PROJECT NUMBER 444-010-95

DRAFT FINAL
REMEDIAL INVESTIGATION / FEASIBILITY STUDY (RI/FS) WORK PLAN
JAMECO INDUSTRIES, INC.
248 WYANDANCH AVE
WYANDANCH, NEW YORK

September 26, 1997

Prepared For:

New York State Department
of Environmental Conservation

and

Camille Gagnon
Watts Industries, Inc.
P.O. Box 6431
South Main Street
Franklin, NH 03235

GEC **Goldman Environmental Consultants, Inc.**
60 Brooks Drive
Braintree, MA 02184-3839
781-356-9140
FAX 781-356-9147
EMail: gec@wn.net

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I. INTRODUCTION

This Remedial Investigation / Feasibility Study (RI/FS) Work Plan (Work Plan) has been prepared by Goldman Environmental Consultants, Inc. (GEC) of Braintree, Massachusetts for the New York State Department of Environmental Conservation (NYSDEC) on behalf of Watts Industries, Inc. (Watts) of Andover, Massachusetts and Jameco Industries, Inc. (Jameco) of Wyandanch, New York. This report has been prepared in accordance with Paragraph II of the NYSDEC Consent Order, dated December 27, 1995, issued to Watts and Jameco regarding historic releases of oil or hazardous materials (OHM) at the Jameco facility located at 248 Wyandanch Avenue, Wyandanch, New York, hereinafter referred to as "the site" or "site".

This document has been compiled in order to meet the requirements of the Work Plan. As specified in the Consent Order, the Work Plan shall include the following:

1) A Chronological description of the anticipated RI/FS activities together with a schedule for the performance of these activities
2) A Plan that shall include:

   - chronological description of the anticipated RI/FS activities together with a schedule for the performance of these activities.

   - Sampling and Analysis Plan that shall include:

     a) Quality Assurance Project Plan (QAPjP) that describes the Quality Assurance and Quality Control protocols necessary to achieve the initial data quality objectives. The plan shall designate a data validation expert and must describe such individuals qualifications and experience; and

     b) Field Sampling Plan that defines the sampling and data gathering methods in a manner consistent with the Compendium of Superfund Field Operations Method (EPA/540/P-87-001, OSWER Directive 9355.0-14, December 1987) as supplemented by NYSDEC.

   - Health and Safety Plan to protect persons at and in the vicinity of the site during performance of the RI/FS which shall be prepared in accordance with 29 CFR 1910 and all other applicable standards by a certified health and safety professional.

- Citizen Participation Plan that is, at a minimum, consistent with the Department's publication, New York State Inactive Hazardous Waste Site Citizen Participation Plan dated August 30, 1988, and any subsequent revisions thereto, and 6NYCRR Part 375.

The Consent Order also stated that the RI/FS Work Plan shall incorporate all elements of a RI/FS as set forth in the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), the National Contingency Plan, the USEPA guidance document entitled Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA dated October, 1988, and any subsequent revisions to that guidance document as well as any applicable NYSDEC guidance documents.

This RI/FS Work Plan describes activities to be conducted at the subject site to assess the source, extent and risk posed by releases identified at the site and described in the Initial Submittal report, submitted to NYSDEC in accordance with Paragraph I of the Consent Order. In addition, this Work Plan also describes investigations that will be conducted to determine the extent and risk posed by a release of cutting oil that was identified subsequent to submission of the Initial Submittal. Additional information regarding the discovery of this cutting oil release and Interim Remedial Measures that have been and will be, conducted relative to this release are described later in this document.

The Work Plan is modeled after the format for RI/FS Work Plans as presented in the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, hereinafter referred to as the Guidance Document. As such, this Work Plan includes a description of the site background and setting, including a brief history of the site and description of overall site conditions, including site hydrogeology and proximity of the site to potential receptors. Further information can be found in the Initial Submittal. This Work Plan also presents a conceptual site model including a summary of existing information regarding soil and groundwater conditions. As is described in this document, a great deal of information regarding soil and groundwater conditions is already known. The Work Plan also includes a summary of information regarding the sources of the four releases that have been identified at the site and the investigations that will be performed to determine the source and extent of each of these releases in all media. The Work Plan includes a description of how the data obtained as part of this investigation will be validated, and how the risk posed by each of the releases will be evaluated. Finally, the Work Plan also includes a QAPjP (Appendix A), Health and Safety Plan (Appendix B), and a scope of work for a Citizen Participation Plan (Appendix C).

II. SITE BACKGROUND AND SETTING

Site Conditions and Site History

The subject site is located at 248 Wyandanch Avenue in Wyandanch, New York. The longitude and latitude of the site are 73° 21' 19" (west) and 40° 44' 28" (north) as identified on the Bay Shore West NY USGS Quadrangle. A Site Locus is included as Figure 1. Information included in previous reports indicates that the site is listed at the Babylon Assessor's Office as District 0100, Section 82, Block 2, Lot 37.5, owned by HM Realty and the area of the lot is 7.4 acres. A Site Plan is included as Figure 2.

The site was most recently occupied by Jameco Industries, Inc., a manufacturer of plumbing fixtures who employs approximately 350 people. The site building consists of a one-story concrete block building surrounded by paved and unpaved parking areas, storage areas, landscaped areas and vacant property. In addition, a portion of the property is occupied by an on-site process water distribution system. The site is located in an industrial area of Wyandanch, New York but is surrounded by both residential and industrial properties.

The site is located within a 500 year flood zone and is approximately 50 feet above mean sea level. The nearest surface water body is the Carlls River, located approximately 1/2 to 5/8 mile southeast of the site. Belmont Lake is located approximately 1/2 to 3/4 mile southeast of the site.

Review of aerial photographs on file and the Babylon Building and Engineering Department, indicates that in 1938 the site consisted of partially undeveloped and entirely vacant land. Wyandanch Avenue had been paved, or covered with oiled stone at this time, but development of this area had not yet taken place. In 1961, residential properties had been developed on lots surrounding the site, but conditions at the site remained unchanged.

Initial development of the site apparently occurred in 1963 when a permit was issued for the construction of a manufacturing facility. Records on file indicate that Jamaica Manufacturing Company, Inc. (later Jameco) was granted a permit on March 4, 1964 for the construction of a single building. Additions were apparently constructed in 1973 and 1980, enlarging the footprint of the existing Jameco facility

During the initial construction of the site, two wells were installed. One well extended to a depth of 64 feet below the ground surface and was used as a "diffusion well." The second well extended to a depth of 64 feet and was used as a source of process water. Use of the process water supply well continued until approximately 1988.

The site has been used by Jameco to manufacture plumbing fixtures, some of which involves plating parts with chrome and nickel. Prior to 1975, plating waste was treated by precipitating metals out of solution by adjusting the pH and then discharging the effluent containing the precipitate to one of two seepage lagoons in the rear yard of the plant. One lagoon would be used until the sludge accumulated to a point that effluent infiltration was hindered. The second lagoon would then be used and the first lagoon allowed to dry so that sludge could be removed to allow the lagoon to function again as an infiltration bed.

In 1975, this method of operation was replaced with a treatment system that separated the sludge from the effluent by the use of clarifiers. The clarified effluent discharged into a set of 48 leaching pools in the rear yard. Beginning in 1975, Jameco has extensively modified the treatment system in accordance with its SPDES permit. Sometime after 1975, the sludge lagoons were closed. The way in which the lagoons were closed was the subject of several investigations. Jameco personnel reported that all sludge material was excavated and disposed at a landfill. The lagoons were then backfilled with clean sand. NYSDEC personnel alleged that the lagoons had simply been backfilled with clean sand and that the sludge material had never been removed. Results of several investigations conducted since NYSDEC's allegations indicate that there is no evidence that contradicts Jameco's original statements.

Recent investigations also revealed that as a result of past disposal practices, cutting oil was discharged to soil and groundwater. As a result, light non-aqueous phase product, (LNAPL) and dissolved-phase chlorinated compounds are present in soil and groundwater in the northern portion of the site and beneath a portion of the site building. Activities conducted in response to this release are documented in a separate report, submitted to NYSDEC, and discussed in greater detail in the following paragraphs.

As part of the Initial Submittal, GEC compiled a plan showing all known or suspected contaminant source areas (Figure 3) and all known sample locations (Figure 4). In addition, laboratory results of analyses performed on soil and groundwater samples are summarized on Tables 1 through 8, attached. The supporting laboratory data for these tables, where available, is included in the Initial Submittal, on file with NYSDEC. Laboratory analyses for soil and groundwater sampling associated with the release of cutting oil are summarized as Tables 9 through 11.

Geologic and Hydrogeologic Characteristics

The following is a summary of information regarding geologic and hydrogeologic characteristics. References for this information were included with the Initial Submittal.

Groundwater at the site occurs primarily in unconsolidated sediments of Pleistocene and Upper Cretaceous age. These sediments are approximately 1350 feet thick and overlie Precambrian crystalline bedrock. The bedrock is considered the bottom of the reservoir. The site in underlain by Pleistocene glacial outwash deposits that are approximately 110 feet thick. The aquifer in these deposits is referred to as the Upper Glacial aquifer. Test borings conducted at the site indicate that the upper portions of the glacial deposits consist of highly permeable quartzose sand and gravel. Locally, the gravel is well rounded and well sorted.

The glacial aquifer is underlain by the Upper Cretaceous Magothy Formation, a micaceous, silty fine to medium sand about 800 to 1000 feet thick. The Magothy Formation consists of fluvio/deltaic deposits that are approximately 700 feet thick. The upper glacial sands and gravel are separated from the Magothy by the relatively impermeable Gardiners Clay throughout most of the study area. The top of the Magothy is characterized by the presence of lignite and interbedded sands, clays and gravel

The following is a simplified log describing lithology encountered during the installation of one of the municipal water supply wells immediately across Wyandanch Avenue from the subject site. This log describes the Pleistocene deposits and the Upper Cretaceous deposits. Copies of Well Logs for both Municipal Water Supply Wells installed across Wyandanch Avenue for the site were included as an appendix to the Initial Submittal.

Depth	Lithology
Upper Glacial Formation	
0 to 87	Coarse sand and gravel
Magothy Formation	
87 to 137	Fine gray sand, lignite, with streaks of clay
137 to 260	Interbedded gray clay and fine brown sand, micaceous
260 to 288	Dark solid clay
288 to 453	Interbedded gray clay and fine brown sand, micaceous
453 to 488	Dark gray solid clay with some thin sand strips
488 to 669	Fine grained sand with streaks of clay and some lenses of fine grained gravel

The Magothy Formation unconformably overlies the Upper Cretaceous clay member of the Rariton Formation which in turn overlies and confines the Upper Cretaceous Lloyd Sand member of the Rariton Formation. The Rariton Formation overlies Precambrian crystalline bedrock. The total thickness of the unconsolidated deposits in this area is approximately 1350 feet.

The groundwater flow rate in the glacial aquifer ranges from 1 to 4 feet per day with an average of 2.5 feet per day. Measurements collected by GEC indicate that the hydraulic conductivity of the uppermost portion of the glacial aquifer, to a depth of approximately 60 feet, is in excess of 10 feet per day. Slug tests conducted in the deeper portion of the upper glacial aquifer indicate that hydraulic conductivity decreases somewhat with depth. Hydraulic conductivity between 90 and 100 feet below grade was calculated to be approximately 0.54 feet per day. The values of hydraulic conductivity obtained during GEC's investigation are well within the range of conductivity expected for clean gravel and sand deposits. This information also correlates well with literature cited by previous investigations indicating that the

Pleistocene deposits beneath the site (0 to 87 feet below grade) have an estimated permeability of 4.445X10^{-3} cm/sec (12.6 ft/day).

