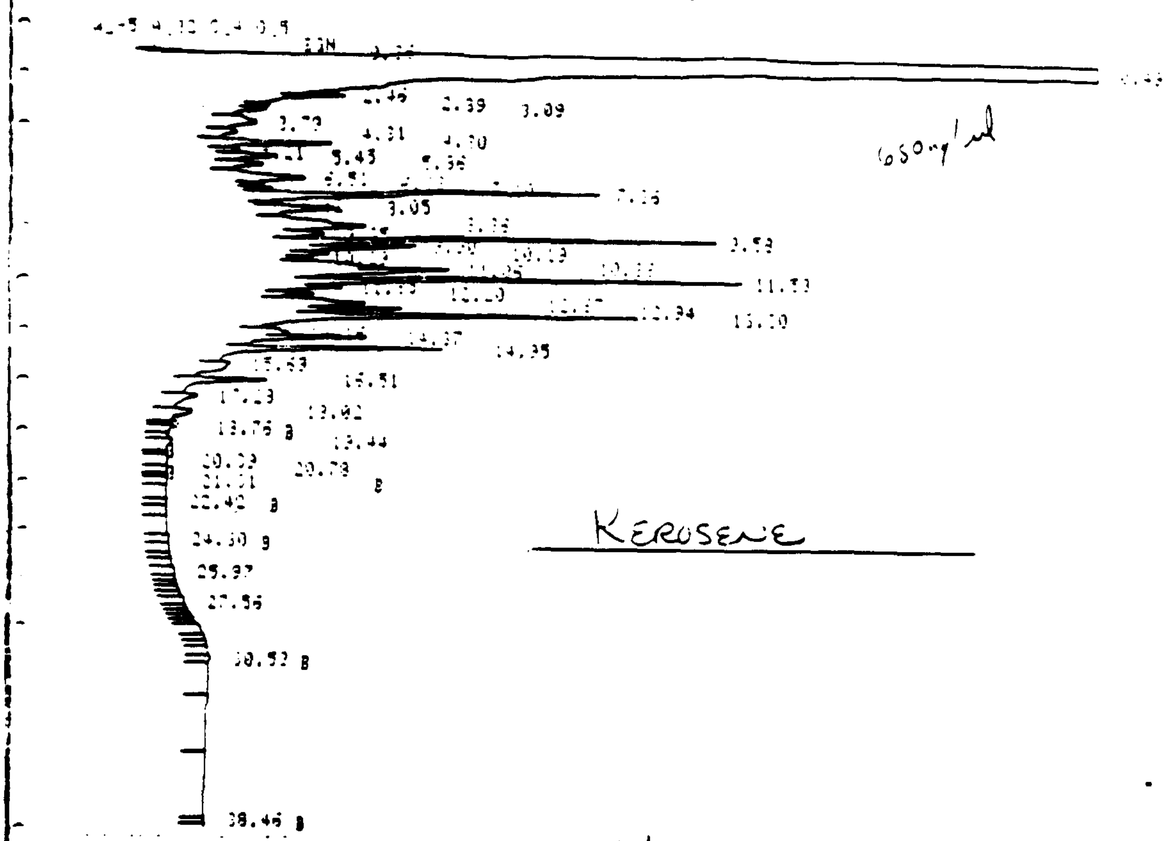
[redacted]

FILE 733 0301-1 STARTED 11:14.3 88/03/10 PETRO STDS - KEROSENE
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 88/02/10

RT	AREA	HEIGHT	BC	AREA PERCENT	HEIGHT PERCENT
0.37	9611	4.7341	T	0.0040	0.0340
0.50	221955632	12315.2070	T	91.7270	92.7462
2.59	1425943	31.3160	T	0.5993	0.2249
3.03	223999	15.5511	T	0.0946	0.1117
3.39	269303	15.2170	T	0.1113	0.1093
4.26	233146	14.7245	T	0.1170	0.1057
[illegible]	[illegible]	[illegible]	[illegible]	0.2425	[illegible]
5.52	479519	23.4432	T	0.1932	0.1634
5.85	401489	20.4474	T	0.1659	0.1468
6.53	575730	22.3556	T	0.2384	0.1595
6.85	331739	22.7482	T	0.1371	0.1634
7.04	314412	22.5632	T	0.1299	0.1627
7.37	1498072	65.3461	T	0.6191	0.4693
8.00	399926	28.5600	T	0.1653	0.2051
8.22	323049	23.9733	T	0.1335	0.1722
8.34	1209281	37.4695	T	0.4993	0.2591
9.22	639397	32.8089	T	0.2613	0.2256
9.55×	1153940	94.0228	T	0.4810	0.6752
9.85	730682	46.4652	T	0.3020	0.3338
10.17	643443	23.4744	T	0.2659	0.2117
11.00	1786157	52.0812	T	0.7381	0.3740
11.48×	1734104	36.8216	T	0.7166	0.6353
12.17	451553	26.0404	T	0.1866	0.1971
12.62	533880	31.4935	T	0.2520	0.2262
12.85	582536	39.4249	T	0.2407	0.2331
13.24×	1249230	75.1921	T	0.5163	0.5471
13.34	300562	17.2523	T	0.1242	0.1229
14.20	552360	31.3336	T	0.2737	0.2259
14.39	465250	38.6404		0.1923	0.2775
15.67	35600	3.3346	U	0.0335	0.0275
16.46	149622	12.3695		0.0618	0.0889
17.21	37254	3.2106		0.0154	0.0231
18.01	64211	4.5400		0.0265	0.0[illegible]
18.44	12239	0.3042		0.0051	0.0065
20.22	7551	0.6753		0.0031	0.0043
22.24	5340	0.4432		0.0026	0.0032
24.09	4625	0.4379		0.0019	0.0011
25.31	4561	0.4349		0.0021	0.0031
30.23	5121	0.6099		0.0024	0.0044
34.73	5321	0.2101		0.0022	0.0022

40 PEAKS > AREA REJECT 241935056 TOTAL AREA % [redacted]
40 PEAKS > HEIGHT REJECT 1.392532e+04 TOTAL HEIGHT

% METHOD 30 PETRO.HC LAST EDITED 10:23.6 87 11 10

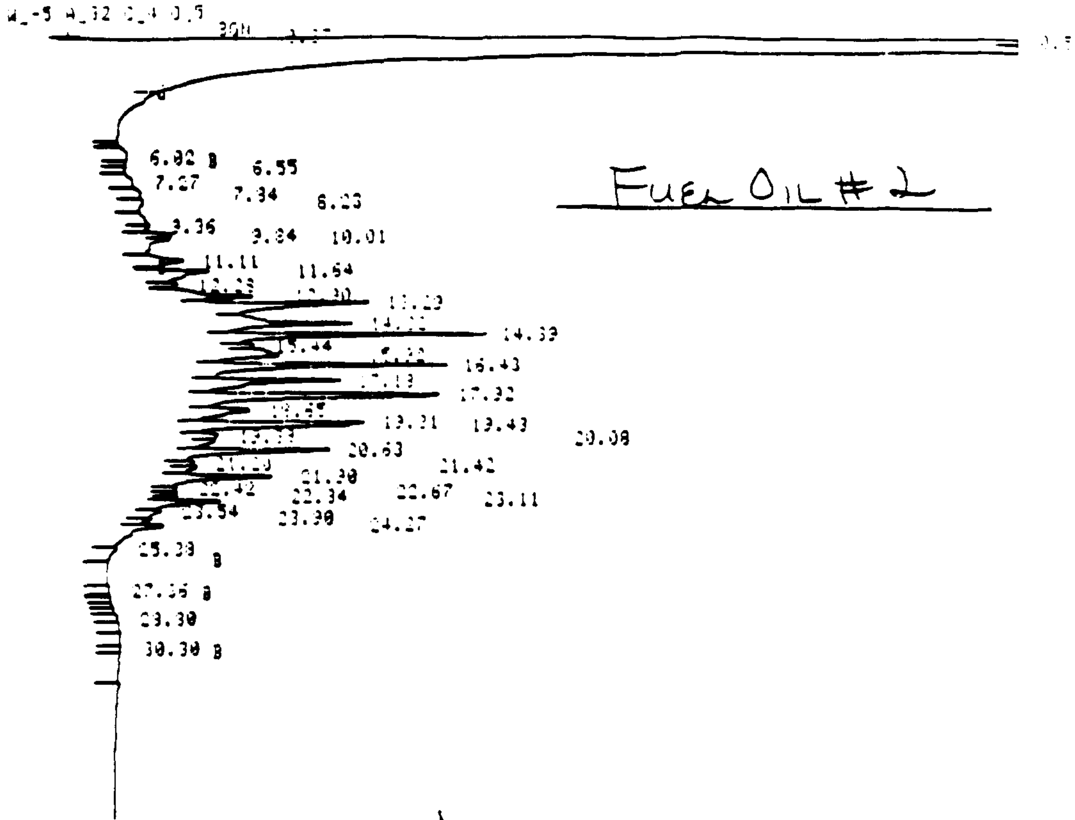


1.64-4

FILE 261 0103-1 STARTED 19:13.7 87 12 19 PETRO STDS - KEROSENE
% METHOD 30 PETRO.HC LAST EDITED 10:23.6 87 11 10

RT	AREA	HEIGHT	BC	AREA PERCENT	HEIGHT PERCENT
0.36	19016	5.4969	T	0.0066	0.0564
0.49	249426363	12372.0515	T	86.5753	75.4035
2.46	1176116	60.7347	T	0.4082	0.4002
2.89	372517	36.5904	T	0.1293	0.2427
3.09	832436	37.6102	T	0.2889	0.2362
3.79	1093369	31.9290	T	0.3792	0.2113
4.31	684367	25.5016	T	0.2375	0.1692
4.30	953615	55.4822	T	0.3327	0.3708
5.21	326602	26.0663	T	0.1134	0.1729
5.45 X	726030	33.0422	T	0.2520	0.2524
5.86	737210	33.2431	T	0.2559	0.2205
6.51 X	1337930	46.7130	T	0.4644	0.3099
6.86	385649	33.4209	T	0.1339	0.2217
7.10	432343	36.1753	T	0.1502	0.2400
7.36	2200925	141.5452	T	0.7640	0.9351
7.82	299353	37.5513	T	0.1039	0.2491
8.05 X	1311990	57.1827	T	0.4554	0.3794
8.36	2131537	65.4607	T	0.7507	0.4342
9.25	1073306	52.2378	T	0.3725	0.3470
9.58 X	2003493	173.6813	T	0.6954	1.1354
9.90	1222959	81.6261	T	0.4245	0.5415
10.19	672450	53.6255	T	0.2334	0.3558
10.29	536662	48.1143	T	0.1862	0.3192
10.86	1373899	70.2046	T	0.4769	0.4658
11.06	1946245	91.9764	T	0.6755	0.6102
11.53	2314911	195.3496	T	0.3035	1.2376
11.85	347607	57.3299	T	0.2269	0.2304
12.20	749730	47.3751	T	0.2602	0.3183
12.67	1516947	64.6566	T	0.5265	0.4299
12.94	320919	75.3297	T	0.3231	0.5064
13.30	2935078	152.2534	T	1.0189	1.0108
14.15	332317	33.4316	T	0.2391	0.2616
14.37	1241096	64.3447	T	0.4208	0.4269
14.35	1536071	83.6325	T	0.5505	0.5330
15.69	696774	20.2674	T	0.2425	0.1345
16.51	535083	31.8241	T	0.2031	0.2112
17.23	194724	3.1651	T	0.0675	0.0601
18.02	144034	7.5257		0.0500	0.0499
18.76	7133	0.5014		0.0025	0.0033
19.44	20373	1.5357		0.0073	0.0106
20.39	10152	0.6640	T	0.0035	0.0044
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
21.31	6052	0.4221		0.0021	0.0028
22.42	5751	0.5027		0.0020	0.0033
24.30	6122	0.4727		0.0022	0.0032
25.37	4437	0.4531	V	0.0015	0.0030
27.56	6679	0.6075	T	0.0023	0.0040
30.53	9532	0.7654		0.0033	0.0051
36.46	2342	0.3984		0.0009	0.0026

FILE 751 0102-1 STARTED 03:54.0 88 03 07 88-323A PETRO - FUEL OIL#2
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 88 02 10

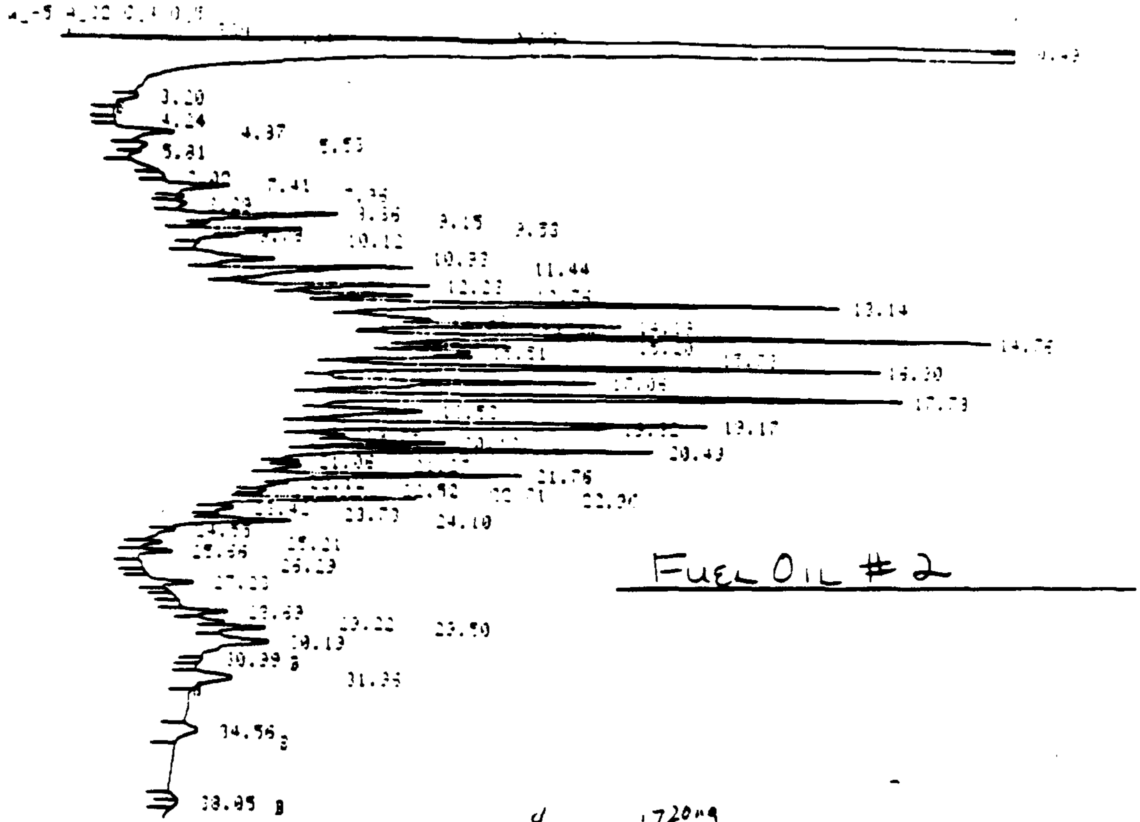


1.19-4

FILE 751 0102-1 STARTED 03:54.0 88/03 07 88-323A PETRO - FUEL OIL#2
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 88.02/10

RT	AREA	HEIGHT	BC	AREA PERCENT	HEIGHT PERCENT
0.37	5941	2.8252	T	0.0024	0.0106
0.50	55620112	12887.3551	T	24.4308	48.6051
0.72	138724896	12515.6406		55.7961	46.8376
6.02	34028	1.5183		0.0137	0.0057
6.55	2955	0.3345	V	0.0012	0.0014
7.27	30430	1.6314	T	0.0122	0.0061
7.34	[illegible]	[illegible]	[illegible]	0.0210	0.0101
8.23	59934	2.5628	V	0.0241	0.0095
9.36	7258	0.7287	V	0.0029	0.0027
9.84	95859	3.9241	T	0.0385	0.0330
10.01	136349	8.1200	V	0.0548	0.0304
11.11	156217	10.1003		0.0628	0.0378
11.64	321952	16.7794	T	0.1295	0.0628
12.28	121933	7.6338	T	0.0490	0.0286
12.90	626163	32.5648	T	0.2518	0.1219
13.29	1590501	70.1400	T	0.6396	0.2625
14.32	2124682	66.0900	T	0.8544	0.2474
14.89X	1759094	109.5751	T	0.7074	0.4101
15.44	595316	35.7498	T	0.2394	0.1338
15.92	1437933	44.3436	T	0.5782	0.1659
16.43X	1919983	98.6226	T	0.7721	0.3691
17.10	1592512	65.2128	T	0.6404	0.2440
17.92X	2252365	97.6133	T	0.9058	0.3653
18.65	1193493	37.7083	T	0.4799	0.1411
19.31	803909	75.2241	T	0.3233	0.2815
19.43	850724	70.4058	T	0.3421	0.2635
19.88	475610	28.6964	T	0.1913	0.1074
20.08	683242	28.0911	T	0.2748	0.1051
20.63X	1310199	65.5082	T	0.5269	0.2452
21.20	300379	22.4359	T	0.1208	0.0842
21.42	435285	23.5145	T	0.1750	0.0880
21.90	1059764	48.0203	T	0.4262	0.1797
22.42	270365	18.3214	T	0.1087	0.0686
22.67	219003	18.5220	T	0.0881	0.0693
22.84	220371	18.8447	T	0.0886	0.0705
23.11	581506	32.9754	T	0.2338	0.1234
23.54	276219	14.4101	T	0.1111	0.0539
23.90	220737	11.6132	T	0.0888	0.0435
24.27	441274	15.8723	T	0.1775	0.0594
25.38	43033	2.4223		0.0173	0.0091
27.36	4073	0.3787		0.0016	0.0014
28.30	4769	0.5237	V	0.0019	0.0020
30.30	5684	0.4996		0.0024	0.0019