Good vertical hydraulic conductivity exists between the upper glacial aquifer and the Magothy Formation aquifer in most areas across Long Island. However, based on well logs from the nearby water supply well, an interbedded clay unit is present at a depth of 87 feet and extends to a depth of 137 feet. The Magothy Aquifer is most likely unconfined and exists under water table conditions. It is unclear whether this clay unit in the vicinity of the site is continuous, and therefore, forms an aquiclude, or is discontinuous and does not form an aquiclude.

Well log reports indicate that the nearby public drinking water supply wells are screened in the lower portion of the Magothy Formation, between approximately 590 and 670 feet below grade level. Information regarding the two nearby water supply wells indicated that the maximum discharge is between 1,515 and 1,543 gallons per minute, while maintaining a drawdown of approximately 37 feet. Permeability in the upper 173 feet of the Magothy range from 10^{-4} cm/sec to 10^{-7} cm/sec (approximately 2.8 x 10^{-1} ft/day to 2.8 x 10^{-4} ft/day). A clay lens is present in the middle of the Magothy (260 to 288 feet) with permeability in the range of 10^{-8} cm/sec (2.8 x 10^{-5} ft/day. An incomplete report included in previous investigations indicates that horizontal flow in the Magothy is much greater than vertical flow, due primarily to the presence of clay lenses and stratified deposits.

III. PHYSICAL CHARACTERISTICS OF THE SITE AND CONCEPTUAL SITE MODEL

Site investigations have been conducted to determine soil and groundwater conditions in seven areas of potential or confirmed releases. These area are depicted on Figure 3 and include: two former wastewater treatment lagoons; one overflow lagoon; the currently active wastewater treatment lagoons; the area of the building beneath the plating baths and solvent storage tank; a former underground cutting oil storage tank; and a former underground fuel oil storage tank. Figure 4 depicts all of the locations where soil and/or samples have been collected to determine the status of releases and soil and conditions. Figure 4 has been compiled based on review of all investigations cited as appendices to this report. In addition, all laboratory analysis have been summarized and are compiled on Tables 1 through 11.

Existing Soil Conditions

Laboratory analyses of soil samples are summarized on Tables 1 through 5, 9 and 10. As previously noted, nearly all of the investigations regarding soil contamination were conducted in the area referred to as the Rear Yard, where two lagoons and one overflow lagoon were formerly located. The actual investigations to determine soil conditions are described in greater detail in other reports. Briefly, several investigators have conducted test pitting activities and test boring activities throughout the rear yard area. In addition, samples were collected from the leaching pools of the currently active wastewater discharge system. The sample locations are depicted on Figure 4. NOTE: Test pitting sample locations are denoted as B-12-T through B-15-T on Figure 4.

Laboratory results indicate that the soil in the rear yard contains elevated concentrations of several metals, including aluminum, chromium, copper, magnesium, nickel and zinc, as is evidenced by the results of analyses presented on Table 1, 2 and 3. Total concentrations of metals in soil samples collected away from the rear yard exhibit lower concentrations of total metals than samples collected near the former lagoons (Table 2). Soil samples collected as part of the 1991 investigation were also analyzed via TCLP to determine the likelihood that metals would leach and become dissolved in the water column. Results of these analyses are presented as Table 3 and indicate that the leachable concentration of the metals is significantly lower than the total concentration. Direct comparison of the total versus leachable concentrations is most evident on Table 5 where these concentrations are presented "side by side". From this table it is apparent that the leachable concentration is approximately one to two orders of magnitude lower than the total concentration.

Subsurface investigations and laboratory analysis of soil samples indicate that there is evidence that soil conditions in the rear yard have been affected by the historic use of the area as a leaching gallery. However, based on the concentrations of metals present in the soil samples there is no evidence to indicate that remnants of the lagoons remain at the site.

There is evidence from previous investigations that surface soil conditions on an abutting property (50 Oswego) have been contaminated by elevated concentrations of metals resulting from a overflow from the leaching gallery. The degree to which these soils have been contaminated has yet to be determined.

Finally, there is evidence that soil contamination, resulting from the improper discharge of cutting oil is present along the northern property border, and beneath a portion of the site building. Soil contamination in this area is characterized by the presence of free-phase cutting oil and low concentrations of chlorinated compounds associated with the cutting oil. Laboratory analyses regarding this soil contamination is included as Tables 9 and 10.

Existing Groundwater Conditions

Investigations to determine the condition of groundwater at the site were initiated in the rear yard but were later expanded to cover several areas at the site where releases of oil or hazardous materials have been confirmed or suspected. Contaminants detected at the site include metals, associated with the former lagoons, as well as chlorinated volatile organic compounds, which were used as degreasers at the site, and cutting oil. Dissolved-phase chlorinated compounds have also been detected in upgradient wells. The source of these compounds is unknown.

Groundwater samples have been collected from wells across the site on several occasions. Groundwater samples have also been collected from seven of the existing monitoring wells at the site as part of a quarterly groundwater sampling program since 1994. Samples have been analyzed for volatile organic compounds (VOCs), via EPA Method 8260 (or equivalent) on five occasions between January, 1995 and January, 1996.

Data from these regular analyses indicate that relatively low concentrations of chlorinated VOCs are present in the upgradient monitoring well (MW-1). Most of the compounds detected in this well are chlorinated compounds including 1,1,1-trichloroethane (TCA) and its known breakdown products. The source of contamination in MW-1 has not been identified, but is likely one of several industrial facilities located upgradient of the site.

Chlorinated compounds were also detected in monitoring wells located in the immediate vicinity of the trichloroethene storage tank and the plating area, as well as those wells located downgradient of the storage tank. Chlorinated compounds detected in well MW-12, located within the site building, include TCA, cis-1,2 dichloroethene, trans-1,2-dichloroethene and tetrachloroethene. Most recent sampling results (January, 1996) indicate that the concentrations of chlorinated compounds decrease with distance away from the center of the building and with depth in the overburden aquifer. The decrease in concentration with depth in the aquifer indicates that separate-phase chlorinated compounds are not likely to be present in the aquifer. The presence of dense non-aqueous-phase liquids (DNAPL) in the aquifer would likely result in elevated concentrations of chlorinated compounds in samples collected below the water table.

Groundwater samples collected from the site have also been analyzed to determine the concentration of total and dissolved metals. As a result of these analyses, slightly elevated concentrations of metals, in both the total and dissolved state, have been detected in samples collected from across the site, including MW-1, located upgradient, MW-7, located cross-gradient, and MW-5 located downgradient of the building. Concentrations of metals used at the site, including chromium, copper, nickel and zinc do not appear to be present at significantly elevated concentrations.

Groundwater samples were also collected from eight of ten groundwater wells installed as part of the investigation related to the cutting oil release. Two of the ten wells were not sampled due to the presence of LNAPL. Groundwater samples were collected to determine the concentration of VOCs and total petroleum hydrocarbons. Results of these analyses indicate that free-phase petroleum is present over a limited area near the former location of the cesspools (also referenced to as the "bells") but that a plume of dissolved-phase chlorinated compounds extends downgradient of this release source area. Results of groundwater analyses related to the cutting oil release are presented on Table 11. A plan depicting the location of the sampling points related to the cutting oil release is presented as Figure 5.

As part of the RI/FS, GEC will install additional observation wells in order to more accurately determine the effect that the leaching pools, the on-site diffusion well, the currently unused production wells, and the nearby public water supply well have on hydrology. This information will be critical to evaluating the flow path of contaminants at the site. These investigations will be discussed in greater detail in subsequent paragraphs.

Conceptual Site Model

Based on the information collected to date as part of investigations conducted by GEC and others, four separate contaminant releases have been identified. Each of these has affected different media, and as such, is associated with different exposure scenarios. Each of these releases is discussed separately below.

Release 1: Residual Metals Associated with Former Lagoons

Release 1 includes the contaminated soil and groundwater associated with the former wastewater treatment lagoons in the rear yard. Contamination in this area includes metals in soil and groundwater. Based on the information collected to date, the extent of soil contamination appears to be limited to the rear yard area and does not appear to extend off site. Similarly, concentrations of metals in groundwater samples collected downgradient of the rear yard indicate that significant concentrations of metals have not migrated off site.

The following is summary of the metals that have been detected in the soil and groundwater at the site. This table was compiled from information on Tables 1 through 7, attached:

Table III-1

Metals in Soil and Groundwater

Metal	Soil Concentration (Highest) mg/kg	Groundwater Concentration (Highest) mg/L
Aluminum	6,423	Not Sampled
Arsenic	170	0.046
Barium	241	Not Sampled
Chromium (Total)	3,423	8.88
Cobalt	9.85	Not Sampled
Copper	3,375	3.16
Lead	420	0.285
Magnesium	969	Not Sampled
Manganese	420	Not Sampled
Mercury	0.312	0.00082
Nickel	962	4.49

Selenium	5.5	0.0055
Thallium	3619	Not Detected
Vanadium	5.25	Not Sampled
Zinc	859	5.6

Highest Concentrations of Metals in Soil were detected in the vicinity of former lagoons. All soil and concentrations presented as "total metals" and concentrations are in parts per million (ppm)

As part of the RI/FS GEC will evaluate the risk associated with exposure to consider both exposure to personnel working at the site and personnel who may come in contact with subsurface soil during the installation of utilities or during construction activities. There is no evidence that children are routinely present at the site, although children occasionally trespass. No gardening is conducted at the site, which might lead to the adsorption and subsequent ingestion of contaminants. As such, GEC will evaluate the risk posed to children who occasionally come in contact with site soils but will not evaluate the risk posed by a residential use scenario or bioaccumulation and subsequent ingestion of contaminated vegetables that might be produced at the site.

GEC will also evaluate the risk with the consumption of groundwater, presuming the future installation of a water supply well in the shallow sediments at the site. GEC recognizes that the installation of a shallow water table well is extremely remote, however, in our opinion, such a scenario should be evaluated in order to present a very conservative "worst-case" scenario for consumption at the site. The results of this evaluation will be used for comparison to other, more realistic, scenarios.

Release 2: Dissolved Chlorinated Compounds in Groundwater

GEC has identified a release of dissolved-phase chlorinated compounds beneath the site building. Based on the information collected to date, it appears that chlorinated compounds migrated from a degreasing tank, through the floor and into subsurface soil. There is no evidence that a DNAPL plume is present at the site.

Chlorinated compounds are present in the upper portion of the water table aquifer beneath the building, and extend to the southeast, in the direction of groundwater flow. In addition, elevated concentrations of volatile organic compounds, presumably chlorinated compounds, are present in the soil gas beneath the building. Investigations conducted to date indicate that the soil gas contamination does not extend beyond the footprint of the building. It is likely that, given the porous nature of the soil, rapid volatilization occurs once the soil gas plume extends beyond the building's footprint.

It is also important to note that volatile organic compounds have also been detected in samples collected from observation wells located at the upgradient end of the property. As such there is evidence that chlorinated compounds are migrating onto the site from an offsite source.

The following is a brief summary of the chlorinated compounds that have been detected at the site.

Table III-2

Chlorinated Compounds in Groundwater

Compound	Concentration (Highest) ug/L	Location
Chlorobenzene	34	MW-5
1,2-Dichlorobebzene	3	MW-10
1,3-Dichlorobenzene	0.4	MW-5
1,4-Dichlorobenzene	0.6	MW-5
1,1-Dichloroethane	4	MW-2
1,2-Dichloroethane	3.67	MW-1
1,1-Dichloroethene	0.6	MW-2
cis- 1,2-Dichloroethene	1,300	MW-12
trans-1,2-Dichloroethene	930	MW-1
Tetrachloroethene	1,500	MW-2
1,1,1-Trichloroethane	52.4	MW-1
1,1,2-Trichloroethane	0.4	MW-2
Trichloroethene	5400	MW-2
Vinyl Chloride	33	MW-2

"Highest Concentrations" represent the highest concentrations of chlorinated compounds detected by GEC or previous consultants. All concentrations are presented as parts per billion (ppb).

It is probable that soil gas containing chlorinated compounds could migrate into the building and impact indoor air conditions. As part of the RI/FS, GEC will evaluate the presence of chlorinated compounds in indoor air and will determine the risk posed by such contamination. In addition, GEC will determine the extent of chlorinated compounds in groundwater and whether there is evidence that these compounds could pose a threat to either downgradient receptors or the nearby public water supply well. GEC anticipates incorporating information collected from the well installation and sampling activities into a groundwater modeling effort. The modeling effort is described in greater detail in subsequent sections.

Release 3: Surface Release of Metals-Contaminated Wastewater

According to reports prepared by previous investigators, an overflow of the wastewater leaching field led to a release of metals-contaminated wastewater to the lawn of an abutting residential property. As a result, metals-contaminated surface soil may be present. Due to this release, gardening in this area could result in an exposure via dermal contact with metals contaminated soil or the ingestion of contaminated produce.

To determine the presence of metals in surface soil, GEC will conduct sampling of the surface soil at the nearby residential property. Based on this information, GEC will determine the risk posed by the dermal contact with sediments and ingestion of produce grown in the affected sediments.

Release 4: Cutting Oil Release

While conducting quarterly groundwater sampling activities, in the fall of 1994, GEC personnel detected a layer of free-phase petroleum product in an observation well located in the northern portion of the site. This observation well was not being sampled as part of the quarterly sampling project but was being gauged to determine groundwater flow direction. This well is denoted as MW-13 on Figure 4.

Watts and Jameco immediately notified NYSDEC by phone of GEC's discovery. On October 13, 1994, Brian E. Campbell from NYSDEC acknowledged the presence of the petroleum and requested that the monitoring well be inspected on a regular and frequent basis to determine whether the petroleum was persistent or intermittent in nature. NYSDEC also required that the extent of the contamination be determined, via the installation of test borings and monitoring wells, that the petroleum be sampled and identified, and finally, that the contamination be "eliminated".

In response to NYSDEC's requests, Watts personnel collected and submitted for laboratory analysis, a sample of the petroleum product from MW-13. Laboratory analysis of this sample indicated the presence of several petroleum based hydrocarbons and a few chlorinated compounds. Based on this information and the site's history, GEC, Watts and Jameco personnel concluded that the material present in the well was machine cutting oil that had been contaminated with relatively low concentrations of chlorinated compounds.

GEC initiated site investigation activities in the vicinity of observation well MW-13, where free phase petroleum product had been detected. As documented in the Work Plan, GEC intended to perform several test pits at and in the vicinity of MW-13, and install additional groundwater observation wells downgradient of MW-13, in order to determine the source and extent of free-phase petroleum product.

GEC performed an investigation in the vicinity of MW-13 that included the performance of several test pits, installation of ten groundwater observation wells, and excavation of approximately 750 cubic yards of contaminated soil. The results of GEC's investigations are documented in a report entitled Report of Immediate Response Actions at Abandoned Septic System, Jameco Industries, Inc. 248 Wyandanch Ave, Wyandanch, New York, dated October 5, 1995. This report was submitted to Brian Campbell of NYSDEC. Since the completion of the initial response actions, Jameco personnel have been manually removing free-phase petroleum product from two groundwater observation wells for the past four months, and monitoring petroleum accumulation.

The purpose of the soil excavation activities was to remove, where possible, grossly contaminated soil which could act as a source for future soil and groundwater contamination. Laboratory analyses of soil samples collected upon completion of the excavation activities indicates that petroleum hydrocarbons remain in the soil surrounding the excavation. The results of inspection and laboratory analysis of groundwater samples collected from the groundwater observation wells indicates that free- and dissolved-phase hydrocarbons are present in groundwater downgradient of the former septic system. Free-phase petroleum product is present in two wells located approximately 25 and 50 feet downgradient of the release area. Free-phase product was not detected in other downgradient wells, however, dissolved phase contaminants, primarily chlorinated compounds were detected in downgradient wells.

As a result of GEC investigations, the source of the petroleum contamination, namely the cesspool system, has been removed, but free-phase petroleum product, which will likely act as a continuing source of soil and groundwater contamination remains under the site building. Most recent sampling and groundwater gauging indicates that the groundwater petroleum product has not migrated significantly from the source area, and given the nature of the floating product (i.e. a relatively heavy petroleum), and the relatively shallow hydraulic gradient, it is GEC's opinion that rapid migration of free-phase petroleum is unlikely.

As part of the RI/FS GEC will evaluate the risk associated with direct contact with soil (i.e. dermal exposure) considering both exposure to personnel working at the site, and personnel who may come in contact with subsurface soil during the installation of utilities or during construction activities. GEC will also evaluate the risk posed to children who occasionally come in contact with site soils but will not evaluate risk posed by a residential use scenario.

Relative to groundwater, GEC will evaluate the risk with the consumption of groundwater, presuming the future installation of a water supply well in the overburden sediments at the site. GEC recognizes that the installation of a well in the overburden is extremely remote, however, in our opinion, such a scenario should be evaluated in order to present a very conservative "worst-case" scenario for consumption of groundwater at the site. The results of this evaluation will be used for comparison to other, more realistic, scenarios.

IV. WORK PLAN RATIONALE

Each of the four releases discussed in the preceding section will require release-specific sample collection and analysis, in order to evaluate the release-specific risks. In the following paragraphs GEC presents a description of the investigatory and analytical procedures that will be employed at the site to gather information regarding soil and groundwater conditions. The results of these investigations will be used as the basis for the evaluation of risk posed by each of the releases. The Work Plan Rationale has been tailored to be in accordance with the Guidance Document.

A. Investigation of Physical Site Characteristics

Data on the physical characteristics of the site and surrounding areas will be collected to the extent necessary to define potential transport pathways and receptor populations and to provide sufficient engineering data for development and screening of remedial action alternatives. A significant amount of information regarding site conditions has been gathered as part of previous investigations. This information has been summarized in the Initial Submittal report and will not be repeated in this document. Following is a description of the work needed to be consistent with NYSDEC's RI/FS guidance document. This is then compared with the activities already conducted, and a description of the work that will be conducted as part of the RI/FS.

1. Surface Features

The guidance document requires the identification of surface features including the identification of facility buildings, surface disposal areas, fencing property lines and utility lines, roadways and railways, drainage ditches, leachate springs, surface water bodies, vegetation, topography, residences and commercial buildings. Where possible and appropriate, the information regarding site features should also include historical information regarding previous building location and waste disposal history.

A significant amount of information regarding site conditions has been obtained as part of previous investigations. This information has been detailed in the Initial Submittal. Site conditions have remained essentially unchanged since the preparation of the Initial Submittal and the reports referenced therein, the primary exception being that significant advancements have been made as to how wastewater is treated and disposed and how hazardous materials and hazardous waste are handled and stored.

GEC does not anticipate conducting investigations to gather additional information regarding the location and condition of surface features. It may be necessary however to gather additional information regarding property usage in the vicinity of the site in order to evaluate the threat posed to abutters by contaminants originating from the site. [It is important to note that there is no evidence that offsite migration of contamination from the site has occurred.] Information of this nature may include property usage, population density, sources of drinking water and presence of private water supply wells.

2. Geology

Site geology can affect: the depth location and extent of water-bearing units or aquifers; the release of contaminants and their subsequent movement; and the engineering aspects of site exploration and remediation. Site geology includes the soils in the vadose zone, as well as any overburden sediments and bedrock that may underlie the site. The investigation of site geology must be tailored to ensure the identification of those features that will affect the fate and transport of contaminants.

A significant amount of information regarding site geology has already been gathered as part of previous investigations and is reasonably well understood. It is GEC's opinion that little additional information is needed to accurately describe site geology particularly for the purpose of characterizing contaminant fate and transport.

Additional subsurface investigations will be conducted to determine the horizontal and vertical extent of contamination in soil and groundwater. As part of these investigations GEC will also collect soil samples for the purpose of determining sediment characteristics, including, grain size distribution and total organic matter. Plans showing proposed soil and groundwater sample locations are presented as Figure 6 and 7. Soil and groundwater sampling and analysis plans are also included as Tables 12 and 13. This information will be used to further our understanding of site geology and will be used in the calculation of contaminant fate and transport.

3. Surface Water Hydrology

Surface water features may include erosion patterns and surface water bodies such as ditches, streams, ponds and lakes. The transport of contaminants in surface water bodies is largely controlled by the flow. Contaminants have three modes of transport in surface water bodies: 1) sorption onto the sediment carried by the flow; 2) transport as suspended solids; and 3) transport as a solute (dissolved). The guidance document indicates that if potential pathways include surface water, necessary data about impoundments and surface water bodies, including the dimensions and flow characteristics must be obtained.

As indicated in the Initial Submittal, based on review of maps and site reconnaissance, there is no indication that surface water bodies are present in the immediate vicinity of the site. Surface soil and overburden sediments are extremely porous and therefore surface water runoff and precipitation percolate into the subsurface rather than flow overland as streams. Wastewater was formerly discharged to several lagoons in the southeast portion of the site where suspended solids became trapped in the soil matrix and liquid percolated to groundwater. As documented in the Initial Submittal, these lagoons have been closed for several years and are no longer in use. Wastewater is currently discharged to a percolation system, also located in the southeast portion of the site.

The nearest surface water body, as identified on topographic maps of the area is Carlls River which generally flows north to south and is located approximately 0.5 miles east of the site. The Carlls River flows into Belmont Lake, located approximately 0.6 miles southeast and hydraulically downgradient of the site. GEC believes that neither of these surface water bodies could be affected by the release at the site and therefore GEC will not gather additional information regarding the flow characteristics of these surface water bodies. However, in the event that offsite well data and fate and transport calculations indicate the possibility that these surface water bodies could be affected, information regarding these features will be obtained and contaminant migration in surface water will be evaluated consistent with the Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (FWIA) documentation.

GEC will also conduct a site reconnaissance to confirm that there are no unidentified surface water features in the vicinity of the site. In the event that as yet unidentified surface water features are observed, the characteristics (i.e., flow, dimensions, inlets and outlets) will be evaluated with respect to contaminant fate and transport.

4. Hydrogeology

Completion of hydrogeologic assessment involves identifying geologic characteristics, the hydraulic properties of those characteristics and groundwater use. This determination is critical for the evaluation of contaminant fate and transport characteristics. The hydrogeologic assessment should determine regional hydrology as well as site specific characteristics.

As previously discussed, a significant amount of information regarding site geology has already been obtained. Other investigators have conducted literature reviews and compiled investigations regarding larger aquifers in the vicinity of the site and the relationship of overburden sediments to the deeper aquifers that are used as a water supply source in this area. In addition, GEC and other investigators have performed several test borings at the site, installed several observation wells and conducted in-situ tests to determine the hydraulic characteristics of shallow and deeper overburden sediments. Therefore, GEC has a sufficient understanding of hydrogeology in the area.

Regardless, additional information will be obtained to characterize the extent of soil and groundwater contamination. This information will facilitate the calculation of contaminant fate and transport in various media. GEC anticipates collecting a limited number of samples for sieve and total organic matter analysis. See Table 12 and Figure 6 for soil sample locations. In addition, GEC will attempt to gather additional information regarding the usage and pumping rates of the public water supply wells in the vicinity of the site in order to confirm the relationship of the overburden sediments to the deeper water-bearing aquifer.