43 PEAKS AREA REJECT 248672392 TOTAL AREA
43 PEAKS > HEIGHT REJECT 2.672136e+04 TOTAL HEIGHT



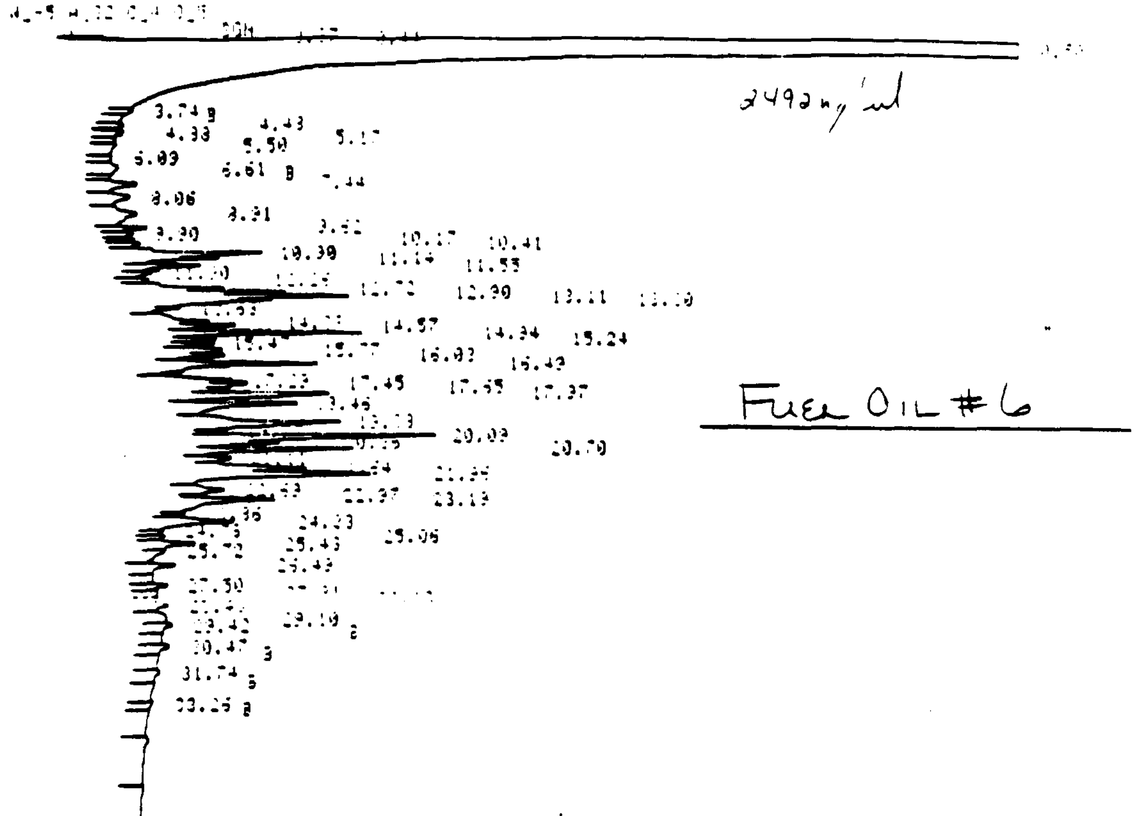
1.05 -4   1720ng

FILE 929 0491-1 STARTED 13:41.6 88/03/23 PETRO STD'S - FUEL OIL#2
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 88/02/10

RT	AREA	HEIGHT	BC	AREA PERCENT	HEIGHT PERCENT
0.36	349826	159.4260	T	0.1252	0.5406
0.44	46036	13.9792	T	0.0165	0.0632
0.49	12850255	12357.8516	T	4.6000	41.8717
0.78	198380576	12531.3018	T	71.0146	42.7575
3.20	214137	9.7556		0.0767	0.0333
4.24	4143	0.4323	U	0.0015	0.0015
4.97	333996	18.0968	T	0.1196	0.0617
5.53	132336	7.5504	T	0.0476	0.0253
5.81	66142	4.3006	U	0.0237	0.0147
7.02	31222	2.4008	T	0.0112	0.0082
7.41	421805	21.5457	T	0.1510	0.0735
7.95	112322	8.3244	T	0.0402	0.0301
8.29	208576	9.6527	T	0.0747	0.0329
8.86	340627	53.9559	T	0.2009	0.2008
9.15	275864	17.2842	T	0.0988	0.0590
9.53	600509	46.4533	T	0.2150	0.1585
9.79	378737	27.3387	T	0.1356	0.0933
10.12	334740	14.5241	T	0.1133	0.0496
10.33	1178527	39.1415	T	0.4219	0.1336
11.44	1634644	33.7319	T	0.5066	0.2359
12.28	1570561	89.4052	T	0.5622	0.2051
12.76	1656270	34.3793	T	0.5929	0.2273
13.14	4551383	222.4678	T	1.6293	0.7591
13.98	2071937	90.7731	T	0.7417	0.3097
14.19	2413438	152.0156	T	0.8639	0.5187
14.46	535523	75.1069	T	0.1917	0.2563
14.76✕	4380028	272.6321	T	1.5679	0.9304
15.20	1779544	114.3492	T	0.6370	0.3922
15.51	1790685	104.0091	T	0.6410	0.3549
15.78	1713408	104.7041	T	0.6155	0.3573
16.30✕	4302946	227.0321	T	1.5407	0.3020
17.06	4219573	145.1735	T	1.5105	0.4952
17.78✕	5403145	244.8429	T	1.9342	0.8354
18.53	2725362	93.3449	T	1.0093	0.7049
19.17✕	2225267	191.8136	T	0.7966	0.6204
19.32	1812427	149.3730	T	0.6488	0.5080
19.75	891158	64.6325	T	0.3191	0.2205
20.12	2105056	37.4476	T	0.7536	0.1125
20.49	2964511	164.6071	T	1.0612	0.5616
21.06	[illegible]	50.4445	T	0.2412	[illegible]
21.27	[illegible]	51.1221	T	0.2471	[illegible]
21.76	[illegible]	[illegible]	T	0.3062	0.4177
[illegible]	[illegible]	47.5544	T	0.1221	[illegible]
22.52	[illegible]	40.2464	T	0.1151	[illegible]
22.71	[illegible]	13.0564	T	[illegible]	[illegible]
22.96	1335170	65.7333	T	0.4334	0.1923
23.42	519644	30.0117	T	0.1932	0.1024
23.73	331202	18.0521	T	0.1136	0.0362
24.10	961773	46.3173	T	0.3514	0.1583
24.55	[illegible]	11.6007	T	0.0361	0.0395
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

16312356

FILE 282 0104-1 STARTED 20:05.3 87 12 13 PETRO STDS - FUEL OIL#6
% METHOD 30 PETRO.HC LAST EDITED 10:23.6 87/11/10

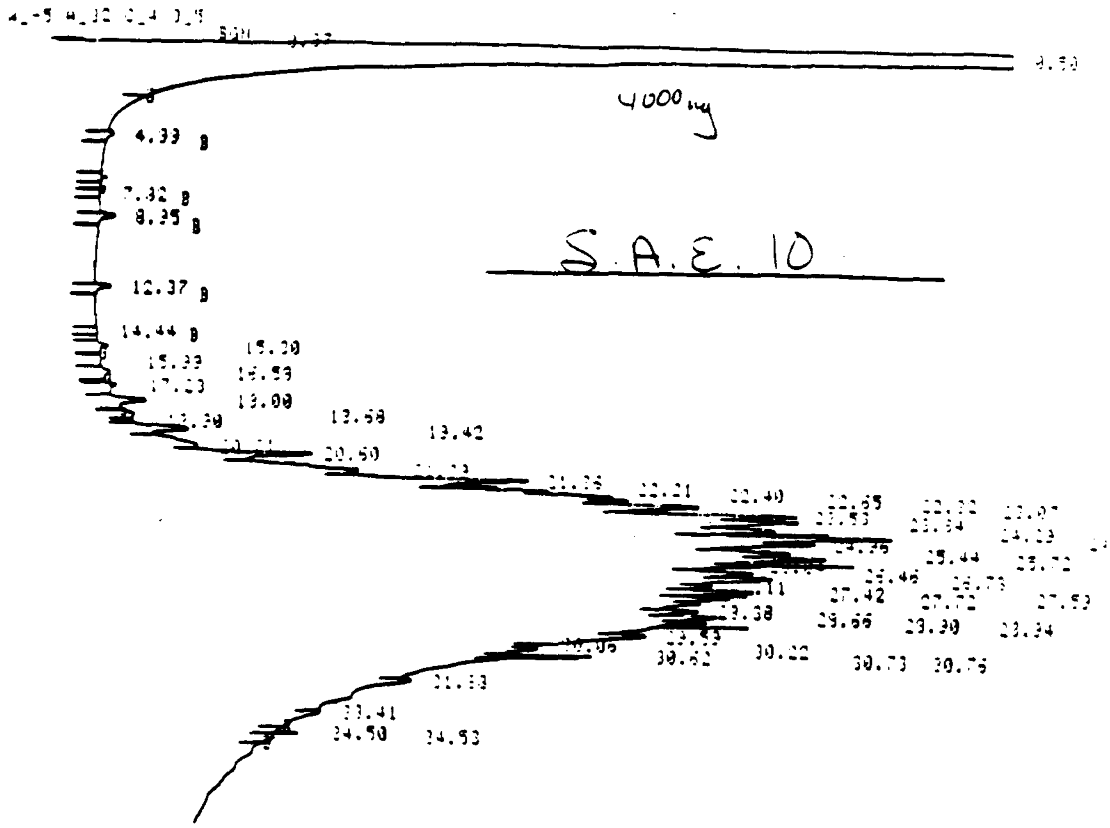


g.43-4

FILE 282 0104-1 STARTED 20:05.3 87 12 13 PETRO STDS - FUEL OIL#6
% METHOD 30 PETRO.HC LAST EDITED 10:23.6 87/11/10

RT	AREA	HEIGHT	BC	AREA PERCENT	HEIGHT PERCENT
0.37	23175	10.1624	T	0.0085	0.0637
0.44	26344	13.7673	T	0.0099	0.0944
0.50	246695064	12325.8242	T	90.4651	86.6555
[illegible]	[illegible]	[illegible].3446	[illegible]	0.0827	0.0572
9.62	103153	10.3945	T	0.0373	0.0753
9.90	79682	6.6505	T	0.0292	0.0456
10.17	74195	6.5265	T	0.0272	0.0452
10.41	102168	8.3771	T	0.0375	0.0575
10.90	645553	46.3538	T	0.2367	0.3222
11.14	434849	33.0960	T	0.1595	0.2270
11.55	359793	27.0040	T	0.1319	0.1852
11.90	176136	11.0135	T	0.0646	0.0755
12.26	120121	9.5296	T	0.0441	0.0654
12.72	481824	33.5141	T	0.1767	0.2299
12.90	522939	53.2063	T	0.1919	0.3650
13.11	824205	73.4493	T	0.3023	0.5039
13.30 x	739018	48.4057	T	0.2796	0.3320
13.60	244251	19.1607	T	0.0896	0.1214
14.39	613294	27.3541	T	0.2249	0.1911
14.57	484402	35.9506	T	0.1776	0.2467
14.94 x	960265	76.4610	T	0.3521	0.5249
15.24	384090	29.1413	T	0.1409	0.1999
15.47	328950	28.3729	T	0.1206	0.1946
15.77	469600	30.3020	T	0.1722	0.2113
16.03	513437	31.6139	T	0.1883	0.2169
16.49	1188296	60.9299	T	0.4358	0.4179
17.29	457930	32.9942	T	0.1676	0.2255
17.45	510196	37.9631	T	0.1871	0.2597
17.65	402325	32.1630	T	0.1477	0.2207
17.97 x	1182329	62.9750	T	0.4339	0.4182
18.46	1176323	53.2135	T	0.4316	0.3651
19.22	1671639	66.5575	T	0.6130	0.4566
19.77	341907	29.6257	T	0.1254	0.2032
20.09	1431139	96.5714	T	0.5249	0.6624
20.36	622024	45.3765	T	0.2281	0.3174
20.70 x	960916	68.2660	T	0.3524	0.4683
21.11	471997	30.0337	T	0.1731	0.2060
21.64	1110145	53.3128	T	0.4071	0.3681
21.99	1597021	74.3452	T	0.5857	0.5100
22.59	619107	27.0591	T	0.2273	0.1856
22.97	200932	20.3459	T	0.0736	0.1417
23.13	1013692	41.7175	T	0.3717	0.2860
23.36	174801	13.4129	T	0.0641	0.0920
24.33	606366	23.5462	T	0.2225	0.1598
24.73	75560	6.1037	T	0.0277	0.0419
25.06	58993	6.1347	T	0.0214	0.0421
25.43	235742	15.3451	T	0.0865	[illegible]
25.72	141646	[illegible]	[illegible]	[illegible]	[illegible]

FILE 757 0101-1 STARTED 15:11.5 88 03 07 PETRO STDS - S.A.E. 10
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 86/02/10

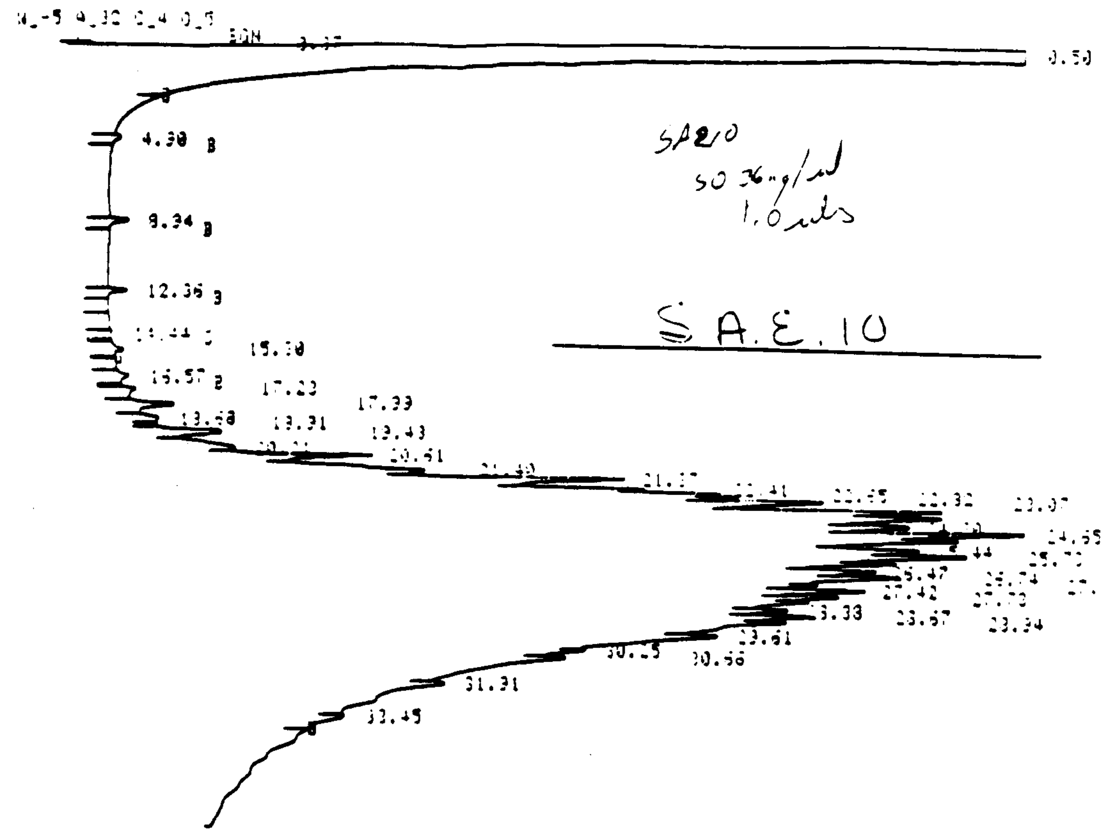


FILE 757 0101-1 STARTED 15:11.5 88 03 07 PETRO STDS - S.A.E. 10
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 86/02/10

RT	AREA	HEIGHT	BC	AREA PERCENT	HEIGHT PERCENT
0.37	1601	2.3692	T	0.0005	0.0135
0.50	225073134	12312.3145		70.1395	70.3698
17.23	45852	3.2927	V	0.0143	0.0172
18.00	143580	10.6286		0.0449	0.0533
18.68	53164	4.0623	T	0.0166	0.0222
19.30	33012	2.5343	T	0.0113	0.0159
19.42	383129	19.0413	T	0.1195	0.1045
20.21	545733	13.3693	T	0.1702	0.1063
20.60	1139594	55.1097	T	0.3741	0.3025
21.39	2024391	67.6237	T	0.6319	0.3712
21.86	3497163	120.7305	T	1.0906	0.6626
22.21	232746	93.1669	T	0.0729	0.5112
22.40	1647796	125.1700	T	0.5139	0.6870
22.65	1973793	145.0773	T	0.6155	0.7963
22.82	1894007	149.9509	T	0.5906	0.8230
23.07	3956733	172.1492	T	1.2339	0.9449
23.53	3586102	202.7245	T	1.1190	1.1127
23.84	4391379	202.1410	T	1.4373	1.1095
24.29	4254129	192.9307	T	1.3267	1.0594
24.65	4385379	229.6493	T	1.3676	1.2604
24.96	4238057	203.7225	T	1.3219	1.1181
25.44	4159475	194.0133	T	1.2971	1.0649
25.72	4061440	204.7692	T	1.2666	1.1239
25.94	1229259	212.6334	T	0.3333	1.1673
26.07	2117226	183.7720	T	0.6603	1.0096
26.46	3496996	179.5615	T	1.0974	0.9900
26.73	4059103	183.6075	T	1.2658	1.0077
27.11	2531256	162.5553	T	0.7894	0.8922
27.42	3281456	175.2933	T	1.0233	0.9621
27.59	152950	172.1302	T	0.0477	0.9450
27.72	2533600	166.6422	T	0.7901	0.9146
27.96	3132233	156.3507	T	0.9769	0.8581
28.36	2726174	154.0679	T	0.8502	0.8456
28.66	2726245	153.3593	T	0.8502	0.8746
28.90	811133	152.1196	T	0.2530	0.8349
28.94	4460232	154.7967	T	1.3909	0.8494
29.59	4244420	132.8927	T	1.3236	0.7294
30.06	532659	93.0322	T	0.1317	0.5331
30.22	1960774	95.6056	T	0.5903	0.5249
30.62	1219917	39.5005	T	0.3735	0.4557
30.73	144512	84.3645	T	0.0451	0.4631
30.75	3576617	82.3203	T	1.1154	0.4519
31.88	2917172	49.1706	T	0.9097	0.2710
33.41	403293	15.0115		0.1276	0.0824
34.50	2571	7.3314	V	0.0006	0.0410
34.53	32116	0.3443		0.0100	0.0046

54 PEAKS > AREA REJECT 320665099 TOTAL AREA
54 PEAKS > HEIGHT REJECT 1.821977e+04 TOTAL HEIGHT

FILE 756 RUN 1 STARTED 14:26.1 88/03/07 PETRO PRODUCTS
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 86/02/10

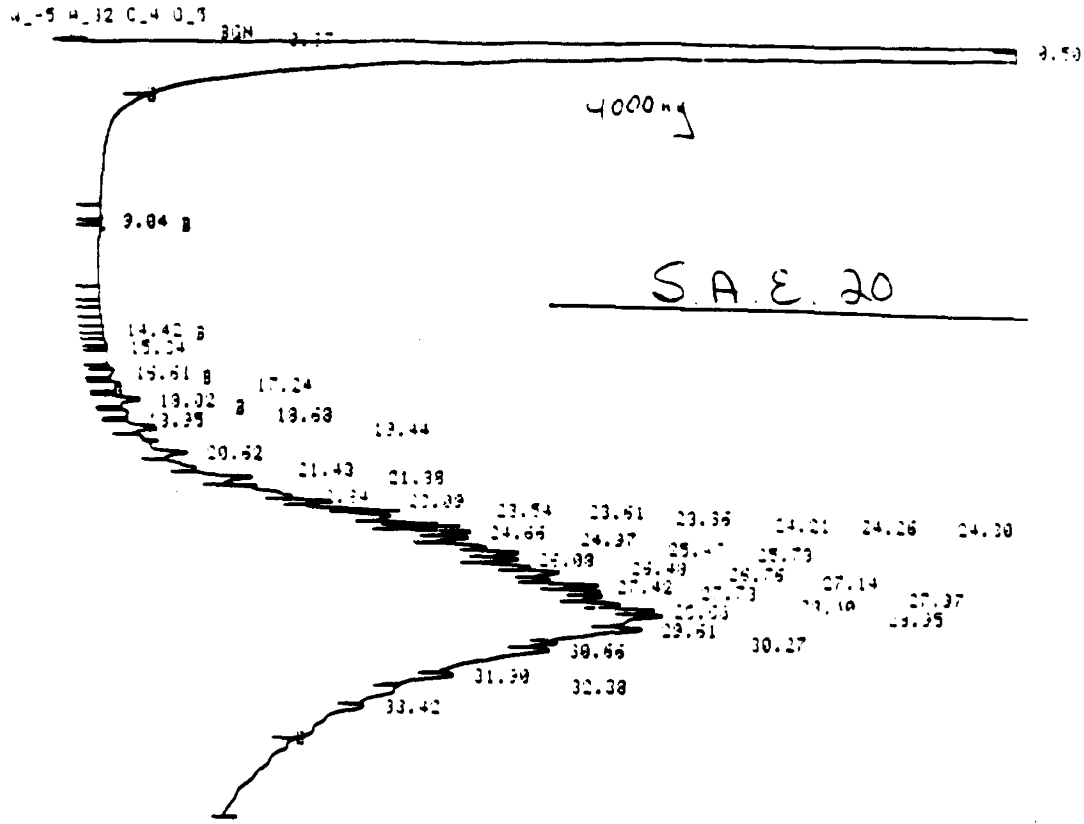


FILE 756 RUN 1 STARTED 14:26.1 88/03/07 PETRO PRODUCTS
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 86/02/10

RT	AREA	HEIGHT	BC	AREA PERCENT	HEIGHT PERCENT
0.37	7277	3.4019	T	0.0022	0.0187
0.50	229104192	12395.8945		66.4775	71.5917
4.90	26936	2.0874		0.0081	0.0115
9.94	62263	5.3726		0.0188	0.0324
12.36	59191	5.8324		0.0179	0.0325
14.44	6222	0.5203		0.0019	0.0029
15.30	46249	3.4810		0.0140	0.0192
16.57	52103	3.4349		0.0157	0.0193
17.23	56760	4.0035	U	0.0171	0.0221
17.99	199192	13.6793	T	0.0602	0.0754
18.68	102019	6.2691	T	0.0308	0.0345
18.91	67993	4.3698	T	0.0205	0.0258
19.43	524565	24.2627	T	0.1584	0.1337
20.21	755042	25.3133	T	0.2290	0.1395
20.61	1465413	68.1929	T	0.4426	0.3757
21.40	2490787	82.2745	T	0.7523	0.4532
21.67	4203394	144.9585	T	1.2697	0.7995
22.41	2208742	149.6025	T	0.6671	0.8241
22.65	2349008	173.2900	T	0.7095	0.9546
22.82	2291547	173.4953	T	0.6921	0.9933
23.07	4717272	205.2015	T	1.4247	1.1304
23.54	4269729	242.0291	T	1.2896	1.3333
23.95	5785263	240.9642	T	1.7473	1.3274
24.30	4975035	229.0449	T	1.5026	1.2613
24.65	5286130	272.3710	T	1.5966	1.5004
24.96	5000622	242.4030	T	1.5103	1.3353
25.44	4876194	228.2276	T	1.4727	1.2577
25.73	4907199	242.5405	T	1.4821	1.3361
26.07	3398511	218.1729	T	1.1775	1.2019
26.47	4140513	210.6434	T	1.2506	1.1604
26.74	4796699	216.8312	T	1.4487	1.1945
27.12	2916751	189.2108	T	0.8809	1.0423
27.42	3887135	203.4772	T	1.1740	1.1209
27.73	3053496	193.9434	T	0.9222	1.0678
27.97	3828498	182.2307	T	1.1563	1.0094
28.38	2944311	175.1640	T	0.8893	0.9649
28.67	3072134	180.2326	T	0.9297	0.9917
29.34	5875155	172.3147	T	1.7745	0.9492
29.61	5407335	147.2223	T	1.6332	0.8149
30.25	1919423	102.6403	T	0.5993	0.5654
30.66	5191664	95.0172	T	1.5701	0.5234
31.31	1227745	51.4633	T	0.3710	0.2835
33.45	360250	13.9549		0.1088	0.0761

43 PEAKS > AREA REJECT 331099264 TOTAL AREA
43 PEAKS > HEIGHT REJECT 1.815280e+04 TOTAL HEIGHT

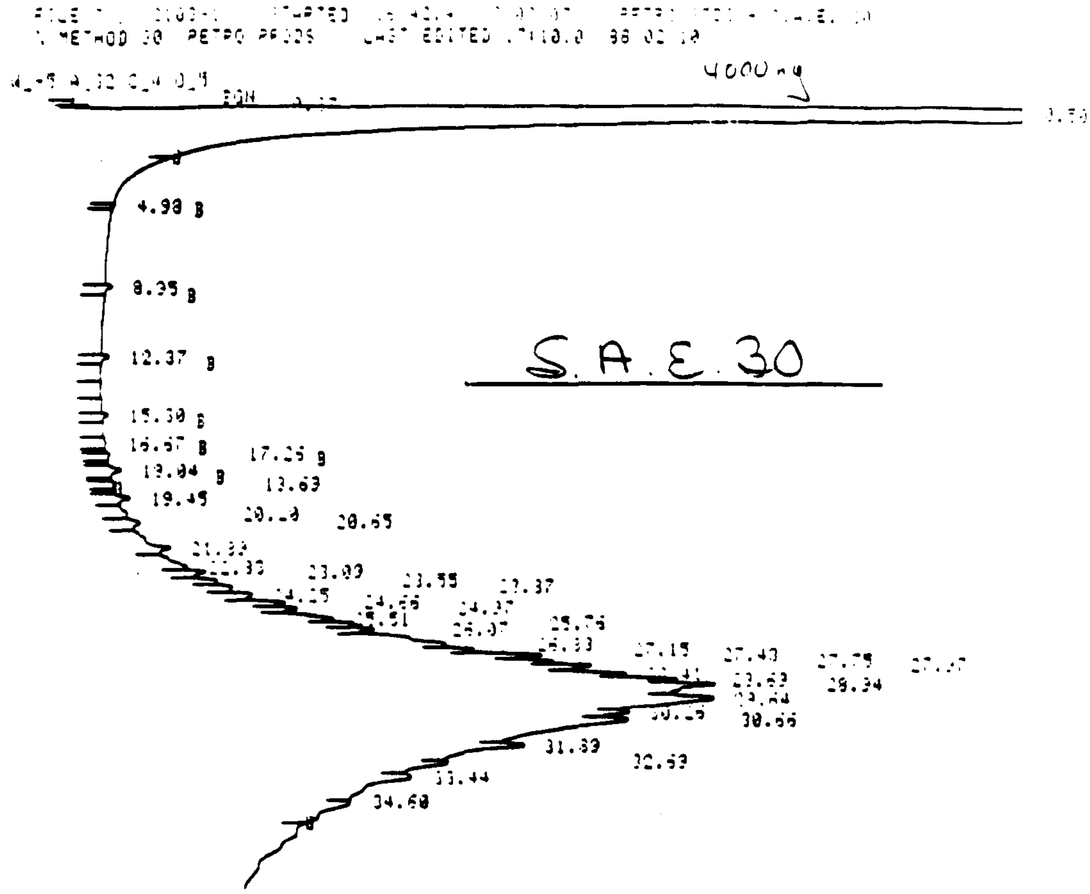
FILE 758 Q102-1 STARTED 15:57.0 ?3 03 07 PETRO STDS - S.A.E. 20
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 88 02 10



FILE 758 Q102-1 STARTED 15:57.0 33/03 07 PETRO STDS - S.A.E. 20
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 88/02/10

RT	AREA	HEIGHT	BC	AREA PERCENT	HEIGHT PERCENT
0.37	8713	4.0885	T	0.0031	0.0146
0.50	12845973	12885.5312	T	4.5632	45.8670
0.72	209636352	12544.5322		74.4681	44.6532
9.04	2156	0.2307		0.0008	0.0008
14.42	6194	0.4909		0.0022	0.0017
15.34	1354	0.2141	V	0.0005	0.0008
16.61	15245	1.3411		0.0054	0.0048
17.24	31003	2.4956		0.0110	0.0089
18.02	92416	7.2314		0.0328	0.0257
18.68	23224	1.8730	T	0.0083	0.0067
18.95	12019	0.8548	V	0.0043	0.0030
19.44	133142	8.8257	T	0.0473	0.0314
20.62	394525	14.5120	T	0.1401	0.0517
21.43	405302	14.4418	T	0.1440	0.0514
21.88	852958	31.2574	T	0.3030	0.1112
22.84	1415714	40.9621	T	0.5029	0.1458
23.09	948419	52.1476	T	0.3369	0.1856
23.54	1082704	66.4412	T	0.3846	0.2365
23.61	182105	72.8753	T	0.0647	0.2594
23.86	1625117	68.9980	T	0.5773	0.2456
24.21	602778	82.8335	T	0.2141	0.2951
24.26	244219	73.1487	T	0.0868	0.2604
24.30	760983	73.4620	T	0.2703	0.2615
24.66	1767193	92.1212	T	0.6273	0.3279
24.97	1707637	90.2151	T	0.6250	0.3211
25.47	2174200	94.2234	T	0.7723	0.3354
25.73	1996244	103.7466	T	0.7091	0.3693
26.08	1864526	102.5956	T	0.6623	0.3652
26.48	2130927	105.1208	T	0.7570	0.3742
26.76	2357413	113.3604	T	0.8374	0.4035
27.14	1855210	109.3167	T	0.6591	0.3891
27.42	2367937	123.7410	T	[illegible]	0.4405
27.73	1846633	123.6035	T	0.6560	0.4400
27.97	2450067	123.1239	T	0.8703	0.4383
28.40	2424692	127.5621	T	0.8613	0.4541
28.63	2235963	137.6513	T	0.8156	0.4900
28.95	4990472	139.2599	T	1.7727	0.4957
29.61	4865340	130.3463	T	1.7235	0.4640
30.27	2011577	100.3127	T	0.7154	0.3593
30.66	5612138	36.5763	T	1.9936	0.2433
31.30	2093455	61.4184	T	0.7416	0.2186
32.38	1350431	42.3321	T	0.4573	0.1507
33.42	1444635	27.1932		0.5132	0.0968

43 PEAKS > AREA REJECT 281511552 TOTAL AREA
43 PEAKS > HEIGHT REJECT 2.809325e+04 TOTAL HEIGHT

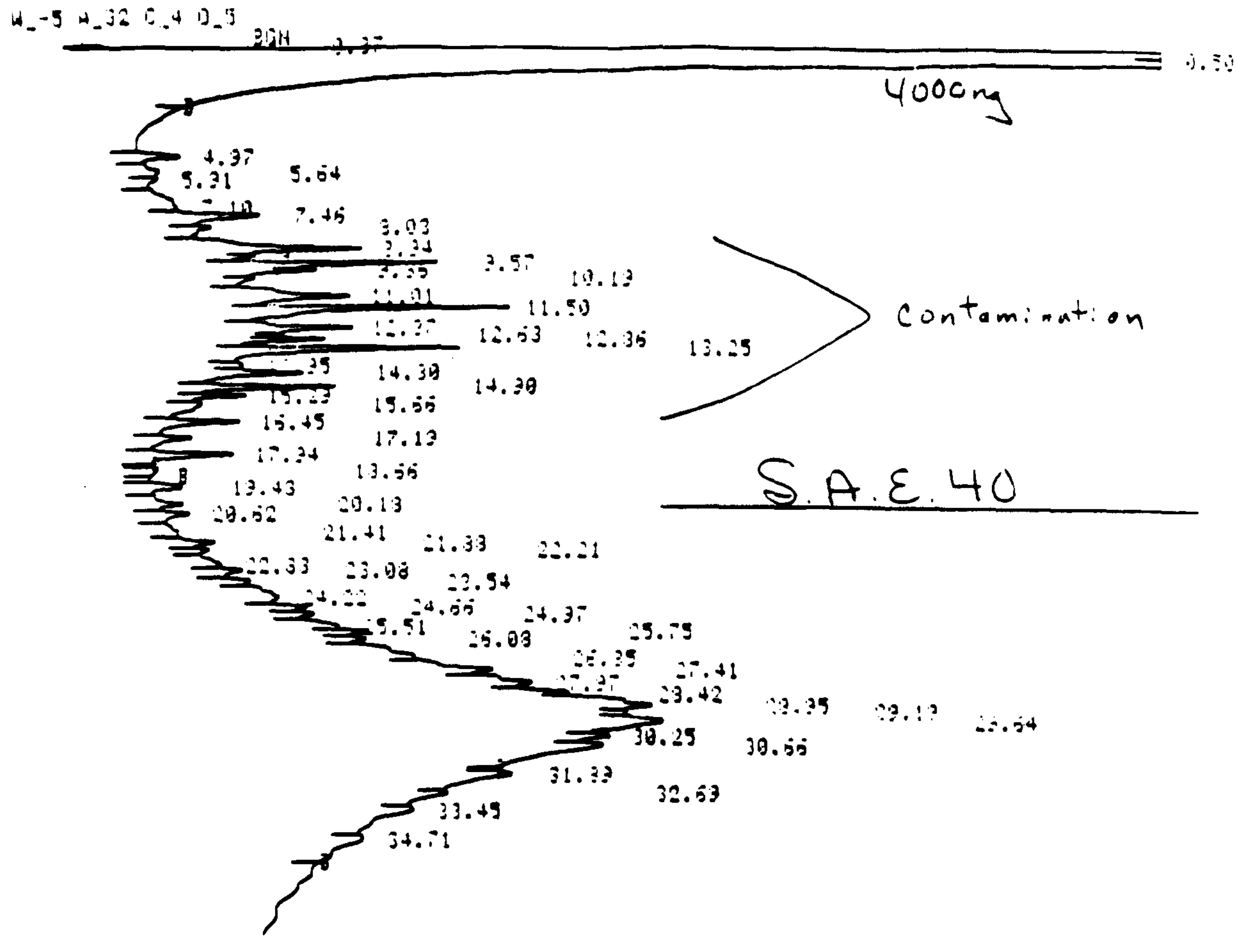


FILE 759 2102-1 STARTED 19:42.4 88 03/07 PETRO STDS - S.A.E. 30
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 88/02/10

RT	AREA	HEIGHT	BC	AREA PERCENT	HEIGHT PERCENT
0.37	6949	4.1031	T	0.0025	0.0273
0.59	224100332	12970.2393		81.1039	87.1513
4.96	4971	0.4409		0.0018	0.0030
8.95	24193	2.1353		0.0087	0.0143
12.37	27853	2.6313		0.0101	0.0182
15.30	13744	1.3222		0.0971	0.0123
16.67	11409	0.6762		0.0041	0.0046
17.25	15332	1.2368		0.0056	0.0037
18.04	57925	3.3932		0.0210	0.0270
18.69	3468	0.7278		0.0034	0.0049
19.45	49041	4.4793	V	0.0177	0.0303
20.20	3655	1.1945	V	0.0035	0.0075
20.65	43749	3.4694	T	0.0158	0.0235
21.89	176337	8.4692	T	0.0638	0.0573
22.83	337216	10.4330	T	0.1221	0.0706
23.09	283079	15.3258	T	0.1025	0.1038
23.55	291999	17.5426	T	0.1057	0.1188
23.87	359195	20.3834	T	0.1300	0.1421
24.25	651029	25.6947	T	0.2356	0.1739
24.66	631330	35.1025	T	0.2235	0.2377
24.97	726339	37.3051	T	0.2629	0.2567
25.51	1109849	47.2430	T	0.4017	0.3139
25.76	865254	53.0951	T	0.3132	0.3595
26.07	1116613	57.3993	T	0.4041	0.3927
26.83	2850391	78.2207	T	1.0317	0.5297
27.15	1589478	86.3099	T	0.5753	0.5844
27.43	2067960	107.0003	T	0.7485	0.7246
27.75	1379077	109.4312	T	0.4991	0.7410
27.97	2239474	120.7283	T	0.8105	0.8175
28.41	2667522	130.4138	T	0.9655	0.8831
28.69	2429929	146.1774	T	0.8795	0.9899
28.34	5200594	157.3139	T	1.8823	1.0653
29.66	[illegible]	[illegible]	T	[illegible]	1.0446
30.26	2597791	124.6301	T	0.9402	0.8439
30.66	7202251	122.9123	T	2.6067	0.8316
31.39	3642273	84.6969	T	1.3183	0.5735
32.69	1871918	57.3083	T	0.6775	0.3881
33.44	2425625	42.5957	T	0.8733	0.2884
34.60	781139	18.7395		0.2827	0.1269