5. Meteorology

Meteorological data are necessary to characterize the atmospheric transport of contaminants for risk assessment determinations and provide real-time monitoring for health and safety issues. Little information regarding site-specific meteorology has been obtained to date. GEC will obtain information regarding meteorology in the vicinity of the site through local airports, municipal agencies, literature review as well as other sources. GEC will gather information regarding precipitation (frequency, duration and amount) temperature (annual average, seasonal averages, seasonality and extremes) and winds (seasonal direction and velocity).

Information regarding the meteorological characteristics at the site will be used as part of onsite specific air quality exposure model if modeling is deemed warranted. Note: Contamination identified at the site to date consists of metals and chlorinated compounds present in subsurface soil and groundwater. There is no evidence that surface soil, surface water or air has been impacted. The need to conduct air quality modeling or determine the contaminant fate and transport in air will be evaluated at as part of this investigation. The scope of the information obtained regarding meteorological conditions at the site will be dependent upon the need for air quality modeling.

6. Human Population and Land Use

Information is needed to identify, enumerate and characterize human populations potentially exposed to contaminants released from the site. As part of previous investigations a limited amount of information regarding general population characteristics has been obtained. GEC will gather supplemental information regarding population size and location with special attention directed toward identifying and obtaining information regarding sensitive sub populations to better facilitate the characterization of risks posed by contaminants exhibiting special effects.

To determine population and land use characteristics, GEC will visit and conduct interviews at local, and regional planning and zoning offices. GEC will also obtain census track information and will visit the offices of local water authorities to identify potential public and private water supplies in the vicinity of the site. In addition, GEC will conduct a comprehensive well survey in the area of the site. GEC will solicit the assistance of the New York State Department of Health to Develop the survey. The information obtained during this file review will be used to characterize potential exposure scenarios to contaminants originating from the site.

7. Ecological Investigations

Biological and ecological information collected for the use in the baseline risk assessment aids in the evaluation of impacts for the environment and also helps to identify potential effects with regard to the implementation of remedial actions. The information needed includes a general identification of the flora and fauna in and around the site. A particular emphasis is required to identify sensitive environments, especially endangered species and their habitats and those species consumed by humans or found in human food chains.

Little information has been obtained to date regarding the ecological conditions at or in the vicinity of the site. Site reconnaissances conducted as part of previous investigations did not reveal the presence of wetland areas, streams, ponds or other surface water bodies in the vicinity of the site. As noted previously, the nearest major surface water bodies are Carlls River and Belmont Lake, located east and southeast of the site, respectively.

Our current understanding of site conditions is that contamination is limited to metals, dissolved-phase and chlorinated compounds, and cutting oil in the soil and groundwater. Therefore, the most likely impact to an ecological receptor would include discharge to surface water at Carlls River or Belmont Lake. GEC will gather preliminary data at local and regional governmental agencies to confirm whether potential ecological receptors are present in the area. At this time, GEC will also gather information regarding the ecological status of Carlls River and Belmont Lake. If, as a result of the contaminant fate and transport modeling (discussed below), there is evidence that contaminant migration to an ecological receptor could occur, GEC will conduct additional file reviews as necessary to gather more information regarding these potential ecological receptors.

B. Definition of Sources of Contamination

Source characterization involves the collection of data describing: 1) facility characteristics that help to identify the source location, potential releases, and engineering characteristics that are important in the evaluation of the remedial action; 2) the waste characteristics, such as the type and quantity of contaminants that may be contained in or release to the environment; and 3) the physical or chemical characteristics of hazardous waste present in the source. The location and type of existing contaminants should be determined for all known sources.

Numerous investigations have been conducted to date to determine the source of contamination at the site. As a result of these investigations, four contaminant sources have been identified as summarized below.

Source 1: Residual Metals Associated with Former Lagoons

Source 1 includes the presence of contaminated soil associated with the former wastewater treatment lagoons in the rear yard. Contamination in this area includes metals in soil and total and dissolved metals in groundwater.

Investigations conducted to date indicate that much of the sludge associated with the former lagoons was excavated for offsite disposal at a hazardous waste facility. The lagoons and sludge were the original source of contamination. Currently, it is unclear if residual soil contamination is also acting as a source of contamination to soil and groundwater. There is no evidence that other contaminants (e.g., polychlorinated biphenyls (PCBs), pesticides, herbicides, VOCs) are present or were discharged from this source.

Source 2: Chlorinated Solvent Tank

Source 2 is an existing above-ground tank used for the storage of chlorinated compounds located inside near the center of the site building. Based on investigations conducted to date, GEC has concluded that a relatively small volume of chlorinated compounds has migrated through the building floor which has affected the underlying soil and groundwater. There is no evidence that a DNAPL plume is present at the site, however, it is likely that the contaminated soil beneath the building slab is acting as a continuing source of soil and groundwater contamination.

Based on the information collected by GEC and others, chlorinated compounds are present in the shallow portion of the aquifer beneath the building, and extending to the southeast, in the direction of groundwater flow. In addition, elevated concentrations of volatile organic compounds, presumably chlorinated compounds, are present in the soil gas beneath the building. Investigations conducted to date do not indicate that the soil gas contamination extends beyond the footprint of the building, and it is likely that given the porous nature of the soil, rapid volatilization occurs once the soil gas plume emanates beyond the building's footprint.

Source 3: Metals-Contaminated Wastewater

Wastewater from the plating operation is pretreated and then directed to a leaching field where it discharges to groundwater. The leaching field has contaminated the site through the infiltration of metals-contaminated wastewater. In addition, according to reports prepared by previous investigators, an overflow of the wastewater leaching field led to a release of metals-contaminated wastewater to a nearby residential property. As a result, the wastewater system is also a source of on-site and off-site surface soil contamination.

GEC has conducted investigations at the site to determine the concentrations of metals at the leaching field in soil and groundwater. Further, samples of the wastewater are collected on a periodic basis for metals analysis.

Source 4: Cutting-oil Contaminated Soil and Groundwater

As documented in the preceding paragraphs, cutting oil, contaminated with low concentrations of chlorinated organic compounds, was discharged to subsurface soil and groundwater via a series of infiltration basins. The system is no longer is use and approximately 750 tons of contaminated soil, which could act as a continuing source of groundwater contamination, has been removed. However, soil and groundwater contamination remain both outside and within the building footprint. Soil contamination appears to extend from a depth of approximately nine feet blow grade to approximately twelve to fifteen feet below grade. NAPL is also present under the building at a depth of approximately ten feet below the ground surface.

As part of previous investigations several groundwater observation wells were installed, both inside and outside the site building. During well installation, soil and groundwater samples were collected for laboratory analysis. Results of these analyses are included on Tables 9, 10 and 11, attached. As a result, the extent of soil and groundwater contamination associated with this release is very well defined.

C. Determination of Nature and Extent of Contamination

The primary objective of planned field investigations is to characterize the nature and extent of contamination such that informed decisions can be made as to the level of risk presented by the site and the appropriate remedial response. This process involves using the information on source location and physical site data to give a preliminary estimate of the locations of contaminant that may have migrated. An iterative monitoring program may be implemented so that the concentrations and locations of contaminants that have migrated into the environment can be documented.

It is Watts and GEC's understanding that all parties (i.e., Watts, GEC and NYSDEC) agree that determining the nature and extent of contamination at the site will include a characterization of soil and groundwater characteristics through traditional sampling techniques. The extent to which contamination has migrated offsite, and the risk that might be posed by such contamination, will be evaluated through the use of predictive models. With the exception of limited surficial soil sampling, no offsite sampling or analysis will be conducted as part of this RI/FS.

GEC proposes to conduct field investigations in two phases. The first phase is intended to gather all necessary information to delineate the source and extent of Sources 1, 2 and 3, but not Source 4, the cutting oil release. Watts and GEC are currently performing a Interim Remedial Measure (IRM) for the cutting oil release and feel that final evaluation of the extent of the release and the risk posed by this release should not be initiated until after the IRM is complete.

The second phase of the investigation includes the collection of soil and groundwater samples to determine the extent of contamination associated with the cutting oil release. Based on the information collected to date, GEC presumed that the installation of additional groundwater observation wells and test borings to determine current soil and groundwater conditions will be necessary.

First and second phase investigation activities are documented in the following paragraphs. Details regarding well construction, and sampling procedures for soil and ground water is described in appendices to this report.

1. Groundwater

The nature and extent of contamination in groundwater will be evaluated both horizontally and vertically. On the basis of geologic and hydrogeologic investigations, GEC will determine if contamination of an aquifer is possible and if such contamination could potentially affect human or environmental receptors. As part of this assessment, the flow direction, and flow rate will be determined, as will contaminant fate and transport characteristics.

Groundwater conditions at the site are well understood. Because a great deal of information regarding on-site groundwater conditions exists, GEC's investigations will be directed toward: 1) refining information regarding the extent to which contamination may have migrated off the site to the south of the Jameco property; and 2) gathering information necessary to develop accurate predictive models to determine the extent and risk posed by off site contamination. Upon completion of site investigations, monitoring well elevations will be determined by a New York State housed surveyor.

Installation of Additional Groundwater Observation Wells

GEC proposes to install one additional groundwater observation well at the site. This well is denoted MW-25 and is depicted on Figure 7. MW-25 will be installed along the southern perimeter of the site. This well is intended to better characterize the extent of groundwater contamination that may be migrating toward downgradient residential properties. The newly installed well will be constructed in accorance with NYSDEC protocols. It will be constructed with 15 feet of screen and will extend to a depth of approximately 10 feet below the apparent water table.

Geoprobe Investigation

In accordance with the requests of NYSDEC, GEC will conduct an offsite investigation using Geoprobe technology to determine offsite groundwater conditions. As part of this investigation five offsite Geoprobe sampling locations will be selected in the area immediately south and southeast of the facility - hydraulically downgradient of the site. The exact location has yet to be determined, but will likely be within the public right-of-way of roadways. Groundwater will be sampled at the water table and then every ten feet vertically to a depth of fifity feet. Prior to choosing geoprobe locations an additional round of water levels will be acquired to determine groundwater flow direction.

Groundwater samples will be collected and submitted for laboratory analysis. Geoprobe locations will be denoted GP-101 through GP-105. At each location the top and bottom samples will be submitted for volatile organic compounds (EPA 8260). In addition, all samples will be submitted for Dissolved Priority Pollutant Metals and Hexavalent Chrome (See Table 13).

The need for permanent offsite wells will be evaluated based on the results of the Geoproble Investigation.

Groundwater Sampling and Analysis

Groundwater at the site has been sampled on a quarterly basis since August, 1994. Prior to the initiation of the quarterly sampling, groundwater samples were collected from on-site observation wells as part of other investigations. As a result of this sampling, groundwater at the site has been well characterized and there is little need for significant additional groundwater sampling. However, in order to accurately characterize groundwater conditions to determine fate and transport, and the potential risk posed by groundwater contamination, some additional groundwater sampling is necessary.

The proposed groundwater sampling plan is included on Table 13. GEC proposes to complete two comprehensive groundwater sampling rounds. Groundwater samples will be collected from several of the existing and newly installed wells. The first round of groundwater sampling will be conducted soon after all of the proposed groundwater observation wells have been installed. During this initial round groundwater samples will be collected to determine the source and extent of the releases associated with Source 1, Source 2 and Source 3. Samples will be analyzed for volatile organic compounds (via EPA Method 8260) 13 Priority Pollutant Metals (total and dissolved) and hexavalent chromium (total and dissolved). As Table 13 indicates, groundwater samples collected quarterly are analyzed for total metals, however, it is also important to understand the relationship between the total concentration and the dissolved concentration. Groundwater samples submitted for metals analysis will not be field filtered.

The second comprehensive round of groundwater sampling will be conducted after implementation and operation of the cutting oil IRM (Source 4) and will include analysis for volatile organic compounds (VOCs) and polycyclic aromatic hydrocarbons (PAHs).

Groundwater Modeling - Fate and Transport

GEC will use predictive groundwater flow models and algebraic equations to predict offsite groundwater flow direction and contaminant fate and transport characteristics.