39 PEAKS > AREA REJECT [illegible] TOTAL AREA
39 PEAKS > HEIGHT REJECT 1.476762e+04 TOTAL HEIGHT

FILE 760 0104-1 STARTED 17:27.3 88 03 07 PETRO STDS - S.A.E. 40
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 88/02/10

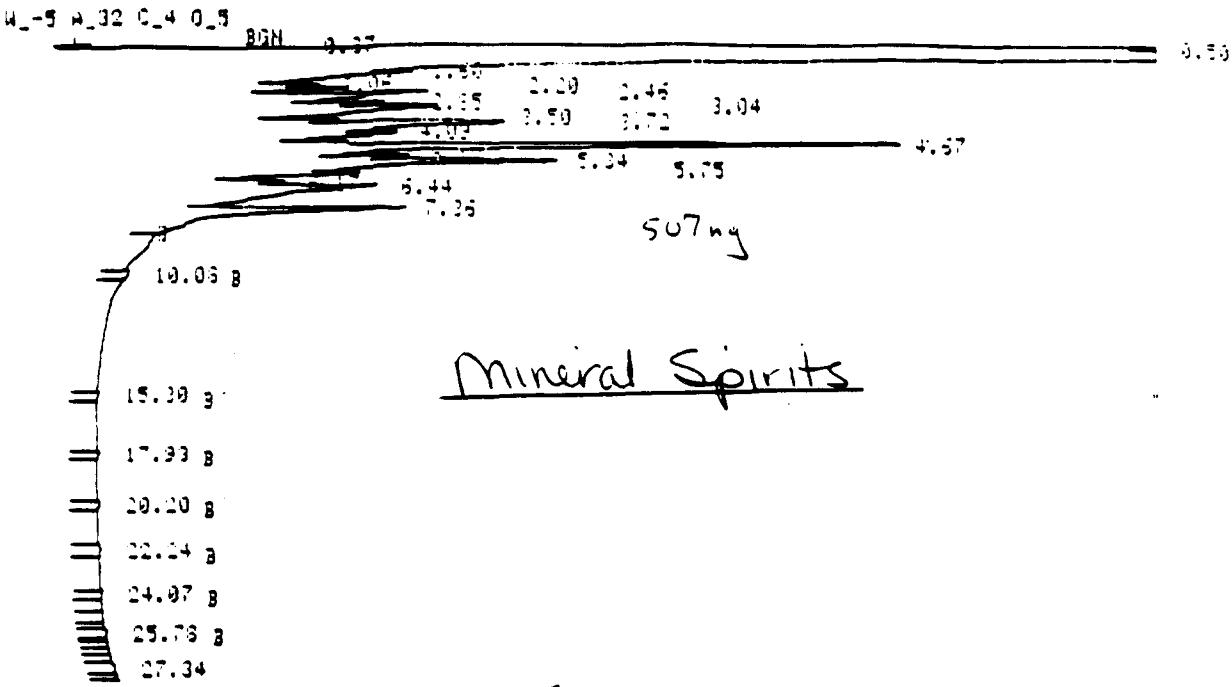


FILE 760 0104-1 STARTED 17:27.3 88 03 07 PETRO STDS - S.A.E. 40
% METHOD 30 PETRO PRODS LAST EDITED 17:10.0 88/02/10

RT	AREA	HEIGHT	BC	AREA PERCENT	HEIGHT PERCENT
0.37	6902	4.4279	T	0.0027	0.0215
0.50	187456176	12831.1650	T	73.0023	62.6815
[illegible]	[illegible]	[illegible]		[illegible]	[illegible]
18.65	29965	2.2176		0.0117	0.0109
19.43	133910	9.1281	U	0.0521	0.0444
20.18	82587	7.4523	U	0.0322	0.0363
20.62	87914	7.7825	U	0.0342	0.0379
21.41	7306	1.0950	U	0.0028	0.0053
21.88	80656	6.1438	T	0.0314	0.0297
22.21	38016	4.1764	T	0.0148	0.0203
22.83	51229	3.2780	T	0.0200	0.0160
23.08	80872	7.3142	U	0.0315	0.0356
23.54	62424	5.5382	T	0.0243	0.0269
24.22	257400	7.3738	T	0.1002	0.0359
24.66	153084	11.5718	T	0.0596	0.0563
24.97	167191	10.4321	T	0.0651	0.0508
25.51	239763	12.6211	T	0.0934	0.0614
25.75	283742	18.6950	T	0.1105	0.0910
26.08	240527	14.6578	T	0.0937	0.0713
26.65	719006	21.6011	T	0.2800	0.1051
27.41	1148901	38.5254	T	0.4474	0.1875
27.97	1246249	44.2663	T	0.4853	0.2154
28.42	939475	50.2247	T	0.3655	0.2444
28.95	2266720	68.8432	T	0.8827	0.3350
29.19	922953	59.8922	T	0.3594	0.2914
29.64	2498915	65.6301	T	0.9732	0.3196
30.25	928273	44.3930	T	0.3615	0.2160
30.66	1394025	39.0997		0.5429	0.1903
31.39	171117	9.2070	T	0.0666	0.0448
32.69	56059	3.5369	U	0.0218	0.0172
33.45	49763	4.5200	U	0.0194	0.0223
34.71	96698	3.8717		0.0377	0.0188

57 PEAKS > AREA REJECT 256779409 TOTAL AREA
57 PEAKS > HEIGHT REJECT 2.055017e+04 TOTAL HEIGHT

FILE 764 0102-1   STARTED 09:46.1 88/03/09   PETRO STDS - MIN SIRITS
% METHOD 30 PETRO PRODS   LAST EDITED 17:10.0 88/02/10



0.72

FILE 764 0102-1   STARTED 09:46.1 88/03/09   PETRO STDS - MIN SIRITS
% METHOD 30 PETRO PRODS   LAST EDITED 17:10.0 88/02/10

RT	AREA	HEIGHT	BC	AREA PERCENT	HEIGHT PERCENT
0.37	9639	4.4812	T	0.0041	0.0167
0.50	12571236	12937.3436	T	5.3351	47.9874
0.71	198341104	12557.7891	T	84.1737	46.8446
1.60	1715959	90.9583	T	0.7282	0.3393
2.06	591486	63.5959	T	0.2510	0.2372
2.20	786641	71.1084	T	0.3338	0.2653
2.46	1685353	92.8357	T	0.7152	0.3463
2.85	814215	79.2373	T	0.3455	0.2958
3.04✗	2101280	93.7327	T	0.8918	0.3497
3.50	580669	64.7363	T	0.2464	0.2415
3.72✗	2233321	110.8096	T	0.9478	0.4134
4.09	1331582	79.6566	T	0.5651	0.2971
4.67✗	4140110	219.6835	T	1.7570	0.8195
5.12	1007530	79.8124	T	0.4276	0.2977
5.34	2335681	120.8193	T	0.9912	0.4507
5.75	1110362	64.3555	T	0.4712	0.2401
6.17	480984	41.9453	T	0.2041	0.1565
6.44✗	2264122	56.1973	T	0.9609	0.2096
7.36	1457319	72.3959		0.6185	0.2701
10.09	16571	1.0509		0.0070	0.0039
15.30	5120	0.4392		0.0022	0.0016
17.93	9083	0.7735		0.0039	0.0029
20.20	10069	0.8718		0.0043	0.0033
22.24	10593	0.7460		0.0045	0.0028
24.07	5158	0.5549		0.0022	0.0021
25.79	7546	0.6267		0.0032	0.0023
27.34	10530	0.7726	V	0.0045	0.0029

27 PEAKS > AREA REJECT   235633136 TOTAL AREA
27 PEAKS > HEIGHT REJECT 2.680736e+04 TOTAL HEIGHT

ROUX ASSOCIATES

CHAIN OF CUSTODY RECORD

Project No. 09001

Project Title RECRA ENVIRONMENTAL, INC

Sample Source SOIL SAMPLE

Collectors Name JOHN SHEEHAN / John C Sheehan
print / signature

Field Information

Method Of Shipping FEDERAL EXPRESS

Relinquished By:
sign John C Sheehan
for Roux Associates inc
Date/Time 3-15-88 / ≈ 4:30

Received By:
sign J. Calvert
for Recra Environmental
Date/Time 3/16/88 / 900 Am

Sample Designation	Sample Location	Date	Time	Analyte	No. Of Containers
DP-1	DP-1 (8.0'-9.0')	3-15-88	2:45	METALS	1
DP-1	DP-1 (9.0'-10.0')	3-15-88	2:55	METALS	1
DP-1	DP-1 (10.0'-11.0')	3-15-88	3:00	METALS	1
DP-1	DP-1 (11.00'-11.5')	3-15-88	3:05	METALS	1
DP-1	DP1 (11.5'-12.0')	3-15-88	3:20	METALS	1

Comments:

TOTAL 5

ROUX ASSOCIATES

CHAIN OF CUSTODY RECORD

Project No. 09001

Project Title RECRA ENVIRONMENTAL, INC.

Sample Source Ground WATER

Collectors Name JOHN SHEEHAN / [signature]
print signature

Field Information

Method Of Shipping FEDERAL EXPRESS

Relinquished By:
sign [signature]
for Roux Associates Inc.
Date/Time 3-15-88 / ≈ 4:20 P

Received By:
sign J. Calvert
for Recra Environmental
Date/Time 3/16/88 / 9:00 Am

Sample Designation	Sample Location	Date	Time	Analyte	No. Of Containers
MW-1	MW-1	3-15-88	11.00	METALS	1
MW-2	MW-2	3-15-88	11:15	METALS	2
MW-10	MW-10	3-15-88	10.45	METALS	1
MW-11	MW-11	3-15-88	10.55	METALS	1

Comments: Total 5

ROUX ASSOCIATES

CHAIN OF CUSTODY RECORD

Project No. 09002

Project Title Recra Environmental inc

Sample Source Ground Water

Collectors Name John Sheehan / John Sheehan
print / signature

Field Information

Method Of Shipping FEDERAL EXPRESS

Relinquished By:
sign John C. Sheehan
for Roux Associates
Date/Time 3-15-88 / 4:00

Received By:
sign J. Calvert
for Recra Environmental
Date/Time 3/16/88 / 9:00 Am

Sample Designation	Sample Location	Date	Time	Analyte	No. Of Containers
MW-3	MW-3	3-15-88	11:30	hydrocarbons	2

Comments: total 2

1/7875.1

ANALYTICAL RESULTS

Prepared For

Deknatel

Prepared By

Recra Environmental, Inc.
10 Hazelwood Drive, Suite 106
Amherst, New York 14150

METHODOLOGIES

The specific methodologies employed in obtaining the enclosed analytical results are indicated on the specific data table. The method numbers presented refer to the following U.S. Environmental Protection Agency reference.

- 40 CFR Part 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act" October 26, 1984 (Federal Register) U.S. Environmental Protection Agency.

COMMENTS

Comments pertain to data on one or all pages of this report.

The values reported as "less than" (<) indicate the working detection limit for the particular sample and/or parameter.

AQUEOUS MATRIX
METALS

PARAMETER (Units of Measure = mg/l)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE) MW-1 (2/11/88)	MW-2 (2/11/88)
Total Chromium	218.1	3/1/88	0.006	0.091
Hexavalent Chromium	218.5	2/12/88	<0.005	0.029
Total Copper	220.1	3/1/88	<0.005	0.041

AQUEOUS MATRIX
METALS

PARAMETER (Units of Measure = mg/l)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE) MW-10 (2/11/88)	MW-11 (2/11/88)
Total Chromium	218.1	3/1/88	0.006	0.005
Hexavalent Chromium	218.5	2/12/88	0.007	0.005
Total Copper	220.1	3/1/88	<0.005	<0.005

AQUEOUS MATRIX
WATER QUALITY TESTING

PARAMETER	METHOD NUMBER	UNITS OF MEASURE	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE) MW-1 (2/11/88)	MW-2 (2/11/88)
Nitrate	352.1	mg NO_3-N/L	2/11/88	1.8	7.1
pH	150.1	Standard Units	2/12/88	6.23	6.79
Total Phosphorous	365.2	mg P/l	2/17/88	<0.02	4.4
Sulfate	375.4	mg/l	3/1/88	53	56

AQUEOUS MATRIX
WATER QUALITY TESTING

PARAMETER	METHOD NUMBER	UNITS OF MEASURE	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE) MW-10 (2/11/88)	MW-11 (2/11/88)
Nitrate	352.1	mg NO_3-N/L	2/11/88	<0.05	<0.05
pH	150.1	Standard Units	2/12/88	5.54	5.48
Total Phosphorous	365.2	mg P/l	2/17/88	<0.02	<0.02
Sulfate	375.4	mg/l	3/1/88	<1	<1

I.D. #88-208

QUALITY CONTROL INFORMATION - PRECISION
AQUEOUS MATRIX
METALS

PARAMETER (Units of Measure = mg/l)	METHOD NUMBER	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Total Chromium	218.1	MW-2	0.090	0.092	0.091	0.0014
Hexavalent Chromium	218.5		0.030	0.027	0.029	0.0021
Total Copper	220.1		0.039	0.042	0.041	0.0021

QUALITY CONTROL INFORMATION - ACCURACY
AQUEOUS MATRIX
METALS

PARAMETER	METHOD NUMBER	SAMPLE IDENTIFICATION	MICROGRAMS OF SPIKE	PERCENT RECOVERY
Total Chromium	218.1	MW-2	500	105
Hexavalent Chromium	218.5		500	96
Total Copper	220.1		500	89

RECRA ENVIRONMENTAL, INC.

1/7875.5

QUALITY CONTROL INFORMATION - PRECISION
AQUEOUS MATRIX
WATER QUALITY TESTING

PARAMETER	METHOD NUMBER	UNITS OF MEASURE	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Nitrate	352.1	mg NO_3-N/L	MW-2	7.3	6.9	7.1	0.28
pH	150.1	Standard Units		6.66	6.92	6.79	0.18
Total Phosphorous	365.2	mg P/l		4.3	4.5	4.4	0.14
Sulfate	375.4	mg/l		56	55	56	0.71

QUALITY CONTROL INFORMATION - ACCURACY
AQUEOUS MATRIX
WATER QUALITY TESTING

PARAMETER	METHOD NUMBER	SAMPLE IDENTIFICATION	MICROGRAMS OF SPIKE	PERCENI RECOVERY
Nitrate	352.1	MW-1	5.0	87
Total Phosphorous	365.2	*	50	99
Sulfate	375.4	MW-2	1,000	85

*Quality control results were generated from a sample of similar matrix at the time of analysis.

I.D. #88-208

ROUX ASSOCIATES

CHAIN OF CUSTODY RECORD

Project No. 09001

Project Title RECRA ENVIRONMENTAL INC

Sample Source GROUND WATER

Collectors Name JOHN SHEEHAN / John Sheehan
print / signature

Field Information

Method Of Shipping FEDERAL EXPRESS

Relinquished By:

sign John Sheehan
for Roux Associates, Inc
Date/Time

Received By:

sign J. Calvert
for Recra Environmental
Date/Time 2/12/88 / 9:00am

Sample Designation	Sample Location	Date	Time	Analyte	No. Of Containers
MW-1	MW-1	2-11-88	1:50PM	METALS	2
MW-2	MW-2	2-11-88	1:20PM	"	2
MW-10	MW-10	2-11-88	12:40PM	"	1
MW-11	MW-11	2-11-88	12:35PM	"	1

Comments: DO NOT MEASURE PH.

ANALYTICAL RESULTS

Prepared For

Deknatel

Prepared By

Recra Environmental, Inc.
10 Hazelwood Drive, Suite 106
Amherst, New York 14150

METHODOLOGIES

The specific methodologies employed in obtaining the enclosed analytical results are indicated on the specific data table. The method numbers presented refer to one of the following U.S. Environmental Protection Agency references.

- 40 CFR Part 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act" October 26, 1984 (Federal Register) U.S. Environmental Protection Agency.
- U.S. Environmental Protection Agency "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods". Office of Solid Waste and Emergency Response. July 1982, SW-846, Second Edition.

COMMENTS

Comments pertain to data on one or all pages of this report.

The values reported as "less than" (<) indicate the working detection limit for the particular sample and/or parameter.

AQUEOUS MATRIX
METALS

PARAMETER (Units of Measure = mg/l)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE)		
			MW-1 (3/21/88)	MW-2 (3/21/88)	MW-2DUP (3/21/88)
Total Chromium	7190	4/14/88	0.027	0.15	0.16
Hexavalent Chromium	7195	3/22/88	<0.005	0.023	0.022
Total Copper	7210	4/13/88	0.083	0.070	0.079

AQUEOUS MATRIX
METALS

PARAMETER (Units of Measure = mg/l)	METHOD NUMBER	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE)		
			MW-3 (3/21/88)	MW-10 (3/21/88)	MW-11 (3/21/88)
Total Chromium	7190	4/14/88	0.012	0.008	0.005
Hexavalent Chromium	7195	3/22/88	<0.005	<0.005	<0.005
Total Copper	7210	4/13/88	0.061	<0.005	0.015

AQUEOUS MATRIX
WATER QUALITY TESTING

PARAMETER	METHOD NUMBER	UNITS OF MEASURE	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE)	
				MW-1 (3/21/88)	MW-2 (3/21/88)
Nitrate	352.1	mg NO_3-N/L	3/23/88	8.1	6.2
Total Phosphorous	365.2	mg P/l	4/16/88	3.6	6.2
Sulfate	375.4	mg/l	4/6/88	55	36

AQUEOUS MATRIX
WATER QUALITY TESTING

PARAMETER	METHOD NUMBER	UNITS OF MEASURE	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE)	
				MW-2DUP (3/21/88)	MW-3 (3/21/88)
Nitrate	352.1	mg NO_3-N/L	3/23/88	3.2	19
Total Phosphorous	365.2	mg P/l	4/16/88	7.4	1.6
Sulfate	375.4	mg/l	4/6/88	35	37

AQUEOUS MATRIX
WATER QUALITY TESTING

PARAMETER	METHOD NUMBER	UNITS OF MEASURE	ANALYSIS DATE	SAMPLE IDENTIFICATION (DATE)	
				MW-10 (3/21/88)	MW-11 (3/21/88)
Nitrate	352.1	mg NO_3-N/L	3/23/88	0.10	<0.05
Total Phosphorous	365.2	mg P/l	4/16/88	<0.02	<0.02
Sulfate	375.4	mg/l	4/6/88	35	<1

QUALITY CONTROL INFORMATION - PRECISION
AQUEOUS MATRIX
METALS

PARAMETER (Units of Measure = mg/l)	METHOD NUMBER	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Total Chromium	7190	MW-10	0.008	0.007	0.008	0.00071
Hexavalent Chromium	7195		<0.005	<0.005	<0.005	-
Total Copper	7210		<0.005	<0.005	<0.005	-

QUALITY CONTROL INFORMATION - ACCURACY
AQUEOUS MATRIX
METALS

PARAMETER	METHOD NUMBER	SAMPLE IDENTIFICATION	MICROGRAMS OF SPIKE	PERCENT RECOVERY
Total Chromium	7190	MW-10	500	82
Hexavalent Chromium	7195		500	85
Total Copper	7210		500	100

QUALITY CONTROL INFORMATION - PRECISION
AQUEOUS MATRIX
WATER QUALITY TESTING

PARAMETER	METHOD NUMBER	UNITS OF MEASURE	SAMPLE IDENTIFICATION	VALUE 1	VALUE 2	MEAN	STANDARD DEVIATION
Total Phosphorous	365.2	mg P/l	*	0.11	0.11	0.11	0
Sulfate	375.4	mg/l	MW-3	37	37	37	0

QUALITY CONTROL INFORMATION - ACCURACY
AQUEOUS MATRIX
WATER QUALITY TESTING

PARAMETER	METHOD NUMBER	SAMPLE IDENTIFICATION	MICROGRAMS OF SPIKE	PERCENT RECOVERY
Nitrate	352.1	*	40	126
Total Phosphorous	365.2	*	20	97
Sulfate	375.4	MW-3	20	102

*Quality control results were generated from a sample of similar matrix at the time of analysis.

ROUX ASSOCIATES

CHAIN OF CUSTODY RECORD

Project No. 09001

Project Title RECRA ENVIRONMENTAL INC

Sample Source GROUND WATER

Collectors Name JOHN SHEEHAN / John C. Sheehan
print — signature

Field Information

Method Of Shipping FEDERAL EXPRESS

Relinquished By:
sign John C. Sheehan
for Roux Associates
Date/Time 3-21-88 / 4:30

Received By:
sign J. Calvert
for Recra Environmental
Date/Time 3/22/88 9:30 Am

Sample Designation	Sample Location	Date	Time	Analyte	No. Of Containers
MW-2	MW-2	3-21-88	2:30p	METALS	2
MW-3	MW-3	3-21-88	3:40p	hydrocarbons	2
MW-11	MW-11	3-21-88	1:15p	METALS	1

Comments:

ROUX ASSOCIATES

CHAIN OF CUSTODY RECORD

Project No. 09002

Project Title RECRA ENVIRONMENTAL INC.

Sample Source GROUND WATER

Collectors Name John Sheehan (print) / John C. Sheehan (signature)

Field Information

Method Of Shipping FEDERAL EXPRESS

Relinquished By:

sign John C. Sheehan
for Roux assoc.
Date/Time 3-21-88 / 14:30

Received By:

sign J. Calvert
for Recra Environmental
Date/Time 3/24/88 / 9:30 Am

Sample Designation	Sample Location	Date	Time	Analyte	No. Of Containers
MW-1	MW-1	3-21-88	1:00p	METALS	2
MW-10	MW-10	"	1:15p	"	1

Comments:

APPENDIX E

AQUIFER USE INFORMATION

APPENDIX E

INTRODUCTION

This appendix contains information on public supply and non public supply wells producing at least 45 gpm in the general vicinity of the Deknatel site. The information was compiled from the following sources:

- o NYSDEC well completion reports
- o Jamaica Water Supply Company:
    - well construction drawings
    - static water level records
    - pumpage records
    - water quality analysis records.

The data base is divided into two sections, the first contains information on the public supply wells and the second on the non public supply wells. The public supply wells listed are all owned and operated by the Jamaica Water Supply Company.

The data base is generally self explanatory, however, the following notes may help clarify some points for the reader.

The asmith and distance values are the geographic coordinates of the wells using the Deknatel site and specifically Deknatel's pumping well, Q1372, as the origin. Both the asmith and distance values were measured on reference maps. The values for the public supply wells were measured on a mylar copy of the Jamaica Water Supply Company (JWSC) Distribution System Map dated 1972 which was supplied by the JWSC. The non public supply well locations were measured on a copy of the well location reference map maintained by the NYSDEC in the Stony Brook, New York office. It was necessary to photo copy this map in sections and then piece the sections together. The accuracy of the measured locations for the non public wells is therefore limited by this fact. The north arrow indicated on the JWSC distribution system map deviated by about 10 degrees east from the longitude lines on the base map used by the NYSDEC, which was Section 18 of the New York City mapped streets map. The lines of longitude seemed to be the more reliable datum therefore a true north-south line based on the lines of longitude was transcribed onto the JWSC map and used for asmith measurements of the public supply wells.

The JWSC well construction drawings indicate the elevation of the well base plates with respect to mean sea level (MSL) allowing the screen elevation of these wells to be given with respect to MSL. The non public supply well completion reports seldom gave any indication of the ground elevation therefore the screen elevation of these wells could only be given with respect to the local ground surface.

Several of the JWSC wells (5, 7, 13, 35A and 36) were redrilled and deepened during the time interval covered by this data base, most often between 1984 and 1985. When this was done, neither the NYSDEC or JWSC well numbers changed in the official records, however the screen elevation did change, usually by at least 100 feet. Therefore, after redrilling, these wells were screened in a different strata than before which would result in discontinuities in the static water level and analytical data from before to after the redrill. In order to avoid such discontinuities in the data base, these wells, after redrilling, were entered as separate wells using the original well number with a suffix of R or RD to indicate that the well had been redrilled and the screen elevation was changed to reflect its new elevation.

Data entries were left blank when the corresponding information from JWSC records or the NYSDEC well completion reports was missing or unavailable.

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
Q0305	05	258.5	7,640	3	TO	-31	MSL	300	PUBLIC SUPPLY	1975						-11.50
										1976	54.0	8.25	<0.03	<0.02	13.7	-9.80
										1977						-13.10
										1978						-9.80
										1979						-9.30
										1980						-11.80
										1981						-12.50
										1982						-12.50
										1983					22.3	-9.00
										1984						-12.80
Q1957	05A	258.5	7,640	-171	TO	-226	MSL	1,700	PUBLIC SUPPLY	1975	36.0	4.91			99.8	-13.20
										1976	36.0	5.07	<0.002	<0.02	99.9	-14.20
										1977					99.7	-15.10
										1978	38.0	5.40	<0.02	<0.02	99.9	-14.30
										1979	37.0	5.40	<0.02	0.05	87.8	-14.50
										1980	37.0	5.23	<0.02	0.03	100	-12.10
										1981	37.0	5.70	<0.02	0.03	99.9	-14.60
										1982	38.0	5.30	<0.02	0.04	99.9	-6.40
										1983	37.0	5.40	<0.0[illegible]	<0.02	99.9	-7.80
										1984	41.0	5.50	<0.02	0.04	99.9	-17.40
										1985	32.0	5.80	<0.02	0.06	48.3	-23.10
										1986	28.0	4.80	<0.02	0.02	35.1	-30.60
										1987	43.6	5.90	<0.02	0.11	1.2	-28.10
Q0305R	05RD	258.5	7,640	-165	TO	-215	MSL	1,205	PUBLIC SUPPLY	1985	43.0	6.70	<0.02	<0.02	25.7	-16.50
										1986	47.0	6.00	<0.02	0.06	45.1	-16.50
										1987	47.0	7.57	<0.02	<0.03	1.0	0.10
Q0307	07	266.0	5,380	-16	TO	-26	MSL	1,200	PUBLIC SUPPLY	1975	60.0	8.16			27.2	-6.00
										1976	59.0	8.07	<0.003	0.04	46.1	-5.70
										1977					53.0	-9.60
										1978	54.0			0.02	48.7	-7.90
										1979						-2.00
										1980	51.0	9.50	<0.02	0.08	34.7	-4.30
										1981	49.0	9.40	<0.02	0.11	29.1	-2.60
										1982	50.0	8.00	<0.02	0.09	29.4	-2.60
										1983	49.0	10.80	<0.02	0.17	25.3	-2.80
										1984					0	-1.00

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
Q0563	07A	266.0	5	-42	TO	-62	MSL	500	PUBLIC SUPPLY	1975	52.0	4.80			26.3	-15.80
										1976	54.0	5.30	<0.003	0.07	35.6	-14.40
										1977					50.1	-13.40
										1978	58.0	6.20	<0.02	0.02	81.2	-7.50
										1979	49.0	5.80	<0.02	0.06	36.7	-3.40
										1980	52.0	6.20	<0.02	0.06	34.6	-3.40
										1981	52.0	8.00	<0.02	0.03	27.2	-4.90
										1982	48.0	4.90	<0.02	0.16	32.8	-.70
										1983					0	17.00
Q0564	07B	266.0	5,380	-172	TO	-222	MSL	1,200	PUBLIC SUPPLY	1975	25.0	5.72			99.6	-6.30
										1976	25.0	6.40	<0.002	<0.02	99.0	-4.90
										1977	28.0				99.3	-6.60
										1978	28.0	6.40	<0.02	0.02	95.8	-5.40
										1979	29.0	6.70	<0.02	0.03	85.9	-6.90
										1980	31.0	6.65	<0.02	0.02	69.3	-5.10
										1981	32.0	7.00	<0.02	0.02	97.9	-6.30
										1982	34.0	6.40	<0.02	<0.02	77.7	-11.60
										1983	33.0	6.60	<0.02	0.02	89.4	-3.70
										1984						
										1985	30.0	7.00	<0.02	0.04	60.3	-12.70
										1986	31.0	7.10	<0.02	0.04	90.6	-23.20
										1987	30.5	6.90	<0.02	0.04	38.2	
Q0307R	07RD	266.0	5,380	-183	TO	-234	MSL		PUBLIC SUPPLY	1985	280.0	6.30	<0.02	<0.02		-8.60
										1986	35.0	6.50	<0.02	0.02	83.2	-9.60
										1987	32.0	6.35	0.02	<0.02		
N0014	09	58.5	13,990	21	TO	-4	MSL	1,180	PUBLIC SUPPLY	1975	12.0	0.85			0.7	36.90
										1976	52.0	6.08			4.4	38.50
										1977					5.0	34.90
										1978	33.0	4.40	<0.02	0.03	7.3	30.20
										1979	51.0	7.10	<0.02	0.03	7.4	33.70
										1980	51.0	6.60	<0.02	0.02	10.9	37.20
										1981	6.0	0.80	<0.02	0.02	1.8	36.00
										1982	44.0	5.50	<0.02	0.04	5.5	35.60
										1983	43.0	7.20	<0.02	0.03	14.6	34.90
										1984	48.0	6.20	<0.02	0.05	0.6	36.50
										1985	45.0	5.10	<1.00	0.03	4.5	36.40

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1986	48.0	5.00	0.02	0.02	6.1	36.40
										1987	41.0	6.10	<0.02	0.05	13.5	
Q0310	10	187.0	8,730	-13	TO	-59	MSL	1,200	PUBLIC SUPPLY	1975	42.0	5.43			4.7	-2.50
										1976	32.0				9.1	-1.30
										1977					9.6	-6.10
										1978	35.0	6.20	<0.02	0.12	11.9	-3.30
										1979	39.0	9.90	<0.01	<0.02	7.4	-4.50
										1980			<0.02	0.03	10.8	-2.30
										1981	64.0	6.40	<0.02	0.02	36.0	-4.70
										1982	47.0	7.00	<0.02	<0.02	52.4	-4.00
										1983	39.0	6.70	<0.02	<0.02	82.4	-8.00
										1984	34.0	0.40	<0.02	0.02	22.1	-7.60
										1985						-7.80
										1986	36.0	3.40	<0.02	0.03	17.6	-11.30
										1987	30.5	2.90	<0.02	0.13	0	
Q1958	10A	187.0	8,730	-336	TO	-388	MSL	1,800	PUBLIC SUPPLY	1975	12.0	0.64			44.6	-4.90
										1976	8.0	0.60	0.00	<0.02	57.6	-3.30
										1977					28.6	-4.00
										1978	12.0	0.50	<0.02	<0.02	29.4	-1.10
										1979	15.0	0.09	<0.02	0.05	71.1	-5.60
										1980	17.6	0.40	<0.02	<0.02	58.7	-4.40
										1981	22.0	0.40	<0.02	0.02	99.7	-13.60
										1982	26.0	0.40	<0.02	0.02	99.6	-2.10
										1983	29.0	0.40	<0.02	<0.02	99.3	-10.90
										1984	31.0	0.40	<0.02	0.02	92.4	-6.00
										1985	34.0	0.30	<0.02	0.02	86.9	-1.00
										1986	33.0	0.50	<0.02	0.10	86.4	-2.80
										1987	18.0	0.40	<0.02	<0.02	48.0	
Q0313	13	296.0	5,280	23	TO	-12	MSL	1,200	PUBLIC SUPPLY	1975	69.0	6.64			18.7	-2.00
										1976	70.0	7.15	<0.003	<0.02	18.6	-1.80
										1977					24.4	-2.60
										1978					0	-4.10
										1979					0	-4.20
										1980	57.0	6.75	<0.02	0.04	25.4	-1.30
										1981					0	-4.10
										1982					0	-8.70

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1983	64.0	7.70	<0.02	0.01	37.1	-1.70
										1984	63.0	5.80	<0.02	0.11	22.6	-1.30
Q1600	13A	296.0	5,280	-175	TO	-195	MSL	1,200	PUBLIC SUPPLY	1975	29.0	3.74			85.4	-4.20
										1976	28.0	3.74	<0.003	<0.02	99.9	-3.70
										1977					100.0	-2.90
										1978	31.0	4.30	<0.02	<0.02	99.9	-1.20
										1979	32.0	4.60	<0.02	<0.02	99.7	-1.70
										1980	34.0	4.43	<0.02	0.02	100.0	-1.70
										1981	36.0	4.30	<0.02	0.03	99.9	-5.60
										1982	35.0	4.50	<0.02	0.02	99.9	-1.70
										1983	36.0	4.56	<0.02	0.03	80.6	1.30
										1984	38.0	4.30	<0.02	0.02	99.9	3.00
										1985	38.0	4.70	<0.02	0.04	77.4	13.70
										1986	38.0	4.90	<0.02	<0.02	37.0	-11.20
										1987	36.0	4.00	<0.02	<0.02	10.6	
Q0313R	13RD	296.0	5,280	-172	TO	-197	MSL	1,261	PUBLIC SUPPLY	1985	39.0	3.30	<0.02	<0.02	0	
										1986	38.0	4.40	<0.02	0.02	57.3	
										1987	34.0	4.60	<0.02	<0.02	3.4	
N9151	15A	127.0	7,620	-334	TO	-374	MSL	1,000	PUBLIC SUPPLY	1975	46.0	7.23			99.8	8.90
										1976	39.0	7.80			37.9	
										1977					42.7	
										1978	20.0	6.80			100.0	
										1979	26.0	6.40	<0.02	0.08	99.9	
										1980					100.0	
										1981	32.0	6.10	<0.02	0.04	72.1	3.10
										1982	32.0	6.00	<0.02	0.03	99.3	-6.90
										1983	33.0	5.80	<0.02	0.03	98.9	7.70
										1984	36.0	5.80	<0.02	0.05	90.0	1.80
										1985	36.0	6.00	<0.02	0.05	55.2	7.70
										1986	26.0	9.20	<0.02	<0.02	8.5	10.90
										1987					7.2	
N0012	15B	132.0	7,860	-320	TO	-369	MSL	1,400	PUBLIC SUPPLY	1975	12.0	2.11			48.4	7.90
										1976					48.1	10.80
										1977					40.7	7.00
										1978	8.0	4.00	<0.02	<0.02	50.5	-12.90
										1979	18.0	3.80	<0.02	<0.02	51.6	11.60