Using existing information, GEC will construct a three-dimensional model of groundwater flow using MODFLOW - a modular, three-dimensional, finite-difference groundwater flow model, created by the United Stated Geological Service. MODFLOW is a well-accepted groundwater flow model and has been used in numerous applications. Information from the model will be used to calculate the likely direction of contaminant migration, which in turn will be used to calculate contaminant concentrations at potential exposure points.

Based on the information collected to date, GEC anticipates calculating contaminant concentrations at three potential exposure points: 1) private water supply wells or irrigation wells installed in overburden sediments (i.e. water table wells) at residential properties downgradient of the site; 2) groundwater discharge to surface water bodies (Carlls River and Belmont Lake) located downgradient of the site and; 3) water pumped from the municipal water supply well, located immediately north of the site.

2. Soil

GEC will evaluate the horizontal and vertical nature and extent of contamination in soil. On the basis of site investigations, GEC will determine whether site contamination is relatively homogeneous or whether discrete hot spots exist; will quantify the degree of soil contamination in order to determine if such contamination could potentially affect human or environmental receptors; and will evaluate fate and transport characteristics.

Soil contamination at the site is well understood and is primarily the result of former wastewater disposal practices. Numerous test borings have been performed in the southeastern portion of the site, where the wastewater lagoons were formerly located, and in the vicinity of the former cutting oil leaching pools. Considering the abundance of information available, GEC will conduct a targeted, and concentrated soil sampling program designed to supplement information regarding potential exposure point concentrations and to gather information required to predict contaminant fate and transport characteristics.

GEC proposes the performance of eighteen test borings. Eleven of the test borings will be performed using a truck-mounted rotary drill rig, with three of the eleven finished as groundwater observation wells. Seven of the test borings will be performed manually. Soil sampling locations are presented on Figure 6 and analyses are included as Table 12.

All soil borings, except those performed manually (i.e., HB-1 through HB-7) will be completed using a rotary drill rig driving hollow-stem auger. Soil samples will be collected in accordance with ASTM standard methods.

Each soil sample will be screened for total ionizable compounds (TICs) using a photo ionization detector. The test borings will extend to a depth of approximately 20 feet below grade or at least five feet below the groundwater level if the test boring is to be completed as an observation well. Soil samples will be collected at intervals not to exceed five feet.

All soils for analysis will be collected using pre-cleaned sampling equipment. Soil samples will immediately be placed in appropriate sample containers for shipment to the laboratory. In addition, all soil samples will be characterized on site by a geologist. Soil characteristics will be recorded on prepared forms to document stratigraphy and fill characteristics, including any unusual odors, discoloration or appearance. Drill cuttings excavated during soil borings will be returned to the bore hole. Thereafter the bore hole will be sealed with cement. Drill cuttings encountered during well installation will be stockpiled on 3-5 mil. plastic and will be sampled and disposed of appropriately.

Test Boring MW-25

MW-25 will be installed along the southern perimeter of the site. This boring will be performed to obtain information regarding soil conditions in this area for evaluation of the risk that may be posed to nearby residences and to more accurately define the extent of soil contamination.

The primary contaminants of concern in this area are volatile organic compounds that may have migrated from beneath the site building. As such, soil samples will be collected in both borings at depths of 0 to 2 and 5 to 7 feet below grade for VOC analysis. In addition, soil samples will be collected during the performance of boring MW-25 at depths of 10 to 12 feet, for VOC analysis, and from 15 to 17 feet, for sediment characteristics, including cation exchange capacity, total organic matter and sieve analysis. Information regarding sediment characteristics will be used to determine contaminant fate and transport.

Test Borings B-27, and B-28

Test borings B-27 and B-28 will be performed through two storm drains located southeast of the site building in an area currently used for storage of scrap metal. This area also serves as one of two primary material loading and unloading areas. Test borings will be installed between the site building and an area where a wastewater treatment lagoon was formerly located, and directly through the storm drains as directed by the Suffolk County Department of Health. The installation of test borings in this area will provide information regarding contaminant concentration in this area. In addition, the sediment characteristics will also be determined in order to model contaminant fate and transport across the site.

Primary contaminants of concern in this area are metals and volatile organic compounds. Soil samples will be collected during the performance of both borings from depths of 0 to 2 feet, 5 to 7 feet, and 10 to 12 feet below the bottom of the storm drain grade for 13 Priority Pollutant Metals (total), hexavalent chromium (total) polycyclic aromatic hydrocarbons and VOC's.

Test Borings B-29, B-30 and B-31

Test borings B-29, B-30 and B-31 will be performed in the area of the site formerly used for wastewater disposal, also referred to as the rear yard. During previous investigations, numerous test borings were performed in this area to determine the extent of metals contamination and to confirm that all sludge, accumulated as a result of the use of the lagoons, had been removed. The purpose of these test borings will be to confirm current soil conditions, with respect to metals contamination, and to determine whether soils have been affected by volatile organic compounds.

Soil samples will be collected during the performance of all three borings from depths of 0 to 2 feet, 5 to 7 feet, and 10 to 12 feet below grade for volatile organic compounds. In addition, one sample from each of the borings will be submitted for 13 Priority Pollutant Metals (total) and hexavalent chromium (total). GEC intends to submit the 0 to 2 foot sample from B-29, the 5 to 7 foot sample from B-30 and the 10 to 12 foot sample from B-31 for metals analysis.

Test Borings B-32, B-33 and B-34

Test borings B-32, B-33 and B-34 will be performed in the area currently used as the wastewater leaching gallery to determine the current concentration of metals and volatile organic compounds in surface and shallow subsurface soils. Wastewater has been discharged to the leaching gallery in this area since the lagoons were closed several years ago and there have been several instances when the flow into the gallery has exceeded the gallery's infiltration capacity, resulting in wastewater overflowing onto surface soils. These test borings will be performed to determine current soil conditions and to gather information to model contaminant fate and transport characteristics.

GEC will perform three test borings in the leaching gallery area. Samples will be collected from each of the borings at depths of 0 to 2 and 5 to 7 feet below grade level. All soil samples will be analyzed to determine the concentration of volatile organic compounds, 13 Priority Pollutant Metals (total) and hexavalent chromium (total).

Test Boring B-35

In accordance with NYSDEC requests, B-35 will be installed to determine site specific background concentrations of polycyclic aromatic hydrocarbons (PAHs) and metals.

Hand Borings HB-1 through HB-7

As noted in the preceding paragraph, the leaching gallery used for the disposal of wastewater has periodically overflowed. On one occasion, wastewater flowed onto an abutting residential property, listed as 50 Oswego Avenue. Hand borings HB-1 through HB-7 will be performed on the residential properties that immediately abut the leaching gallery. The purpose of these borings is to document the concentration of metals and chromium on surface soils at these residences.

GEC will perform these seven borings manually, using a stainless steel, two-inch diameter bucket auger. Samples will be collected from each of the borings from 0 to 3 inches and at 2 feet below grade level. All soil samples will be analyzed for volatile organic compounds, 13 Priority Pollutant Metals (total) and hexavalent chromium (total). Prior to the performance of the hand borings, advance notice will be given to the resident(s) of 50 Oswego to ensure access to the property. Additional anecdotal information concerning the affected area will be obtained from the resident prior to collecting samples to direct sampling and provide data representative of the release. GEC will attempt to determine if soils in the affected area have been removed and/or covered since the wastewater release occurred. Particular attention will be given to any visually stained soils and areas with stressed vegetation.

Other

Numerous soil samples were collected during the installation of groundwater monitoring wells during the investigation of the cutting oil release. Therefore, soil conditions prior to the implementation of the IRM are well understood. GEC anticipates that a limited test boring program may be necessary to document soil conditions after implementation of the IRM. The exact location of the soil borings will be determined upon completion of the IRM.

3. Surface Water

Leachate from contaminant sources or discharge of contaminated can result in the contamination of surface waters. Surface water sampling locations may be chosen at the perceived location of contaminant entry to the surface water and downstream to document the extent of contamination.

Based on site investigations conducted to date it is extremely unlikely that a release to surface water has occurred. The nearest surface water body is approximately 0.5 miles from the site and given the attenuation observed at the site, the possibility that detectable concentrations of site contaminants would reach surface water bodies is remote.

As part of the investigations proposed at the site, GEC will construct a model using data generated during the site investigation. This model will be used to, among other things, confirm that a release to surface water is unlikely. If the model indicates that a contaminant plume originating from the site could impact surface water, GEC will prepare and implement a sampling plan to determine surface water conditions. Otherwise, no surface water sampling is proposed as part of this investigation.

4. Sediments

A potentially more serious and common problem associated with surface water is the contamination of sediments. Whereas contamination in surface water tends to become diluted or transformed as it travels downstream, contaminants deposited in sediments tend to remain in place.

It is therefore important to monitor for sediment contamination if surface water contamination is suspected.

As previously discussed, there is little likelihood that site contamination will affect surface water or sediments. Therefore, GEC will evaluate the need to conduct sediment sampling upon completion of the modeling effort. If necessary, a sediment sampling plan will be prepared.

5. Air

Volatilization of organics and emissions of airborne particulates can be a concern at hazardous waste sites. Though there is no evidence that past releases have resulted in air emissions, GEC is recommending a field screening program to confirm that there is no air pollution issue. The field screening program may indicate that additional analyses or implementation of a complete air monitoring program are warranted.

As part of previous investigations, a soil gas survey was conducted to determine whether the release of chlorinated compounds, detected beneath the building, had affected sub-slab soil gas conditions. As a result of this investigation, elevated concentrations of volatile organic compounds were detected in the soil pore space beneath the site building. GEC is currently designing a soil vapor extraction (SVE) system which will be installed as part of an Immediate Response Measure (IRM). The installation of the SVE system is intended, and expected, to mitigate the migration of volatile contaminants from beneath the building into the work space.

Samples of soil gas will be collected during and after installation of the SVE system as a means of monitoring system operation. As such, GEC does not anticipate that additional sampling of indoor air will be necessary.

V. DATA EVALUATION AND RISK ASSESSMENT

The data collected from field investigation activities will be evaluated throughout the remedial investigation process. GEC's initial focus will be the further development or refinement of the conceptual site model, described in Section III. In particular, the data evaluation process will focus on the current extent of contamination, estimating the travel time to potential exposure points, and predicting contaminant concentrations at potential exposure points. The data collected will be evaluated to further characterize the following: the site's physical characteristics; the sources of contamination; the nature and extent of contamination; the contaminant fate and transport pathways; and components of the site's baseline risk assessment, including contaminant identification, exposure assessment, toxicity assessment, and risk characterization.

The remedial investigation will be conducted as an iterative process. After each phase of data acquisition, the data will be evaluated to determine whether it meets the data quality objectives. If warranted, during subsequent steps, the investigatory and analytical procedures will be modified from those proposed in the RI/FS Work Plan. Data acquisition and evaluation will continue until all data quality objectives are met, the need for remediation is determined, and sufficient data exist for the development and evaluation of remedial alternatives.

Data evaluation will be conducted by an interdisciplinary team comprised of a hydrogeologist, risk assessor, and engineer. Data reduction will be conducted during this process, in order to present data in a manner meaningful to each of the site characteristics identified above. Tables, charts, graphs, and plans will be used to present interpretations of the data concisely. Provided below is a description of the data evaluation process, followed by the risk assessment work plan.

A. Data Evaluation of Site Characteristics

1. Site Physical Characteristics

The RI/FS Work Plan has been designed to collect data regarding, or calculate estimates of, site physical characteristics. For this site, information important for characterizing fate and transport processes includes stratigraphic and geologic properties (e.g., topography, ground cover, soil composition, intrinsic permeability, organic carbon content, percent moisture, and cation exchange capacity) and hydrogeologic properties (e.g., depth to groundwater, vertical and horizontal groundwater gradient, flow direction, hydraulic conductivity, communication between aquifers, and discharge to surface waters).