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1980					30.6	-16.20
										1981	26.0	5.10	<0.02	<0.02	43.6	-6.40
										1982	24.0	2.70	<0.05	0.02	37.0	
										1983	24.0	3.00	<0.02	0.03	56.1	-5.20
										1984	25.0	2.10	<0.02	0.02	27.7	-5.30
N10206	15CRD	134.0	8,070	-338	TO	-404	MSL	1,387	PUBLIC SUPPLY	1975	54.0	1.55			100.0	-.60
										1976					75.8	
										1977					60.8	9.90
										1978						12.70
										1979	59.0	1.50	<0.02		38.1	12.70
										1980					62.7	8.60
										1981	60.0	1.30	<0.02	0.02	64.7	11.20
										1982	63.0	1.60	<0.02	0.02	45.2	
										1983	63.0	2.00	<0.02	0.02	45.1	11.60
										1984		0.20	<0.02	<0.02	13.0	
										1985	16.0	0.20	<0.02	<0.02	10.5	-24.80
										1986	12.0	0.60	<0.02	0.02	18.7	-24.70
										1987					30.0	
N0693	15D	127.0	6,850	-21	TO	-45	MSL	1,736	PUBLIC SUPPLY	1975	61.0	10.05			6.3	8.70
										1976	67.0	9.15			18.4	15.20
										1977					12.5	13.60
										1978	53.0	9.20	<0.02	<0.02	12.9	0.70
										1979	40.0	4.70	<0.02	<0.02	9.0	0.50
										1980					15.3	-5.30
										1981	56.0	9.00	<0.02	0.02	10.2	-8.10
										1982	52.0	7.80	<0.02	0.03	22.9	-6.50
										1983	57.0	8.80	<0.02	<0.02	50.0	-8.80
										1984	51.0	8.00	<0.02	0.02	45.2	-7.70
										1985	58.0	8.80	<0.02	0.02	31.5	-5.30
										1986	38.0	4.60	0.04	0.02	8.3	1.00
										1987					18.4	
N10207	15E	134.0	8,070	-342	TO	-414	MSL	1,200	PUBLIC SUPPLY	1984	8.0	0.10	<0.02	<0.02		
										1985	10.0	0.10	<0.02	<0.02	0	0.00
										1986	10.0	2.40	<0.02	0.02	73.5	
										1987	10.0	<0.10	<0.02	0.02	58.8	-4.60
N0015	16	50.0	12,470	33	TO	13	MSL	1,200	PUBLIC SUPPLY	1975	13.0	0.50			0.7	36.50

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1976	63.0	7.02			5.0	37.70
										1977					5.2	34.60
										1978	46.0	5.50	<0.02	0.11	5.5	35.30
										1979	51.0	6.80	<0.02	0.18	0	35.30
										1980						41.20
										1981						35.90
										1982						37.70
										1983						33.00
										1984						36.00
										1985						36.80
										1986						34.60
N1958	16A	50.0	12,470	-555	TO	-616	MSL	1,200	PUBLIC SUPPLY	1975	14.0	0.09			83.5	
										1976	13.0	0.12	<0.003	0.08	79.5	
										1977					83.2	
										1978	5.0	<0.1	<0.02	<0.02	67.8	
										1979	6.0	<0.1	<0.02	<0.02	96.9	
										1980	6.0	<0.1	<0.02	0.02	62.0	
										1981	7.0	<0.1	<0.02	0.04	57.5	
										1982	5.0	<0.1	<0.02	0.02	99.4	
										1983	6.0	<0.1	<0.02	0.02	89.4	
										1984	8.0	0.10	<0.02	0.06	90.9	
										1985	7.0	0.20	<0.02	0.04	84.8	
										1986	10.0	0.10	<0.02	0.03	60.5	
										1987					7.3	
Q0321	21	319.0	6,060	-148	TO	-196	MSL	1,200	PUBLIC SUPPLY	1975	74.0	3.30			25.3	3.80
										1976	75.0	3.61			28.1	5.50
										1977					24.3	5.20
										1978	58.0	3.90	<0.02	0.03	28.3	3.00
										1979	58.0	6.80	<0.02	0.02	16.4	1.80
										1980					23.6	4.70
										1981	62.0	3.90	<0.02	0.03	28.3	5.30
										1982	61.0	3.80	<0.02	<0.02	29.0	1.60
										1983						
										1984	40.0	4.00	<0.02	<0.02	29.7	
										1985	37.0	13.00	<0.02	<0.02	98.5	7.60
										1986	34.0	4.30	<0.02	<0.02	93.1	4.70

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED TOP		INTERVAL --- BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1987					98.0	0.90
Q2435	21A	321.0	5,970	-149	TO	-189	MSL	1,200	PUBLIC SUPPLY	1975	40.0	4.22			98.9	5.40
										1976	41.0	4.01			87.2	5.30
										1977					95.2	5.40
										1978	41.0	4.50	<0.02	<0.02	85.9	5.20
										1979	40.0	4.60	<0.02	0.03	95.8	5.80
										1980					96.6	5.80
										1981	40.0	4.50	<0.02	0.02	98.0	5.30
										1982	40.0	4.10	<0.02	0.02	41.1	3.50
										1983	38.0	4.40	<0.02	0.02	70.5	4.10
										1984	40.0	4.00	<0.02	<0.02	79.3	1.40
										1985	42.0	4.10	<0.02	0.04	80.1	4.40
										1986	42.0	3.80	<0.02	0.02	26.7	3.50
										1987	0.0	0.00	0.00	0.00	26.9	0.00
Q0323	23	183.5	6,970	-17	TO	-39	MSL	1,200	PUBLIC SUPPLY	1975	38.0	6.08			4.3	1.00
										1976					13.6	-1.80
										1977					6.4	-2.10
										1978	39.0	5.90	<0.02	0.15	9.0	1.10
										1979	28.0	4.00	<0.02	0.36	1.1	
										1980			<0.02	0.20	3.5	2.40
										1981	36.0	6.80	<0.02	0.09	3.9	8.70
										1982	38.0	6.00	<0.02	0.15	24.6	-1.30
										1983	38.0	5.90	<0.02	<0.02	30.1	-4.20
										1984	36.0	5.60	<0.02	0.06	12.4	0.40
										1985	35.0	5.70	<0.02	0.07	5.1	4.70
										1986	31.0	5.30	<0.02	0.15	1.2	-1.60
										1987	32.0	4.40	<0.02	0.11	24.2	
Q0568	.23A	183.5	6,970	-243	TO	-304	MSL	1,500	PUBLIC SUPPLY	1975	27.0	3.12			47.4	-.90
										1976	27.0	3.82			54.4	-.40
										1977					67.3	-1.80
										1978	25.0	4.00	<0.02	<0.02	63.3	0.60
										1979	27.0	4.30	<0.02	<0.02	60.7	-2.20
										1980	27.0	4.85	<0.02	<0.02	48.5	-2.20
										1981	22.0	5.50	<0.02	<0.02	36.0	-3.40
										1982	31.0	5.60	<0.02	<0.02	84.7	-5.30
										1983	31.0	5.50	<0.02	<0.02	79.7	-6.80

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED TOP	INTERVAL	--- BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1984	32 0	5.70	<1 0	0.02	59 8	-2 20
										1985	33 0	6 50	0 02	<0 02	58 1	-1 90
										1986	33.0	7 30	<0 02	0 03	48 9	-2 60
										1987		6.50	<0.01	0.03	20.6	
Q0324	24	244 5	13,780	-25	TO	-35	MSL	2400 (3 WE LLS)	PUBLIC SUPPLY	1975	80 0	2 16			31 5	-.40
										1976	80.0	2.16			0	-1.70
										1977						-1.70
										1978						- 10
										1979						0 30
										1980						-.10
										1981					0.3	-4 40
										1982						-2 00
										1983						1 70
										1984						2 40
										1985						0 30
										1986						3.00
										1987						4 10
Q0569	24A	246 0	13,170	-11	TO	-26	MSL	2,400 (3 W ELLS)	PUBLIC SUPPLY	1975	91.0	4.70			31 5	0.10
										1976	94 0	4 95			71 0	-.50
										1977					57 6	-1 80
										1978	80 0	5.70	<0.02	0.03	33.8	0 50
										1979	90.0	5.20	<0.02	<0.02	39.9	1.50
										1980					22 5	1 10
										1981	72.0	6.40	<0 02	0.03	15 2	0.80
										1982	84 0	5.30	<0.02	0.02	64.0	2 10
										1983						1.50
										1984						1 90
										1985						1.50
										1986						1.50
Q0570	24B	243 0	13,950	-14	TO	-34	MSL	1,200	PUBLIC SUPPLY	1975	103 0	1.96			12 8	-4.70
										1976	86 0	2 28			26 2	-.40
										1977					19 9	-2 00

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1978	92.0	3.90	<0.02	0.06	16.0	-.80
										1979	101.0	3.40	<0.01	0.03	10.5	2.00
										1980			<0.02		22.6	2.10
										1981	81.0	4.80	0.02	0.02	21.2	4.20
										1982	88.0	4.00		<0.02	51.5	4.10
										1983					0	2.00
										1984					0	3.20
										1985					0	3.30
										1986					0	2.00
										1987						
Q1058	24C	240.0	13,220	-13	TO	-33	MSL	1,078	PUBLIC SUPPLY	1975					0	-.30
										1976	86.0	3.14			40.8	0.80
										1977					0	0.70
										1978	90.0	1.80	<0.02	0.17	30.4	1.60
										1979					0	2.40
										1980					37.9	1.70
										1981	116.0	2.20	<0.02	0.02	31.9	0.80
										1982	85.0	1.40	<0.02	0.02	63.7	2.90
										1983					0	3.60
										1984					0	3.60
										1985					0	0.10
										1986					0	3.60
										1987						
N2115	25	168.5	12,710	-31	TO	-51	MSL	1,200	PUBLIC SUPPLY	1975	37.0	2.18			5.0	9.40
										1976	44.0	3.15			30.5	6.70
										1977					23.0	5.00
										1978	53.0	5.50	<0.02	<0.02	20.0	6.50
										1979	54.0	5.40	<0.02	<0.02	25.6	7.30
										1980					26.3	9.60
										1981	44.0	3.00	<0.02	<0.02	8.1	5.40
										1982	46.0	5.60	<0.02	<0.02	12.9	7.90
										1983	42.0	5.20	<0.02	0.02	27.7	5.40
										1984	47.0	4.80	<0.02	<0.02	13.7	4.50
										1985	44.0	5.00	<0.02	<0.02	69.4	1.50
										1986	41.0	4.40	<0.02	<0.02	41.4	0.40
										1987						7.30

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
N7482	25A	168.5	12,710	-363	TO	-403	MSL	1,800	PUBLIC SUPPLY	1975	24.0	0.08			99.7	1.10
										1976	24.0	0.09			100.0	2.60
										1977					82.8	1.70
										1978	20.0	<0.1	<0.02	<0.02	65.9	0.50
										1979	23.0	<0.1	<0.02	0.03	85.9	2.40
										1980					99.5	-1.50
										1981	26.0	<0.1	<0.02	0.02	40.7	-6.10
										1982	27.0	0.20	<0.02	0.03	37.4	-13.60
										1983	27.0	<0.1	<0.02	0.02	76.6	-3.60
										1984	30.0	<0.1	<0.02	<0.02	98.7	-1.50
										1985	30.0	0.10	<0.02	<0.02	95.6	-6.90
										1986	29.0	0.10	<0.02	<0.02	66.6	
										1987					73.2	
Q1450	26	216.5	7,660	-37	TO	-57	MSL	1,000	PUBLIC SUPPLY	1975	67.0	4.03			9.9	-7.40
										1976	65.0	4.24			17.6	-7.40
										1977					16.4	-11.20
										1978	65.0	4.40	<0.02	<0.02	28.4	-8.60
										1979	64.0	4.80	<0.02	0.02	13.2	-8.30
										1980	68.0	4.80	<0.02	<0.02	23.9	-8.00
										1981	63.0	6.00	<0.02	<0.02	76.3	-10.60
										1982	64.0	7.10	<0.02	0.02	75.5	-12.40
										1983	60.0	6.90	<0.02	0.03	95.3	-8.90
										1984	58.0	7.50	<0.02	<0.02	99.9	-7.80
										1985	49.0	8.60	<0.02	0.04	85.9	-4.30
										1986	54.0	5.90			29.6	-4.80
										1987	44.3	5.86	<0.02	0.05	53.4	
Q1815	26A	216.5	7,660	-184	TO	-224	MSL	1,600	PUBLIC SUPPLY	1975	46.0	3.24			98.3	-10.80
										1976	47.0	2.71	<0.003	<0.02	99.9	-10.10
										1977	45.0				98.7	-11.60
										1978	40.0	2.40	<0.02	<0.02	83.9	-8.60
										1979	46.0	2.50	<0.02	0.11	99.9	-9.60
										1980	45.3	2.33	<0.02	0.04	99.8	
										1981	47.0	2.40	<0.02	<0.02	79.4	-25.20
										1982	49.0	2.70	<0.02	0.02	99.5	-12.40
										1983	44.0	3.10	<0.02	0.02	99.7	-8.70
										1984	48.0	3.10	<0.02	0.02	99.7	-10.40

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1985	42.0	3.60	<0.02	0.06	84.8	-5.10
										1986	46.0	3.40	<0.02	0.03	64.4	-6.20
										1987	35.0	5.03	<0.02	<0.02	37.5	
Q1747	27	280.0	8,440	-47	TO	-69	MSL	1,200	PUBLIC SUPPLY	1975	35.0	2.56			99.9	6.10
										1976	38.0	0.09			99.4	9.30
										1977					99.9	-3.40
										1978	38.0	1.70	<0.02	<0.02	99.9	-9.70
										1979	37.0	3.10	<0.02	0.32	98.2	-9.70
										1980					86.9	-8.60
										1981	42.0	3.50	<0.02	<0.02	89.8	-18.60
										1982	45.0	2.90	<0.02	<0.02	99.9	-7.70
										1983	43.0	3.40	<0.02	0.02	99.8	-9.40
										1984	47.0	3.70	<0.02	0.02	100.0	-8.30
										1985	47.0	4.00	<0.02	<0.02	99.8	-5.80
										1986	48.0	4.00	<0.02	0.03	69.3	-7.00
										1987					35.3	-4.30
N2414	28	142.5	13,530	-16	TO	-34	MSL	1,200	PUBLIC SUPPLY	1975	40.0	3.80			12.4	13.90
										1976	41.0	4.02			12.5	17.30
										1977					24.1	11.30
										1978	39.0	5.80	<0.02	<0.02	36.6	13.50
										1979	33.0	3.00	<0.02	<0.02	5.9	16.70
										1980					14.7	14.40
										1981	41.0	6.20	<0.02	0.02	8.8	12.90
										1982	36.0	4.80	<0.02	<0.02	18.4	14.20
										1983	33.0	4.10	<0.02	<0.02	20.0	10.10
										1984	40.0	4.30	<0.02	0.03	1.2	13.50
										1985	50.0	3.30	<0.02	0.06	0.6	15.60
										1986	39.0	4.60	<0.02	<0.02	5.9	12.70
										1987					0.4	12.00
N2413	28A	142.5	13,530	425	TO	-455	MSL	800	PUBLIC SUPPLY	1975	18.0	0.06			99.2	7.30
										1976	26.0	0.08			99.9	9.00
										1977					91.5	5.20
										1978	22.0	<0.1	<0.02	<0.02	55.0	- 80
										1979	22.0	<0.01	<0.02	0.06	64.9	
										1980					38.7	
										1981	22.0	<0.1	<0.02	<0.02	30.0	5.50

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1982	24.0	0.10	<0.02	0.03	25.0	8.60
										1983	24.0	0.40	<0.02	<0.02	17.7	4.90
										1984	24.0	<0.1	<0.02	<0.02	3.4	5.00
										1985	24.0	<0.1	<0.02	<0.02	46.4	-7.70
										1986	3.0	<0.1	<0.02	<0.02	18.9	
										1987					18.9	
N10211	288	142.5	13,530	-384	TO	-445	MSL	1,000	PUBLIC SUPPLY	1984	35.0	0.40	<0.02	<0.02	94.3	
										1985	38.0	<0.10	<0.02	<0.02	95.4	
										1986		<0.10	<0.02	<0.02	94.3	
										1987					95.4	-9.30
Q1534	29	237.0	3,250	-10	TO	-30	MSL	1,200	PUBLIC SUPPLY	1975	58.0	8.11			12.6	-2.10
										1976	58.0	8.11			0	-3.60
										1977					0	-5.00
										1978					0	-4.40
										1979					0.9	1.10
										1980					0	-4.40
										1981	54.0	9.20	<0.02	<0.02	1.4	-5.90
										1982	54.0	9.20	<0.02	<0.02	0	-5.00
										1983					0	-4.20
										1984					0	0.80
										1985					0	2.90
										1986	36.0	10.20	<0.02	0.18	0	3.70
										1987						
Q1629	29A	237.0	3,250	-168	TO	-208	MSL	1,600	PUBLIC SUPPLY	1975	32.0	7.30			85.6	-8.40
										1976	34.0	6.30	<0.003	<0.02	91.6	-5.60
										1977	31.0				96.2	-5.40
										1978	31.0	6.60	<0.02	<0.02	85.4	-5.60
										1979	31.0	7.40	<0.02	0.02	80.3	-4.60
										1980	40.0	6.70	<0.02	<0.02	52.3	-4.60
										1981	17.0	7.60	<0.02	<0.02	12.0	-43.90
										1982	27.0	7.60	0.02	<0.02	17.5	-6.60
										1983	26.0	7.20	<0.02	<0.02	0	-5.60
										1984					0	-4.60
										1985					0	-9.50
										1986					0	-9.60
										1987	19.0	9.70	<0.02	<0.02		

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
N4077	35	81.5	10,620	2	TO	-8	MSL	1,400	PUBLIC SUPPLY	1975	12.0	0.58			8.2	24.90
										1976	12.0	0.35			13.3	31.30
										1977					16.9	28.80
										1978	7.0	1.40	<0.02	0.03	16.2	28.10
										1979	12.0	0.90	<0.02	0.04	10.9	30.50
										1980	11.0	1.40	<0.02	0.03	20.2	3.25
										1981	12.0	2.60	<0.02	0.20	24.7	28.10
										1982	18.0	6.40	<0.02	0.09	13.5	28.40
										1983	24.0	3.70	<0.02	0.14	39.9	24.80
										1984	12.0	1.80	<0.02	0.04	54.9	24.60
										1985	11.5	2.10	<0.02	0.03	39.8	29.80
										1986	35.0	2.60	<0.02	0.03	35.9	26.40
										1987	27.0	3.10	<0.02	<0.02	5.7	26.10
N4298	35ARD	81.5	10,620	-275	TO	-321	MSL	1,500	PUBLIC SUPPLY	1975	27.0	4.90			67.9	23.30
										1976	25.0	4.37	<0.003	<0.02	61.6	26.70
										1977					82.3	24.90
										1978	22.0	4.90	<0.02	0.03	81.4	25.30
										1979	22.0	4.80	<0.02	0.02	74.1	23.80
										1980	24.0	4.40	<0.02	0.02	67.6	19.60
										1981	24.0	4.70	<0.02	0.02	53.9	21.90
										1982	24.0	4.30	<0.02	<0.02	71.0	22.00
										1983	25.0	4.20	<0.02	<0.02	82.8	20.20
										1984	15.0	2.80	<0.02	<0.02	36.2	23.30
										1985	23.0	4.00	<0.02	0.02	36.2	21.10
										1986	24.0	4.20	<0.02	<0.02	26.4	24.10
										1987	13.5	2.90	<0.02	0.07	84.8	
Q2026	36	174.0	14,634	0		0	MSL	0	PUBLIC SUPPLY	1975	29.0	0.05			45.9	-2.40
										1976	33.0	0.08			34.6	-2.40
										1977					59.1	-3.50
										1978	38.0	0.40	<0.02	0.05	61.4	-6.00
										1979	35.0	6.10	<0.02	0.09	51.2	-4.60
										1980					55.6	-1.80
										1981	52.0	<0.10	<0.02	0.04	75.8	-8.20
										1982	39.0	<0.10	<0.02	0.04	80.5	-5.90
										1983	37.0	<0.10	<0.02	0.06	55.7	-2.20
										1984	39.0	<0.10	<0.02	0.06	78.1	-5.80

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM	REF	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1985	35.0	0.13	<0.02	0.08	57.0	-3.60
										1986	43.0	0.20	<0.02	0.08	5.0	-3.40
										1987					27.0	-1.30
Q2001	37	266.0	12,050	-50	TO	-86	MSL	1,183	PUBLIC SUPPLY	1975	69.0	0.40			61.6	-9.80
										1976	67.0	0.37			47.6	-9.70
										1977					62.8	-11.90
										1978	84.0	0.80	<0.02	<0.02	54.5	-9.10
										1979	93.0	0.60	<0.02	0.02	37.7	-7.30
										1980					62.9	-6.20
										1981	83.0	0.90	<0.02	<0.02	45.2	-8.30
										1982	94.0	0.70	<0.02	0.02	51.9	-5.30
										1983	85.0	1.00	<0.02	<0.02	88.2	-11.00
										1984	68.0	1.00	<0.02	<0.02	64.9	-8.50
										1985	88.0	0.90	<0.02	<0.02	57.9	-4.40
										1986	83.0	1.30	<0.02	0.20	15.3	-9.20
										1987					17.8	-3.70
Q1997	38	259.5	9,360	-33	TO	-53	MSL	1,400	PUBLIC SUPPLY	1975	77.0	4.76			98.3	-18.10
										1976	77.0	4.86	<0.003	<0.02	83.6	-17.60
										1977	79.0				82.9	-18.90
										1978	74.0	3.30	<0.02	0.02	99.9	-18.60
										1979	73.0	5.00	<0.02	0.06	99.5	-15.50
										1980	69.3	4.53	<0.02	0.05	83.7	-15.00
										1981	74.0	5.50	<0.02	0.03	100	-16.20
										1982	74.0	5.00	<0.02	<0.02	99.9	-15.80
										1983	71.0	5.30	<0.02	<0.02	99.7	-16.60
										1984	72.0	5.20	<0.02	<0.02	99.8	-17.80
										1985	79.0	5.80	<0.02	0.02	99.9	-10.40
										1986	68.0	6.10	<0.02	0.05	56.8	-11.40
										1987	62.0	5.35	<0.02	<0.02	2.3	
Q2000	39	320.0	3,450	0	TO	-20	MSL	1,490	PUBLIC SUPPLY	1975	60.0	7.37			36.0	4.60
										1976	60.0	7.25	<0.003	0.04	44.4	6.60
										1977	58.0				63.3	0.90
										1978	58.0	7.60	<0.02	0.02	85.7	-.30
										1979	56.0	7.60	<0.02	<0.02	34.3	1.10
										1980	45.5	7.95	<0.02	0.11	54.8	3.70
										1981	53.0	8.50	<0.02	0.02	99.9	1.40

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1982	52.0	7.50	<0.02	0.07	99.9	2.00
										1983	50.0	8.20	<0.02	0.09	84.9	3.20
										1984	54.0	7.60	<0.02	0.02	90.2	1.40
										1985	48.0	6.70	<0.02	0.02	2.4	7.60
										1986	47.0	7.00	<0.02	0.03	11.0	3.30
										1987	33.0	4.53	<0.02	<0.02	2.4	
Q2188	39A	320.0	3,450	-141	TO	-182	MSL	1,600	PUBLIC SUPPLY	1975	29.0	6.05			99.8	1.00
										1976	30.0	6.23	<0.003	<0.02	99.9	2.90
										1977					75.4	1.30
										1978	27.0	6.20	<0.02	0.02	99.9	2.10
										1979	29.0	7.00	<0.02	0.06	99.2	2.20
										1980	29.3	6.53	<0.02	0.02	100	0.20
										1981	30.0	7.50	<0.02	0.02	99.8	-.60
										1982	29.0	6.50	<0.02	0.05	99.9	1.60
										1983	29.0	6.60	<0.02	0.06	78.4	1.30
										1984	32.0	6.20	<0.02	0.02	99.9	2.40
										1985	31.0	6.80	<0.02	0.03	98.7	
										1986	30.0	6.80	<0.02	<0.02	73.0	
										1987	49.0	7.90	<0.02	<0.02		
Q2027	42	222.0	9,710	-27	TO	-37	MSL	400	PUBLIC SUPPLY	1975	60.0	9.11			8.6	-6.70
										1976	80.0	8.50	<0.003	0.02	18.2	-5.20
										1977					10.6	-7.70
										1978	52.0	12.10	<0.02	0.05	9.5	-5.30
										1979	50.0	11.80	<0.01	0.08	5.3	-8.30
										1980	53.0	13.60	<0.02	0.03	16.7	-6.00
										1981	54.0	12.10	<0.02	0.04	35.5	-8.60
										1982	56.0	9.60	<0.02	0.02	38.0	-1.40
										1983	53.0	9.60	<0.02	0.03	99.3	-6.00
										1984	55.0	8.70	<0.02	0.02	99.9	-5.10
										1985	61.0	9.30	<0.02	0.03	71.8	-2.20
										1986					0	-2.80
										1987	40.5	9.30	<0.02	<0.02		
Q2028	42A	222.0	9,710	-192	TO	-232	MSL	1,700	PUBLIC SUPPLY	1975	42.0	0.74			98.2	-11.30
										1976	47.0	0.67	<0.003	0.04	99.6	-10.40
										1977	40.0				87.9	-9.80
										1978	42.0	0.60	<0.02	0.02	78.4	-10.90

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JUSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED TOP		INTERVAL BOTM.	--- REF	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1979	46.0	0.60	<0.02	0.05	92.4	-10.40
										1980	44.0	0.63	<0.02	0.06	99.1	-10.10
										1981	48.0	0.60	<0.02	<0.02	89.0	-17.10
										1982	49.0	1.50	<0.02	0.07	88.2	-14.50
										1983	48.0	1.60	<0.02	0.04	98.2	-10.70
										1984	41.0	0.60	<0.02	<0.02	88.8	-8.40
										1985	44.0	0.73	<0.02	0.02	98.3	-10.40
										1986	46.0	0.70	<0.02	0.04	38.4	-13.20
										1987	44.0	0.20	<0.02	<0.02		
N5155	44	118.0	9,320	-5	TO	-15	MSL	1,200	PUBLIC SUPPLY	1975	50.0	4.30			10.9	22.20
										1976	49.0	7.05			18.3	22.30
										1977					3.1	19.60
										1978	45.0	5.80	<0.02	0.09	26.3	18.00
										1979	48.0	3.70	<0.02	0.10	15.2	20.00
										1980					28.6	23.50
										1981	36.0	6.10	<0.02	0.17	11.3	19.90
										1982	25.0	3.00	<0.02	0.13	6.5	18.10
										1983	36.0	6.40	<0.02	0.03	13.4	21.30
										1984	33.0	4.40	<0.02	0.05	3.7	20.30
										1985	28.0	4.70	<0.02	0.06	1.8	23.10
										1986	30.0	4.20	<0.02	0.04	1.8	23.70
										1987					26.3	27.10
N5156	44A	119.0	9,360	-226	TO	-260	MSL	1,600	PUBLIC SUPPLY	1975	27.0	2.68			90.4	40.10
										1976	25.0	2.42			97.7	11.50
										1977					90.5	11.00
										1978	22.0	2.80	<0.02	0.02	91.8	12.20
										1979	22.0	2.60	<0.02	0.04	99.4	11.70
										1980					84.8	13.30
										1981	17.0	2.60	<0.02	0.02	55.1	13.30
										1982	24.0	2.60	<0.02	<0.02	66.3	13.50
										1983	24.0	2.50	<0.02	<0.02	51.2	18.40
										1984	24.0	2.20	<0.02	0.02	85.8	13.30
										1985	26.0	2.60	<0.02	0.04	40.8	11.80
										1986	28.0	2.50	<0.02	0.03	7.8	15.80
										1987					17.9	
N6744	44B	120.0	9,490	-12	TO	-24	MSL	1,000	PUBLIC SUPPLY	1975	54.0	6.33			7.0	17.50

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1976	55.0	6.51			13.7	21.00
										1977					17.2	17.10
										1978	49.0	5.50	<0.02	0.07	12.5	18.70
										1979	43.0		<0.02	0.06	8.9	20.00
										1980					13.5	21.50
										1981	40.0	6.90	<0.02	0.04	17.8	20.00
										1982	29.0	3.20	<0.02	0.06	5.0	20.00
										1983	38.0	6.40	<0.02	<0.02	16.1	17.80
										1984	38.0	4.20	<0.02	<0.02	11.3	14.00
										1985	35.0	5.00	<0.02	0.02	18.8	19.00
										1986	35.0	3.80	<0.02	0.05	12.9	20.00
										1987					13.5	
N6745	44C	121.0	9,530	-233	TO	-273	MSL	1,600	PUBLIC SUPPLY	1975	35.0	3.02			69.5	14.80
										1976	28.0	2.84			74.8	12.60
										1977					74.6	11.00
										1978	25.0	3.20	<0.02	0.05	62.6	10.90
										1979	26.0	3.50	<0.02	0.04	83.1	10.40
										1980					82.1	13.30
										1981	25.0	3.30	<0.02	0.03	59.1	15.60
										1982	26.0	3.00	<0.02	0.05	23.1	18.00
										1983	24.0	3.60	<0.02	0.03	25.2	13.30
										1984	24.0	3.10	<0.02	0.04	40.2	10.00
										1985	26.0	3.10	<0.02	0.05	33.0	13.10
										1986	27.0	2.90	<0.02	0.08	52.4	19.20
										1987					35.3	
Q2243	46	209.0	12,880	0		0		0	PUBLIC SUPPLY	1975	65.0	7.80			10.1	3.10
										1976	6.0	8.60			8.4	0.70
										1977					14.6	6.40
										1978	54.0	8.70	<0.02	<0.02	11.9	8.80
										1979			<0.02	<0.02	8.7	9.20
										1980					17.8	9.30
										1981	55.0	9.60	<0.02	<0.02	14.6	5.80
										1982	52.0	6.90	<0.02	<0.02	54.7	11.50
										1983	39.0	5.60	<0.02	<0.02	25.1	7.00
										1984	42.0	10.40	<0.02	<0.02	4.4	9.70
										1985						

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1986						
										1987					0.1	
Q2275	47	199.0	5,440	-29	TO	-49	MSL	1,500	PUBLIC SUPPLY	1975	59.0	8.34		0.00	4.8	-2.30
										1976	55.0	8.50			11.6	-2.10
										1977					13.0	-6.60
										1978	51.0	8.00	<0.02	0.05	12.4	-1.20
										1979	51.0	3.60	<0.01	0.02	6.1	-1.10
										1980	52.0	8.10	<0.02	0.03	18.5	
										1981	52.0	9.30	<0.02	0.04	22.1	-13.50
										1982	51.0	7.20	<0.02	0.05	27.2	
										1983	52.0	7.60	<0.02	0.04	10.8	-7.60
										1984					0.1	-1.60
										1985					0	-2.70
										1986	53.0	6.40	<0.02	0.06	0	-1.20
										1987	31.0	5.90	<0.02	0.12		
Q2276	47A	199.0	5,440	-249	TO	-289	MSL	1,600	PUBLIC SUPPLY	1975	14.0	4.14			28.9	-5.30
										1976	11.0	3.82	<0.003	<0.02	30.2	-3.40
										1977	10.0				24.8	-5.30
										1978	6.0	4.70	<0.02	0.02	23.8	-2.60
										1979	9.0	5.80	<0.02	<0.02	14.9	-1.40
										1980	10.0	5.90	<0.02	0.03	28.1	-1.40
										1981	9.0	5.90	<0.02	<0.02	65.7	-9.50
										1982	13.0	5.40	<0.02	0.02	97.1	-8.70
										1983	15.0	5.80	<0.02	0.02	81.9	-10.10
										1984	30.0	6.30	<0.02	<0.02	100.0	-6.50
										1985	20.0	6.77	<0.02	0.04	94.9	-2.90
										1986	18.0	6.90	<0.02	0.03	57.4	-7.50
										1987	13.0	7.60	<0.02		32.2	
Q2299	48	228.5	6,560	-39	TO	-59	MSL	1,438	PUBLIC SUPPLY	1975	58.0	10.20			8.6	-12.10
										1976	57.0	9.15	<0.003	0.04	21.9	-13.20
										1977	52.0				39.0	-18.00
										1978	52.0	10.00	<0.02	0.03	65.1	-13.10
										1979	53.0	10.90	<0.02	0.11	99.3	-13.70
										1980	53.0	10.00	<0.02	0.03	100.0	-11.90
										1981	47.0	10.80	<0.02	0.03	57.0	-11.40
										1982	56.0	9.20	<0.02	0.06	41.0	1.30

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1983	51.0	10.00	<0.02	0.03	8.9	-10.80
										1984					0	-9.50
										1985					0	-10.00
										1986	56.0	9.50	<0.02	0.07	43.5	-5.50
										1987	44.0	9.98	<0.02	<0.02	46.3	
Q2300	48A	228.5	6,560	-179	TO	-219	MSL	1,800	PUBLIC SUPPLY	1975	38.0	7.55			92.4	-12.20
										1976	38.0	7.35	<0.003	<0.02	99.9	-10.60
										1977	34.0				99.6	-13.00
										1978	33.0	7.80	<0.02	0.05	99.9	-11.70
										1979	33.0	7.70	<0.02	0.05	99.9	-13.20
										1980	31.3	7.46	<0.02	0.02	99.9	-10.50
										1981	41.0	8.20	<0.02	0.02	58.1	-14.20
										1982	30.0	7.80	<0.02	0.05	24.7	-8.20
										1983			<0.02	0.03	0.6	-10.60
										1984					0	-8.00
										1985					0	-26.00
										1986	29.0	8.70	0.02	0.08	47.6	-4.10
										1987	44.5	8.13	<0.02	<0.02	79.5	
Q2321	49	196.0	2,480	-43	TO	-63	MSL	1,400	PUBLIC SUPPLY	1975	59.0	7.15			8.5	-19.70
										1976	60.0	7.40			22.2	-17.90
										1977	60.0				31.8	-24.70
										1978	55.0	7.90	<0.02	0.02	42.1	-22.40
										1979	55.0	7.20	<0.02	0.05	18.5	-19.30
										1980	50.5	7.95	<0.02	0.04	39.4	-17.40
										1981	76.0	8.40	<0.02	0.05	80.9	-19.30
										1982	52.0	7.20	<0.02	0.03	99.6	-7.30
										1983					0	-2.90
										1984					0	-2.60
										1985					0	8.00
										1986	57.0	6.00	<0.02	0.07	0	7.10
										1987						
Q2343	49A	196.0	2,480	-122	TO	-162	MSL	1,600	PUBLIC SUPPLY	1975	32.0	8.75			98.4	-5.00
										1976	34.0	8.67	<0.003	<0.02	99.6	-.20
										1977	28.0				99.9	-2.10
										1978	29.0	9.60	<0.02	0.04	99.8	-3.20
										1979	28.0	10.60	<0.02	0.07	83.8	-5.20

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC	JWSC	ASMITH	DISTANCE	-- SCREENED INTERVAL ---				CAPACITY	USE	YEAR	SULFATE	NITRATE	CHROMIUM	COPPER	PUMPAGE	STATIC WATER
WELL NO	WELL NO	(DEGREES)	(FT)	TOP		BOTM.	REF.	(GPM)			(MG/L)	(MG/L)	(MG/L)	(MG/L)	(%)	LEVEL (FT MSL)
										1980	28.0	10.93	<0.02	0.04	80.8	-.60
										1981	20.0	12.40	<0.02	0.06	37.5	-14.00
										1982	23.0	9.70	<0.02	0.02	48.8	-11.80
										1983	23.0	10.50	<0.02	0.08	51.7	-1.90
										1984					0	-.60
										1985					0	5.50
										1986	25.0	13.80	<0.02	0.05	0	-5.40
										1987						
Q2442	54	181.5	9,380	-39	TO	-49	MSL	1,200	PUBLIC SUPPLY	1975	55.0	6.08			26.7	-.20
										1976	56.0	6.28			13.1	1.50
										1977					17.0	-2.40
										1978	50.0	6.20	<0.02	0.04	14.5	0.20
										1979	54.0	5.80	<0.02	0.03	8.6	-2.60
										1980	55.0	6.00	<0.02	0.03	21.0	-.10
										1981	49.0	5.20	<0.02	0.03	12.2	-2.60
										1982	45.0	5.20	<0.02	0.07	17.2	-5.10
										1983			<0.02	0.02	0.7	-5.80
										1984					0	-2.60
										1985					0	2.70
										1986	33.0	4.80	<0.02	0.05	0	6.60
										1987	33.5	4.35	<0.02	0.05		
Q2443	54A	181.5	9,380	-267	TO	-307	MSL	1,225	PUBLIC SUPPLY	1975	25.0	0.27			45.7	-.90
										1976	28.0	0.16			33.6	-.80
										1977					51.5	-.40
										1978	21.0	0.20	<0.02	0.02	43.5	-4.30
										1979	24.0	0.10	<0.02	0.04	29.3	-3.50
										1980	25.5	0.10	<0.02	0.02	74.6	
										1981	21.0	<0.1	<0.02	0.03	48.3	-14.50
										1982	28.0	0.20	<0.02	<0.02	82.8	-6.10
										1983	28.0	0.10	<0.02	0.02	81.9	-20.00
										1984	28.0	0.20	<0.02	0.02	47.9	-4.70
										1985					0	-7.00
										1986	38.0	1.40	<0.02	0.03	21.1	-8.60
										1987	25.5	0.10	<0.02	0.03	38.6	
Q3034	55	250.5	8,940	-184	TO	-224	MSL	1,200	PUBLIC SUPPLY	1975	42.0	5.65			91.5	
										1976	46.0	6.33	<0.003	<0.02	99.9	