These properties will be defined by direct measurement of field conditions, calculations using field data and literature values, and modeling of hydrology using MODFLOW. Sufficient data will be collected to define site physical characteristics in both the saturated and unsaturated zones. Ecology is expected to be less important for defining physical site characteristics, because ecological resources are not located in the immediate vicinity of the site. Meteorological characteristics will be important for estimating dispersion of dusts generated from surface soils, or dispersion of vapors and dusts during excavation activities.

Data reduction will be accomplished using tables, charts, graphs, and plans. In particular, data will be presented in the following formats: soil boring logs; monitoring well diagrams; groundwater contour plans; stratigraphic cross sections; charts showing calculations of intrinsic permeability, hydraulic gradient, hydraulic conductivity, hydraulic flow rate; tables showing organic carbon content, percent moisture, cation exchange capacity, and depth to groundwater and groundwater elevation; and a wind rose. Results of hydrologic modeling using MODFLOW will be summarized in tables and on plans, and the model input and output parameters attached in an appendix.

The data will be evaluated to determine if they provide a representative, reasonably accurate or conservative description of physical site conditions, and to determine if they provide adequate input parameters for estimating fate and transport processes. If not, additional data will be collected. The limitations and uncertainties in the data collection or estimation process will be continuously evaluated. Whenever the limitations or uncertainties are unacceptable, additional data will be collected or overly conservative estimates of physical site conditions will be used.

2. Source Characteristics

The RI/FS Work Plan has been designed to further characterize known release sources of hazardous substances. Four source areas have been identified. The field investigation is designed to determine the vertical and horizontal boundaries, and magnitude of the release from each source area. The volume of the release at each source area will be calculated based on data collected from soil and groundwater sampling and analysis. If needed, the sampling network will be expanded to determine the boundaries of the source areas.

Analytical data will be presented in tabular form, with a plan depicting the source areas and the hazardous substances associated with each source area. The chemical and physical properties of, and information regarding the mobility and persistence of these hazardous substances will be obtained from the scientific literature, including reference sources of the U.S. Environmental Protection Agency. This information will be presented in charts for use when evaluating fate and transport processes.

3. Nature and Extent of Contamination

The concentrations of each hazardous substance in soil, groundwater and soil vapor will be directly measured by collecting samples for analysis. Levels of hazardous substances in indoor air and ambient air will be estimated using models, which are further described in the section on Fate and Transport Pathways.

Data will be reduced and presented in tabular and graphical form. Isocons of contamination for groundwater, soil, and soil vapor contamination will be presented on plans of the study area.

Following each round of data collection, the collected and derived information will be evaluated to determine if hazardous substance concentrations have been collected or estimated for all potential fate and transport pathways. Concurrent with this evaluation, the data will be evaluated to determine if it is valid and representative of site conditions. Based on this evaluation, the field investigation or modeling plan will be revised, as necessary, to investigate each potential location where hazardous substances may come to exist and to derive exposure point concentrations for the risk assessment.

Based on prior analyses, the identity of site-specific hazardous substances has been determined. This list is subject to change based on ongoing field investigations. Table V-1 shows locations that have been identified as potential areas where site-specific hazardous substances may come to exist. Also provided in the table is a description of the data to be evaluated.

Table V-1

Location	Potential Site-Specific Hazardous Substances	Data to be Evaluated
Shallow Aquifer: on site	VOCs, metals, petroleum hydrocarbons	Groundwater monitoring; LNAPL gauging
Deeper Aquifer: on site	VOCs, metals, petroleum hydrocarbons	Groundwater monitoring; MODFLOW; arithmetic or numerical modeling of fate and transport (if needed)
Shallow Aquifer: off site	VOCs, metals, petroleum hydrocarbons	Geoprobe Investigation: MODFLOW; arithmetic or numerical modeling of fate and transport (if needed)
Deeper Aquifer: off site	VOCs, metals, petroleum hydrocarbons	Geoprobe Investigation: MODFLOW; arithmetic or numerical modeling of fate and transport (if needed)
Surface soils: on site	Metals	Soil sampling and analysis
Subsurface soils: on site	Metals, VOCs, petroleum hydrocarbons	Soil sampling and analysis
Surface soils: off-site residential properties	Metals	Soil sampling and analysis
Indoor air: on-site facility	VOCs	Groundwater monitoring; soil vapor monitoring; arithmetic or numerical modeling of vapor transport into building
Indoor air: off-site residences	VOCs	Groundwater monitoring; groundwater flow direction and rate; arithmetic or numerical modeling of soil vapor levels and vapor transport into building
Ambient air: on site	Vapor - VOCs Particulates - metals and petroleum hydrocarbons	Monitoring and arithmetic or numerical modeling
Ambient air: off site	Vapor - VOCs Particulates - metals and petroleum hydrocarbons	Monitoring and dispersion modeling

The data collected consistent with Table V-1 will be used to describe the current impacts to environmental media. Specifically the horizontal and vertical extent of hazardous substances in soil and groundwater, impacts to the sediments of storm drains and dry wells, and estimates of levels in indoor air of the facility and abutting residences, and estimated levels in ambient air will be determined. The potential for future impacts to the aquifer beneath the clay layer, and to the municipal wells intercepting groundwater in this deeper aquifer will be evaluated via modeling, as described in the Fate and Transport Pathways section. Biota and surface water are unlikely to be impacted by hazardous substances originating from this site, because no environmental resources are located in the immediate vicinity of the site.

Using a substantial amount of analytical data that exists for the site, the data can be evaluated to determine if spatial or temporal trends in hazardous substance dispersion exists. The potential for cross-media contamination (e.g., the potential for one environmental media to act as a source of contamination for a second environmental media) will be evaluated as described in the Fate and Transport Pathways section.

4. Fate and Transport Pathways

Fate and transport pathways are used to: (1) identify or rule out potential exposure points while determining exposure point concentrations for each hazardous substance for the risk assessment; (2) determine if one media is acting as a continuing source of contamination to another media; and (3) evaluate remedial alternatives.

Fate and transport pathways applicable to the site will be identified by evaluating site physical characteristics, source characteristics, and nature and extent of contamination. Based on a preliminary evaluation of existing information, Table V-1 identified the fate and transport pathways that are potentially relevant to the Jameco facility. Also provided are the hazardous substances relevant to the pathway, and the data to be collected, if warranted, and evaluated to determine whether the pathway is significant to the site.

Table V-2

Potential Fate and Transport Pathway	Potential Site-Specific Hazardous Substances	Data to be Evaluated
Leaching from soils	VOCs	Arithmetic or numerical modeling of leaching to groundwater using data on soil characteristics, including organic carbon content, contaminant levels, and physical and chemical properties of the contaminants
Leaching from soils	Metals	Leachate testing; Arithmetic or numerical modeling of leaching to groundwater using data on soil characteristics, including cation exchange capacity, contaminant levels, and physical and chemical properties of the contaminants
Vapor migration in unsaturated zone to inside buildings	VOCs	Groundwater monitoring; soil sampling and analysis; soil vapor monitoring; groundwater flow rate and direction; arithmetic or numerical modeling of vapor transport into building
LNAPL plume migration	Petroleum hydrocarbons	Gauging of monitoring wells
Groundwater plume migration - horizontally	VOCs, metals	Groundwater monitoring; groundwater flow rate and direction; MODFLOW to model hydrology; airthmetic or numerical modeling of groundwater plume migration, if needed
Groundwater plume migration to aquifer below clay layer, and to municipal wells	VOCs, metals	Groundwater monitoring; groundwater flow rate and direction; MODFLOW to model hydrology; airthmetic or numerical modeling of groundwater plume migration, if needed
Surficial runoff to neighboring residences	Metals	Soil sampling and analysis

Surficial runoff to dry wells and catch basins	VOCs, metals, petroleum hydrocarbons	Sediment sampling and analysis
Dispersion of dusts and vapors in ambient air	VOCs, metals, petroleum hydrocarbons	Soil sampling and analysis; arithmetic or numerical modeling of dispersion

Soil sampling data, leachate testing, and simple analytical numerical modeling will be used to characterize leaching of metals and volatile organic compounds to groundwater. Analytical or numerical modeling will be used to estimate the direction of groundwater plume migration, rate of migration, and potential contaminant concentrations. Soil vapor monitoring and simple analytical modeling will be used to characterize vapor transport to building interiors, and estimate concentrations inside the buildings. Conservative assumptions regarding site conditions will be used when modeling to account for sandy soil conditions, and to compensate for limitations or uncertainties in the input parameters or in the models themselves. Emphasis will be placed on obtaining conservative estimates of transport. Limitations and uncertainties regarding the models and input parameters will be identified and evaluated to determine if they are acceptable. If needed, more conservative, numerical modeling will be conducted to obtain more realistic estimates of transport.

Data reduction will be conducted, and data will be presented in charts and figures showing the projected direction and bounds of contaminant migration. Documentation for all calculations and models will be provided in appendices. Input parameters, tabulated for ease of evaluation, and model selection will be explained and justified in the documentation. The results of the modeling efforts will be presented in summary tables and figures. The results of the fate and transport pathway analysis will be evaluated to determine if the data quality objectives are met.

B. Baseline Risk Assessment

A baseline risk assessment will be conducted following completion of the investigation and evaluation of site characteristics. The baseline risk assessment provides an evaluation of the potential threat to health and the environment assuming no remedial action at the site. The results of the risk assessment are used to determine whether a remedial action is necessary for an exposure pathway and also to evaluate the effectiveness of potential remedial alternatives. The four components of the risk assessment process, i.e., contaminant identification, exposure assessment, toxicity assessment, and risk characterization, are described below in terms of the RI/FS process at the Jameco site. The work plan for the baseline risk assessment will be modified, as appropriate, upon completion of the field investigation portion of the Remedial Investigation. The baseline risk assessment will be conducted consistent with the *Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part A)* by the U.S. Environmental Protection Agency (USEPA) (EPA/540/1-89/002, December 1989).

1. Contaminant Identification

A substantial amount of analytical data exists for the site. Based on this data, summarized in Tables 1 to 11, Table V-3 lists the hazardous substances have been identified in soils or groundwater at the site. Some of these substances have been detected infrequently, and at low concentrations.

Following completion of the field investigation, the data will be further evaluated to identify site-specific contaminants of concern for the risk assessment. Background concentrations of metals, frequency and levels detected of each hazardous substance, toxicological properties and mobility of each hazardous substance will be evaluated to identify the contaminants of concern.