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1977					99.7	
										1978	38.0	5.80	<0.02	0.02	99.9	
										1979	42.0	6.20	<0.02	0.03	98.7	
										1980	44.3	6.10	<0.02	<0.02	99.1	-16.20
										1981	48.0	6.00	<0.02	<0.02	95.7	-23.20
										1982	52.0	5.70	<0.02	<0.02	99.9	-14.80
										1983	49.0	5.60	<0.02	0.02	99.9	-16.30
										1984	50.0	5.40	<0.02	<0.02	99.9	-18.00
										1985	45.0	5.60	<0.02	0.02	52.7	-16.30
										1986	46.0	4.40	<0.02	<0.02	15.4	-24.40
										1987	36.0	4.10	<0.02	0.06	23.6	
Q2955	56	0.0	0	-380	TO	-420	MSL	1,400	PUBLIC SUPPLY	1975	17.0	0.12			30.5	2.20
										1976					35.8	0.60
										1977					33.5	1.40
										1978	17.0	<0.10	<0.02	<0.02	29.5	NR
										1979	20.0	<0.10	<0.02	0.02	29.3	0.10
										1980					39.4	-2.20
										1981	43.0	<0.10	<0.02	0.04	43.3	-6.80
										1982	25.0	<0.10	<0.02	0.12	67.0	-1.20
										1983	26.0	<0.10	<0.02	0.02	44.8	-3.20
										1984	29.0	<0.10	<0.02	<0.02	32.9	-2.20
										1985	27.0	0.73	<0.02	<0.02	12.0	-1.40
										1986	32.0	0.01	<0.02	0.03	9.1	-1.40
										1987					15.6	-2.60
N7649	57	72.0	12,510	-67	TO	-107	MSL	1,200	PUBLIC SUPPLY	1975	9.0	3.29			8.0	33.60
										1976	33.0	7.20	<0.003	0.04	33.6	37.80
										1977	27.0				31.3	36.90
										1978	41.0	9.50	<0.02	0.05	57.8	NR
										1979	32.0	7.20	<0.02	<0.02	2.7	NR
										1980	43.0	8.70	<0.02	0.04	45.1	42.70
										1981	42.0	9.60	<0.02	<0.02	52.9	34.80
										1982	39.0	8.60	<0.02	0.02	55.5	41.10
										1983	6.0	3.60	<0.02	<0.02	9.6	36.60
										1984	13.0	4.60	<0.02	0.04	0.1	35.00
										1985	42.0	7.60	<0.02	<0.02	2.8	34.80
										1986						38.30

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1987	24.5	7.80	<0.01	0.03	26.9	38.50
N7650	57A	72.0	12,510	-302	TO	-342	MSL	1,200	PUBLIC SUPPLY	1975	9.0	3.29			69.0	11.90
										1976	8.0	3.82	<0.003	<0.02	85.5	37.20
										1977					75.7	36.00
										1978	2.0	4.20	<0.02	0.02	84.1	37.70
										1979	10.0	4.00	<0.02	0.02	70.4	37.20
										1980	3.0	4.30	20.02	0.02	88.6	35.40
										1981	4.0	4.20	<0.02	0.02	94.4	32.70
										1982	6.0	5.20	<0.02	0.03	72.9	34.20
										1983	6.0	4.60	<0.02	<0.02	86.3	33.00
										1984	8.0	4.20	<0.02	0.02	53.6	34.20
										1985	55.0	4.90	<0.02	<0.02	55.9	32.20
										1986	8.0	5.00	<0.02	0.02	91.3	30.10
										1987	7.5	4.80	<0.02	0.03	72.7	
Q3014	58	272.0	13,560	-168	TO	-219	MSL	1,000	PUBLIC SUPPLY	1975	19.0	0.28			99.5	
										1976	22.0	0.35			99.9	
										1977					99.4	
										1978	35.0	0.06	<0.02	<0.02	99.9	
										1979	39.0	0.60	<0.02	0.25	95.3	
										1980					99.8	-12.70
										1981	48.0	0.96	<0.02	0.02	99.9	-14.60
										1982	50.0	1.00	<0.02	0.04	88.5	-16.10
										1983	50.0	1.20	<0.02	0.04	99.7	-14.40
										1984	56.0	1.10	<0.02	0.02	99.9	-16.10
										1985	52.0	0.93	<0.02	<0.02	98.8	-18.00
										1986	53.0	2.20	<0.02	0.03	55.7	-24.00
										1987					65.8	-18.10
Q3062	59	202.0	13,900	-345	TO	-395	MSL	1,200	PUBLIC SUPPLY	1975	10.0	0.70			13.9	
										1976	15.0	0.35			97.4	
										1977					99.4	
										1978	15.0	0.20	<0.02	<0.02	99.9	
										1979	11.0	1.20	<0.02	<0.02	99.8	
										1980					95.5	-14.40
										1981	15.0	<0.10	<0.02	0.02	90.2	-18.90
										1982	16.0	<0.10	<0.02	0.03	91.8	-18.00
										1983	17.0	<0.10	<0.02	<0.02	99.7	-21.40

WELL AND GROUND WATER INFORMATION FOR PUBLIC WATER SUPPLY WELLS
IN THE GENERAL VACINITY OF THE DEKNATEL SITE

NYSDEC WELL NO	JWSC WELL NO	ASMITH (DEGREES)	DISTANCE (FT)	-- SCREENED INTERVAL --- TOP		BOTM.	REF.	CAPACITY (GPM)	USE	YEAR	SULFATE (MG/L)	NITRATE (MG/L)	CHROMIUM (MG/L)	COPPER (MG/L)	PUMPAGE (%)	STATIC WATER LEVEL (FT MSL)
										1984	20.0	<0.10	<0.02	<0.02	90.0	-20.00
										1985						-17.90
										1986	21.0	<0.10	<0.02	0.04	32.9	-8.30
										1987					17.8	-5.00
Q3083	60	182.0	13,365	-262	TO	-310	MSL	1,400	PUBLIC SUPPLY	1980					43.7	
										1981	48.0	<0.10	<0.02	0.04	38.9	42.30
										1982	52.0	<0.10	<0.02	0.02	13.5	41.40
										1983	54.0	<0.10	<0.02	0.03	4.2	-1.60
										1984			<0.02	<0.02	0.9	-1.60
										1985	72.0	<0.10	<0.02	0.02	0	-1.70
										1986	68.0	<0.10	<0.02	0.08	0	-1.70
										1987						0.80

67 records listed.

APPENDIX F

DECONTAMINATION OF EQUIPMENT

1.0 Applicability

This SOP describes methods used for decontamination of all field equipment exposed to potential contamination during sampling. This includes bailers, split spoon, trowels, hand augers, and other equipment used to collect samples.

Decontamination of equipment is a necessity for quality assurance of work performed in the field. The prevention of cross contamination between samples collected, the spreading of potential contamination throughout a site is achieved by cleaning equipment. This procedure also reduces the health risk of personnel at a site exposed to contamination.

2.0 Responsibilities

The project manager is responsible for securing an area to be designated for decontamination, that all site specific guidelines for cleaning equipment are followed, all waste materials from decontamination are properly disposed of and that all field personnel are fully aware of the protocols and procedures in this SOP in accordance with health and safety regulations.

3.0 General Sampling Decontamination Procedure

The method of decontamination varies with the quantity and type of known contaminants. Also the methods used is subject to state regulations. The following is a general decontamination procedure any variations to the procedure will be noted.

3.1 Wash with non-phosphate detergent solution.
3.2 Rinse with potable water.
3.3 Rinse with distilled water.
3.4 Rinse with a 10% nitric acid solution (if metals are to be analyzed).
3.5 Rinse with distilled water.
3.6 Rinse with acetone (pesticide grade).
3.7 Air dry.
3.8 Rinse with distilled water.
3.9 Wrap equipment with aluminum foil or suitable material.

4.0 Submersible Pump

For the purpose of ground-water-sampling in deep wells a submersible pump is used to purge a specific volume before sampling. No samples are collected using a submersible pump, therefore, decontamination of submersible pump will involve a purging of the pump using potable water and cleaning the outside of the pump with hot pressure washer or hot soapy water.

5.0 Quality Assurance/Quality Control

For the purpose of quality assurance, a field blank will be collected during the sampling process. Distilled water will be poured through decontaminated equipment, collected and analyzed for the same parameters as other samples collected.

APPENDIX G

COLLECTION OF SOIL SAMPLES FOR LABORATORY ANALYSES

1.0 Applicability

This Standard Operating Procedure (SOP) is concerned with the collection of valid soil samples to be analyzed by a laboratory.

2.0 Responsibilities

The project hydrogeologist is responsible for the collection of valid and representative soil samples. Also, to ensure that all field personnel are fully aware of the protocols and procedures in this SOP in accordance with project specifications.

3.0 Materials

- split spoon/hand auger
- plastic sheeting
- stainless steel spatula
- disposable vinyl/rubber gloves
- laboratory clean sample containers
- cooler

- distilled water
- acetone
- brushes

4.0 Procedure

4.1 Split-spoon core samplers or stainless steel bucket type hand augers are used to collect sediment samples.

4.2 Prior to collection of the soil sample, all sampling equipment is thoroughly pre-cleaned according to standard decontamination protocols.

4.3 Once the sample is collected it is placed on a clean plastic sheet and logged in detail by the geologist as quickly as possible to reduce the potential for the loss of volatile organics.

4.4 Using disposable vinyl gloves and pre-cleaned stainless steel spoons the sample is then placed in appropriate (EPA-approved) laboratory supplied, pre-cleaned containers.

4.5 The sample containers are then labeled with the following information:

a. Name of person(s) collecting soil sample
b. Sample location
c. Time and date of sample collection
d. Sample designation

4.6 Samples are then placed immediately on ice to maintain a temperature of 4° C.

4.7 A chain-of-custody form is completed for each sample collected.

4.8 At the end of each day samples are delivered or shipped to the laboratory for analysis.

APPENDIX H

PROTOCOL FOR DEVELOPMENT OF MONITORING WELLS

1.0 WELL DEVELOPMENT

Before a newly constructed well can be used for water-quality sampling, it will be developed. Well development refers to the procedure used to clear the well of fine-grained materials (sands, silts, and clays) produced during drilling. Well development continues until the well responds to water-level changes in the formation (i.e., a good hydraulic connection is established between the well and formation and the well produces clear, sediment-free water to the extent possible.

Depending on the drilling technique used, composition of the formation screened, and well diameter and construction materials, well development may include one or more of the following techniques.

a. Bailing.
b. Pumping (centrifugal, submersible, or air).
c. Backwashing.
d. Surging (mechanical).
e. Jetting.
f. A combination of the above.

A one-pint sample of the last meter removed during development will be obtained and inspected by the field hydrogeologist for relative clarity to determine whether development is complete. Well development procedures will be recorded appropriately.

Dispersing agents, acids disinfectants, or other additives will not be used during development nor will they be introduced into the well at any other time. During development, water will be removed from the entire column of water standing in the well (i.e., by periodically lowering and raising the pump intake). Well development will include the rinsing of the interior well casing above the water column in the well using only water from that well.

APPENDIX I

GROUND-WATER SAMPLING PROCEDURES FOR MONITORING WELLS

A2380.3

1.0 Applicability

This Standard Operating Procedure (SOP) defines and describes the protocols and procedures to be used for sampling monitoring wells.

2.0 Responsibilities

The project hydrogeologist and/or his designate will be responsible for ensuring that all groundwater sampling is performed in accordance with this SOP and all project-specific sampling protocols.

3.0 Materials/Equipment

See Attachment A, Well Sampling Checklist.

4.0 General procedure for groundwater sampling of monitoring wells.

4.1 Identify the well and enter pre-sampling information in the field notebook and sampling form.

4.2 Inspect protective casing and note any items of concern such as lock missing or casing bent, fill out well inspection form Attachment B.

4.3 Clean the top of the well off with a clean rag and remove the cap or plug.

4.4 Measure the depth to water using a precleaned electric probe or steel tape. Measure the depth of the well. Record and compute the volume of water in the well.

4.5 Existing wells will be pumped or bailed and a minimum of three casing volumes will be removed (if the recharge rate is adequate to accomplish this within a reasonable amount of time) prior to sampling. Teflon or stainless-steel bailers or submersible peristaltic or centrifugal pumps will be cleaned prior to use.

4.6 Record the physical appearance of the water on the field data form (color, odor, turbidity, etc.) as it is pumped or bailed.

4.7 Prepare the bottles for receiving their samples: label the bottle with location number, other pertinent information and place on ice, record all information on the sampling data form Attachment C.

4.8 After the well has been purged, a teflon or stainless steel bailer will be used to collect the groundwater sample. This bailer will have been thoroughly precleaned. Prior to lowering the bailer in the well, rinse three volumes of distilled water through the bailer. In addition, the first three bailer volumes obtained from the well should be discarded. Use non-absorbent polyethylene cord to lower the bailer into the well. This cord will be discarded after use in the well.

4.9 Lower the bailer into the well at the depth appropriate to the density of the constituents sampled for. Samples to be analyzed for dissolved metals will be filtered in the field before being placed in sample containers.

4.10 Place the sample immediately on ice. Maintain the samples in a secure area and forward to the laboratory within 24 hours, maintaining strict chain-of-custody, Attachment D.

4.11 After the sample is collected, measure and record the temperature, conductivity, pH, and the physical appearance of the water.

4.12 Replace the well cap and cover the well, locking the protective cap.

4.13 Bailers, hoses and pumps shall be deconned following Roux protocol with site-specific variations, if any.

4.14 Discard the cord, rags, gloves, etc. in an appropriate manner.

4.15 Complete sampling data form.

5.0 Groundwater Inspection Procedure - Floating Free Product Determination

5.1 Slowly lower acrylic or teflon bailer into well until bottom of bailer contacts fluid surface.

5.2 Using a reference point on the bailer line, slowly lower bailer into fluid a distance less than the bailer length so that at its deepest point the top of the bailer remains above the air/fluid contact.

5.3 Slowly raise the bailer out of the well.

5.4 In field book note the approximate thickness of floating free product.

5.5 Replace locking and/or protective caps.

5.6 Clean bailer with a non-phosphate detergent prior to rinsing with distilled water.

ATTACHMENT A

Date

Well Sampling Checklist   Project

1) Appropriate bailer(s) for constituents to be analyzed for
2) Non-absorbent cord (Polypropylene)
3) Pre-measured plastic bucket(s)
4) 4′ x 4′ plastic sheets
5) M-Scope - battery check
6) Tape measure (steel - tenth of a foot)
7) Pen knife
8) Field book
9) Well location map
10) Cleaning agents (detergent distilled water, tap water)
11) Pump (if required for purging)
    A. Teflon tap
    B. Polyethylene tubing if using peristaltic pump
12) Water well handbook
13) Calculator
14) Rubber or plastic gloves
15) Hard hat (if required on location)
16) pH meter
17) Conductivity meter
18) Thermometer
19) paper towels, rags
20) Pen & pencil

21) Ice

22) Sample jars & codes

23) Electrical tape

24) Pipe wrench

25) Screwdriver, hammer

26) Cooler

27) Water jugs

28) Disposable polyvinyl gloves

29) Well keys

30) Masking tape for labeling

31) Indullible markers

32) Field sampling form(s)

33) Chain-of-custody form

34) Relevant well sampling data

    A. Bottom of well

35) Distilled water

ATTACHMENT C

WELL SAMPLING DATA FORM

Well Number: Date: Sampled By:

Time at Start: Weather:

Tape Held At: Depth to Water: Water Column (WC)

Wet Cut:

Depth to Well Bottom:

Volume of Water in Well: WC x C

C - 0.07 (for 1 1/4" diam. wells)

C = 0.17 (for 2" diam. wells)

C = 0.65 (for 4" diam. wells)

Volume of water to remove before sampling:

Physical appearance at start:

Color: Odor: Turbidity:

Conductivity: pH:

Physical appearance after purging:

Color: Odor: Turbidity:

Did well go dry: (Volume of water removed)

Time at finish:

Types of samples collected, preservations and bottles used:

Laboratory name, number and location:

Method of sample collection.

Remarks:

APPENDIX J

SPECIFIC CAPACITY TEST PROCEDURE

Specific Capacity Test Procedure

1. Enter all pertinent data concerning the pumping well and piezometers to be measured on the data sheets provided.

2. Check to make sure that all equipment is available and functioning: electric probes, data sheets, pencils, rain gauges (if necessary), stop watches, pump, generator, water quality meters (if necessary).

3. Record water level in pumping well and piezometers before pump is inserted in pumping well.

4. Insert pump in well, allow five minutes for water level to equilibrate, record new water level in pumping well and piezometers.

5. Start the pump and run a short term (15-30 minute) drawdown-recovery test pumping at a constant rate. The pumping rate selected should be based on estimates of well yield from soil samples collected during drilling.

6. Record water levels on a predetermined time schedule.

7. If one of the first closely-spaced readings is missed, record the next one (do not attempt to alter data).

8. Throughout note any changes pertinent to the test such as: changes in water color or turbidity; time and nature of any discharge fluctuations; time and length of any temporary pump shutdown; effects of any nearby pumping wells; and precipitation events.

9. If there is a shutdown (even if it's brief) measure water levels in at least the pumping well.

10. At the end of the drawdown test, recovery levels should be measured until water levels return as close as possible to pre-test levels. The drawdown schedule for water level measurements should be followed during recovery.