Table V-3

Volatile Organic Compounds	Metals	Other Substances
Acetone	Aluminum	Petroleum hydrocarbons
n-Butylbenzene	Antimony	Sulfide
sec-Butylbenzene	Arsenic	
Chlorobenzene	Barium	
Chloroform	Beryllium	
Chloromethane	Cadmium	
1,1-Dichloroethane	Chromium	

cis-1,2-Dichloroethane	Cobalt	
Ethylbenzene	Copper	
p-Isopropyltoluene	Lead	
Methylene chloride	Magnesium	
4-Methyl-2-pentanone	Magnesium	
Naphthalene	Mercury	
n-Propylbenzene	Nickel	
1,1,2,2-Tetrachloroethane	Selenium	

Table V-3
(continued)

Volatile Organic Compounds	Metals	Other Substances
Tetrachloroethene	Silver	
Toluene	Thallium	
1,2,3-Trichlorobenzene	Vanadium	
1,1,1-Trichloroethane	Zinc	
1,1,2-Trichloroethane		
Trichloroethene		
1,2,4-Trimethylbenzene		
1,3,5-Trimethylbenzene		
Vinyl chloride		
Xylenes (Total)		

2. Exposure Assessment

An exposure assessment will be conducted consistent with the USEPA guidance documents entitled, *Superfund Exposure Assessment Manual* (EPA/540/1-88/001, April 1988), *Exposure Factors Handbook* (EPA/600/8-89/043, March 1989), and *Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors"* (OSWER Directive 9285.6-03, 1991). Alternative exposure factors may be appropriate in some instances based on an evaluation of site-specific factors. Following completion of the field investigation, data evaluation of site characteristics, and final refinement of the conceptual site model, exposure scenarios will be developed. The exposure scenarios will be developed in three steps: (1) identification of actual or potential exposure pathways; (2) the characterization of the actually or potentially exposed population; and (3) determination of the extent of exposure.

a. Actual or Potential Exposure Pathways

Based on the available information, several scenarios exist which may be actual or potential exposure pathways related to the site. These scenarios, described in Table V-4, will be further evaluated to determine which are actual exposure pathways. This process requires: confirming the sources of contamination; determining the nature, magnitude and extent of contamination for each hazardous substance; identifying actual or potential migration pathways; and reviewing information regarding land and water use, and population characteristics.

If contamination is demonstrated to have no potential to exist at a potential exposure point, by both direct measurement and evaluation of fate and transport pathways, then the scenario will not be considered an actual or potential exposure pathway. Similarly, if no actual or potential exposed population is identified, then the scenario is not considered a possible exposure pathway. Following each round of investigation, the data will be evaluated to determine if other actual or potential exposure pathways exist. Provided in Table V-4 is a preliminary assessment of each exposure scenario. Also provided is an assessment of each scenario's likelihood of being an actual or potential exposure pathway, given the available data.

Routes of exposure, such as ingestion, inhalation, and dermal contact, will be evaluated based on the exposure point. For the Jameco site, a preliminary evaluation of applicable routes of exposure for each scenario are provided in Table V-4.

b. Actual or Potentially Exposed Populations

Based on the available information, actual or potentially impacted populations have been identified for each potential exposure scenario. The Jameco facility is currently zoned and used for manufacturing purposes. Future use of the facility will likely remain manufacturing or other industrial or commercial operations. A production well exists at the site; although not currently in use, its future use can not be precluded at this time. Portions of the site are enclosed by a five-foot fence topped with approximately 1 foot of barbed wire. Workers have access to all areas of the property. Construction workers, utility workers, and visitors are at the site on occasion. During GEC's inspection of the facility, the presence of graffiti, abandoned bikes, and other artifacts suggests that children may trespass at the site on occasion.

Abutters include other industrial and commercial businesses, as well as residents. Swing sets, bikes, sleds and other toys located on the residential properties indicate the presence of children. No vegetable gardens were noted on the abutting residential properties; however, the use of vegetable gardens will not be precluded. Two municipal water supply wells are located across the street from the site, and service residents and businesses within the town. The wells are screened in a deep aquifer beneath a clay layer. Data regarding population characteristics of the area will be obtained from the U.S. Census Bureau and local sources. No environmental resources are located proximal to the site; therefore, no ecological receptors are believed to exist based on the available information.

Table V-4

Scenarios to be Investigated to Determine if Actual or Potential Exposure Pathway	Actually or Potentially Exposed Population	Time Frame C = Current F = Future	Preliminary Assessment of Exposure Scenario
Direct contact and incidental ingestion of on-site soils	On-site workers, utility or construction workers, visitors or trespassers, including children	C and F	Feasible scenario
Inhalation of dusts at the site, under ambient conditions or during soil movement activities	On-site workers, utility or construction workers, visitors or trespassers, including children	C and F	Feasible scenario
Inhalation of vapors emanating from the groundwater or soils beneath the facility	On-site workers, visitors	C and F	Feasible scenario
Dermal contact with production well water and inhalation of vapors emanating from production well water	On-site workers, visitors	F	Unlikely scenario, unless production well is used in the future
Inhalation of vapors emanating from a groundwater plume potentially migrating beneath residential properties	Off-site residents, including children	C and F	Unknown feasibility, until site characterization is complete
Ingestion and dermal contact to municipal well water, and inhalation of vapor from municipal well water	Workers and residents within the municipality receiving the well water, including on-site workers and nearby residents	F	Unlikely, unless groundwater plume penetrates clay layer; requires additional site characterization

Direct contact and incidental ingestion of off-site soils potentially contaminated by surficial runoff; ingestion of garden produce contaminated either by uptake of the plant or by dusts adhering to produce	Off-site residents, including children	C and/or F	Unknown feasibility, until site characterization is complete
Inhalation of vapors emanating from the site during soil movement activities	Off-site residents, including children, and workers at nearby businesses	F	Unknown feasibility, until site characterization is complete
Inhalation, direct contact, and incidental ingestion of fugitive dusts emanating from the site during soil movement activities	Off-site residents, including children, and workers at nearby businesses	F	Unknown feasibility, until site characterization is complete

c. Extent of Exposure

The extent of exposure will be determined for each exposed population affected by an actual or potential exposure pathway and each hazardous substance related to the exposure pathway. Determination of the extent of exposure will be conducted consistent with the USEPA guidance documents identified previously, unless alternative exposure factors are appropriate based on evaluation of site-specific factors.

3. Toxicity Assessment

Toxicity assessment, including adjustments for absorption efficiency, will be conducted following the USEPA's *Risk Assessment Guidance for Superfund: Volume II: Human Health Evaluation Manual (Part A)* (540/1-89/002, December 1989). Information regarding the toxicity of each hazardous substance of concern will be obtained from published sources. In particular, qualitative information on most of the hazardous substances will be obtained from review documents published by the USEPA, and the U.S. Agency for Toxic Substances and Disease Registry (ATSDR). Dose-response values, such as oral reference doses, inhalation reference concentrations, oral cancer potency factors, and inhalation cancer unit risk values, will be obtained from the USEPA, with preference for values provided in the computerized, on-line Integrated Risk Information System (IRIS), followed by the Health Effects Assessment Summary Tables (HEAST).

4. Risk Characterization

a. Characterization of Human Risk

Characterization of the risk to human health will be conducted by calculating cumulative risk estimates for each actually or potentially exposed population following USEPA's guidance documents. Cumulative risk estimates will be calculated for both cancer (non-threshold) and non-cancer (threshold) health outcomes.

For each exposed population, cumulative risk estimates will be derived using: (1) the calculations of extent of exposure for every exposure pathway and hazardous substance applicable to that population; and (2) the dose-response value(s) applicable to the exposure pathway(s) for each hazardous substance. The cumulative risk estimates for the site will be compared to the promulgated risk limits.

The final analysis will include a summary of the risks associated with the site, including each exposure pathway for the hazardous substances of concern, and the distribution of risk across various portions of the exposed population. Factors affecting uncertainty in the risk assessment process will be documented, including uncertainties related to site characterization, exposure assumptions, and toxicity information.

b. Characterization of Environmental Risk

No environmental resources or ecological receptors are located proximal to the site. Therefore, no environmental risk characterization will be conducted.

c. Evaluation of the Baseline Risk Assessment Findings

This baseline risk assessment will be used, together with analysis of Applicable and Appropriate Requirements (ARAR), to determine whether remediation is required, and to what extent. The scope and direction of the feasibility study will depend on the outcome of the baseline risk assessment. It will also be used as baseline information during the feasibility analysis of each remedial alternative during the feasibility study.

ARARs will be identified and documented for the site. A list of state- and federal ARARs will be developed by reviewing pertinent state and federal regulations, and contacting state and federal agencies. The ARARs will be identified based on a review of chemical-, location-, and action-specific requirements. For situations where more than one ARAR may be applicable to a site condition, the more conservative ARAR will generally be specified as selected for the site. The documentation will include a description of why each ARAR was determined to be applicable or relevant and appropriate to the site.

VI. CHRONOLOGICAL DESCRIPTION OF SITE ACTIVITIES - RI/FS TASKS

Included in the following paragraphs is a description of the schedule of activities to be conducted as part of the RI/FS. It is important to note that two IRMs are planned for the site as a means of reducing soil and ground water contamination. As indicated, GEC and Watts intend to conduct assessment activities related to the cutting oil release after implementation and operation of the associated IRM.

A schedule of proposed RI/FS activities is included as Figure 8. This schedule also includes a timetable for the implementation of the IRMs. However, a description of the IRM tasks is only included in the paragraphs below as necessary to present information regarding the RI/FS. The timing of all activities is highly dependent upon NYSDEC plan review and approval times. For the purpose of this time table we have assumed a 45 day review and approval period, whenever applicable.

November & December, 1997 Upon approval of the RI/FS Work Plan, GEC will initiate investigations associated with the RI/FS. The initial phase of work will include the review of information on file at state and local agencies in order to supplement information regarding the proximity of the site to potential sensitive receptors or exposure points. In addition, GEC will conduct supplemental site inspections to determine the proximity of the site to possible environmental receptors, including Belmont Lake, and to confirm that assumptions regarding likely exposure scenarios are appropriate. We have allowed two weeks for completion of this task.

November & December, 1997 GEC will initiate field activities to determine the source and extent of contamination associated with Sources 1, 2 and 3. Investigations regarding Source 4, the cutting oil release, will be conducted upon completion of the IRM.

GEC will conduct all test boring activities including the installation of all proposed observation wells. GEC will also collect all soil samples including those to be collected manually around the perimeter of the leaching field. Approximately one week after well installation, GEC will conduct groundwater sampling activities. GEC will attempt to conduct groundwater sampling activities at approximately the same time as the ongoing quarterly groundwater sampling. Depending upon the date of NYSDEC's RI/FS approval and the time needed to install the monitoring wells, GEC may request that October's sampling be conducted late so that all groundwater samples can be collected at the same time.

GEC will also install soil gas sampling points within the site building to determine the extent to which contamination associated with Source 2 (chlorinated vapors beneath the site building) have affected indoor air conditions. Soil gas samples will be collected at this time and may be recollected once the IRM for this area has been put into operation.

January & February, 1998 GEC anticipates that all soil and groundwater sampling associated with determining the extent of Sources 1, 2 and 3 will have been completed and that validated laboratory results will be available. GEC is anticipating five weeks to evaluate all of the data collected and to determine if additional soil or groundwater sampling and analysis is needed.

February & March, 1998 Presuming soil and groundwater analyses do not indicate the need for additional investigations, GEC will construct computer models to determine the likely fate and transport characteristics of site contaminants. As discussed, GEC anticipates using MODFLOW and AT123D, and may use other computer models as necessary and appropriate, to determine the extent to which contaminants are likely to migrate off site, evaluate exposure pathways and to predict contaminant concentrations at known exposure points. GEC anticipates that this task will require approximately four weeks.

February & March, 1998 Presuming soil and groundwater analyses and model results do not indicate the need for additional investigation and assessment, GEC will next complete an assessment of the risk posed by contaminants emanating from Sources 1, 2 and 3 in all media, both for on-site and off-site exposures. GEC anticipates this task will require approximately six weeks for completion.

April, 1998 Field investigations to determine the extent of the release from Source 4 will be conducted upon completion of the cutting oil IRM. Field investigations may be conducted in Febuary, contingent upon the performance of the IRM. GEC anticipates performing limited soil sampling and analysis which will be collected from existing observation wells.

April to June 1998 Based on the results of the field sampling conducted with respect to Source 4, GEC will evaluate the data and presuming there does not appear to be a need for further investigation, will assess the risk posed by contaminants associated with this source.

June to August, 1998 GEC will prepare the Final Remedial Investigation Report once the risk associated with all releases has been evaluated. As this is the final step of the Remedial Investigation, the timing of report preparation is highly dependent upon the performance of the IRMs and the time required to conduct all necessary field investigations and risk assessment activities. GEC anticipates that this task will require approximately six weeks from initiation.

VII. SAMPLING AND ANALYSIS PLAN

A. Quality Assurance and Quality Control

The Quality Assurance Project Plan (QAPjP) for all site activities is included as Appendix A. Figure 1 presents the RI/FS Program Organization including QAPjP. All site QAPjP efforts are managed by Eileen Furlong, GEC's Vice President and the QAPjP Manager. She has data validation responsibility for site activities and over 15 years of experience managing hazardous waste site programs. Mrs. Furlong's resume, along with those of all anticipated site personnel, are contained in Appendix A. All site personnel have at least 40 hours of EPA Hazardous Waste Site Worker Training and are thoroughly trained in the QAPjP Plan for the site.

The goal of the Quality Assurance Project Plan, as it relates to the RI/FS Plan, is to provide a framework for achieving data quality and analytical precision that is consistent with good engineering practice.

B. Field Sampling Plan

GEC will conduct all field sampling activities in accordance with our corporate Standard Operating Procedures (SOPs). These SOPs have been modeled after EPA and NYSDEC protocols. SOPs applicable to this investigation are included as Appendix A. Field activities will be conducted according to the schedule shown on Figure 8. Samples will collected at locations specified on Tables 11 and 12 and Figures 6 and 7. All laboratory analyses will be conducted using standard EPA Methodologies by a New York State certified laboratory. At this time GEC anticipates using IEA Corporation headquartered in Monroe, Connecticut. Each soil sample will be screened for total ionizable compounds (TICs) using a photoionization detector.

Monitoring wells will be installed in all appropriate test borings. Each monitoring well will be constructed using 4-inch Schedule 40 PVC casing. Well screens consisting of 0.010-inch slotted casing will be installed so that they extend approximately five (5) feet above the top of the water table and ten (10) feet below the water table. A silica sand filter will be set in the borehole annulus surrounding the well screen. A bentonite seal will be placed above the sand filter. The remainder of the borehole will be backfilled with clean soil. A bentonite seal and steel protective casing will be placed at the surface. All newly installed monitoring wells will be surveyed to a known datum and to existing wells to determine the groundwater elevation and the groundwater gradient beneath the subject property.

Prior to groundwater sample collection the approximate volume of standing water in each well will be computed and a volume of water equal to between three and five times the volume of standing water will be evacuated from the monitoring well. GEC will utilize dedicated or precleaned standard check-valve bailers or pre-cleaned electric pumps. All samples will be stored on ice in laboratory-issued, preserved, glass and nalgene containers. All samples were shipped overnight to IEA's facility under fully documented chain of custody procedures.

Test boring and well installation methods were included since the installation and some elements of the sampling activities are very site-specific. All other site activities, including well development, well sampling, and surveying, will be conducted in accordance with the SOPs. GEC will not deviate from the proposed sampling plan without NYSDEC approval.

VIII. HEALTH AND SAFETY PLAN

GEC has prepared a site-specific Health and Safety Plan designed to protect personnel involved in the performance of investigatory of remedial activities at the site. See Appendix B. This plan addresses health and safety concerns that may be encountered during the sampling and investigation activities proposed in this work plan. The Health and Safety Plan will be updated in the event that additional information regarding site contaminants is encountered or in the event that activities not specified in the plan are conducted.

The Health and Safety Plan, included with this Work Plan, does not specifically address health and safety issues associated with personnel not conducting the site investigation but who are present at the site. Contamination at the site is limited to the presence of metals and volatile organic compounds in subsurface soil. As such, the plan is protective of those likely to come in contact with subsurface soil and/or; i.e. those conducting the investigations. During the site investigation activities, GEC will establish an exclusion zone, where only personnel covered by the health and safety plan will be permitted.

The Health and Safety Plan addresses remediation personnel. To address concerns of local residents and Jameco employees, GEC will continuously monitor total ionizable compounds (TIC's) during any invasive field activities, including drilling activities. In the event that an elevated level (> 5 parts per million) of TIC's are detected, GEC will follow applicable procedures as outlined in the NYSDOH Community Air Monitoring Plan.

GEC will also implement measures to assure that fugitive dust is minimized. To minimize the volume of dust generated, GEC will assure that all work areas, where the potential for dust generation exists, are thoroughly wetted. GEC anticipates potential dust generation associated with the penetration of the test borings. Due to the limited scope of activities in which the potential for dust generation exists, GEC does not propose to conduct particulate monitoring.

The Health and Safety Plan has been prepared in accordance with 29 CFR 1910 and all other applicable standards by a Health and Safety Professional.

IX. CITIZEN PARTICIPATION PLAN

The following is a Citizen Participation Plan, developed in accordance with 6 NYCRR Part 375 - Inactive Hazardous Waste Disposal Site Remedial Plan, revised May 1992. A Glossary of Terms found in this Citizen Participation Plan is included in Appendix C.

Citizen Participation Measures

Upon completion, the RI/FS draft final Work Plan will be placed into the information repositories, listed below. A fact-sheet, describing the RI/FS Work Plan will be produced and disseminated to those on the Distribution List. NOTE: Prior to dissemination of the fact-sheet, a draft will be forwarded to NYSDEC and, once approved, will be disseminated to the public.

Once the Remedial Investigation Report is complete, a copy will be placed in the information repositories and a fact-sheet will be disseminated to the public contact list (including to the media contacts). Furthermore, a public meeting may be held at this juncture, as determined by NYSDEC and based on the following factors: the level of public interest; the significance of the data gathered; the timing between the RI completion and the next major milestone for citizen involvement; and the Proposed Remedial Action Plan. If an RI meeting is held, the fact-sheet will also serve as a meeting invitation, and the public will also be notified through a NYSDEC press notice, distributed to the media on the contact list.

At the juncture of the Proposed Remedial Action Plan (PRAP), a meeting invitation / fact sheet, describing the PRAP, will be disseminated to those on the Distribution List. The public will also be notified of the PRAP public meeting through a press notice to the media (i.e., Media Contact / Public Contact list). There will also be a public comment period. The State's consideration of comments will be documented in a Responsiveness Summary, which will be placed in the repositories and may be more widely distributed as appropriate. The Public will also be notified of the Record of Decision.

Public Contact List

The following individuals will be included on the distribution list and will be provided with copies of documentation forwarded to NYSDEC. Included below is a list of those entities who have expressed an interest in site activities and who have been provided with information relative to site investigations.

Local Contacts

Richard H. Schaffer
Supervisor - Town of Babylon
200 East Sunrise Highway
Lindenhurst, NY 11757

Office of the Town Clerk
Town of Babylon
200 East Sunrise Highway
Lindenhurst, NY 11757

Mr. Ronald Kluesner
Town of Babylon
281 Phelps Lane
North Babylon, NY 11703

Suffolk County Dept. of Health
Services - Division of Public Health
Richard A. Sandstrom - Freedom of
Information Officer
228 Rabro Drive East
Hauppauge, NY 11766

Media Contacts:

The Beacon
P.O. Box 670
Babylon, NY 11702

South Bay Newspaper
150 West Hoffman Avenue
Lindenhurst, NY 11757

Newsday
Government Watch - Long Island Beat
Newsday - Long Island Desk
235 Pinelawn Road
Mellville, NY 11747-4250
ATTN: Mary Ellen Pereira

Department Contacts

Robert Becherer, P.E.
Attn: Jamie Ascher - Geologist
Div. of Hazardous
Waste Remediation
NYSDEC
SUNY Building 40
Stony Brook, NY 11790-2356

Mr. John Olm
NYSDOH
Bur. Environmental Exposure Inv.
2 University Place
Albany, NY 11203-3399
(518) 458-6305 ext. 6305

Ms. Nina Knapp
Health Liaison Specialist
State Department of Health
2 University Place
Albany, NY 12203-3399
(800) 458-1158 ext. 6402

Joshua Epstein, Ph.D.
Citizen Participation Specialist
NYSDEC
Building 40
SUNY
Stony Brook, New York 11790-2356

G. Anders Carlson, Ph. D.
Director, Bureau of
Environmental Exposure
Investigation
NY State Dept. of Health
2 University Place
Albany, NY 12203

Salvatore Ervolina, P.E.
NY State Dept. of Environmental
Conservation
50 Wolf Road
Albany, NY 12233-7010

Residents in the Area of the Site

No residents in the area of the site have been identified, either individually or as groups, as being active and willing or who have expressed an interest in the site. Until such an individual or group is identified, Fact Sheets will be prepared and distributed to all residences within a 1/5 mile radius of the site, as well as all residents within a 1/4 mile radius downgradient of the site.

Contacts for Further Information

Those individuals interested in obtaining more information regarding RI/FS activities or who have questions regarding activities will be referred to the individuals listed below.

Ms. Nina Knapp, Health Liaison Specialist, or
Mr. John Olm, at Bur. Environmental Exposure Inv.
NYSDOH
2 University Place
Albany, NY 12203-3399
(800) 458-1158 Ms. Knapp at ext. 6402
Mr. Olm at ext. 6305

Joshua Epstein, Ph.D.
Citizen Participation Specialist
NYSDEC
Building 40
SUNY
Stony Brook, New York 11790-2356
(516) 444-0249

In addition, Samuel Butcher, of Goldman Environmental Consultants, Inc. will be identified as the technical contact for information on specific site activities.

Information Repositories

Information repositories are places where people can go to read the relevant, public documents associated with the site.

Public repositories will be established at the following locations:

NYSDEC Regional Office
Div. of Env. Remediation
SUNY Campus
Building 40
Stony Brook, NY 11790
561-444-0249

ATTN: Public Repositories
Wendell Cherry - Director
Wyandanch Public Library
14 South 20th Street
Wyandanch, NY 11798

The Citizen Participation Plan will not include distribution of complete documentation to all parties. These parties listed as "Department Contacts" and "Information Repositories" will receive complete reports. Those parties listed as "Local Contacts" and "Residents in the Area of the Site" will be provided with a copy of the document transmittal letter, Fact Sheet, and information regarding the availability of reports and other documentation.

The contact list presented above is subject to change as new interested parties are identified.

X. PROJECT MANAGEMENT

All site activities will be directed and overseen by Goldman Environmental Consultants, Inc. Test boring and well installation activities will be conducted by a subcontracted firm, the selection of which will be determined on a competitive bid basis, however, it is likely that test boring activities will be conducted by GeoLogic Drilling Company, of Hopkinton, Massachusetts, with which GEC has a long-standing relationship. All laboratory analytical services will be provided by IEA, a New York state certified laboratory based in Monroe, Connecticut. At this time, GEC does not foresee the need to utilize any additional subcontractors.

Included below is a listing of the names of all contractors who GEC anticipates will be involved in the completion of the RI/FS.

Goldman Environmental Consultants, Inc.
60 Brooks Drive
Braintree, Massachusetts 02184
Attention: Samuel W. Butcher

GeoLogic Drilling Company
86 Elm Street
Hopkinton, Massachusetts 01748
Attention: Debbie Arey

IEA, An Aquarian Company
200 Monroe Turnpike
Monroe, CT 06468
Phone: (203) 261-4458
GEC Contact is David Wielandt Phone: (508) 667-1400

XI. FINAL STATEMENT

This RI/FS Work Plan has been prepared to describe activities to be conducted at the site in order to determine the source, nature and extent of contamination resulting from releases at the site and to evaluate the potential risks associated with these releases. As stated in the preceding paragraphs, this document has been prepared in accordance with the Consent Order issued to the site. Watts and GEC look forward to initiating these activities in a deliberate and thorough manner with necessary approval from NYSDEC.

Respectfully submitted,
Goldman Environmental Consultants, Inc.

Prepared By:

Samuel W. Butcher, L.S.P.
Vice President, Operations

Reviewed By:

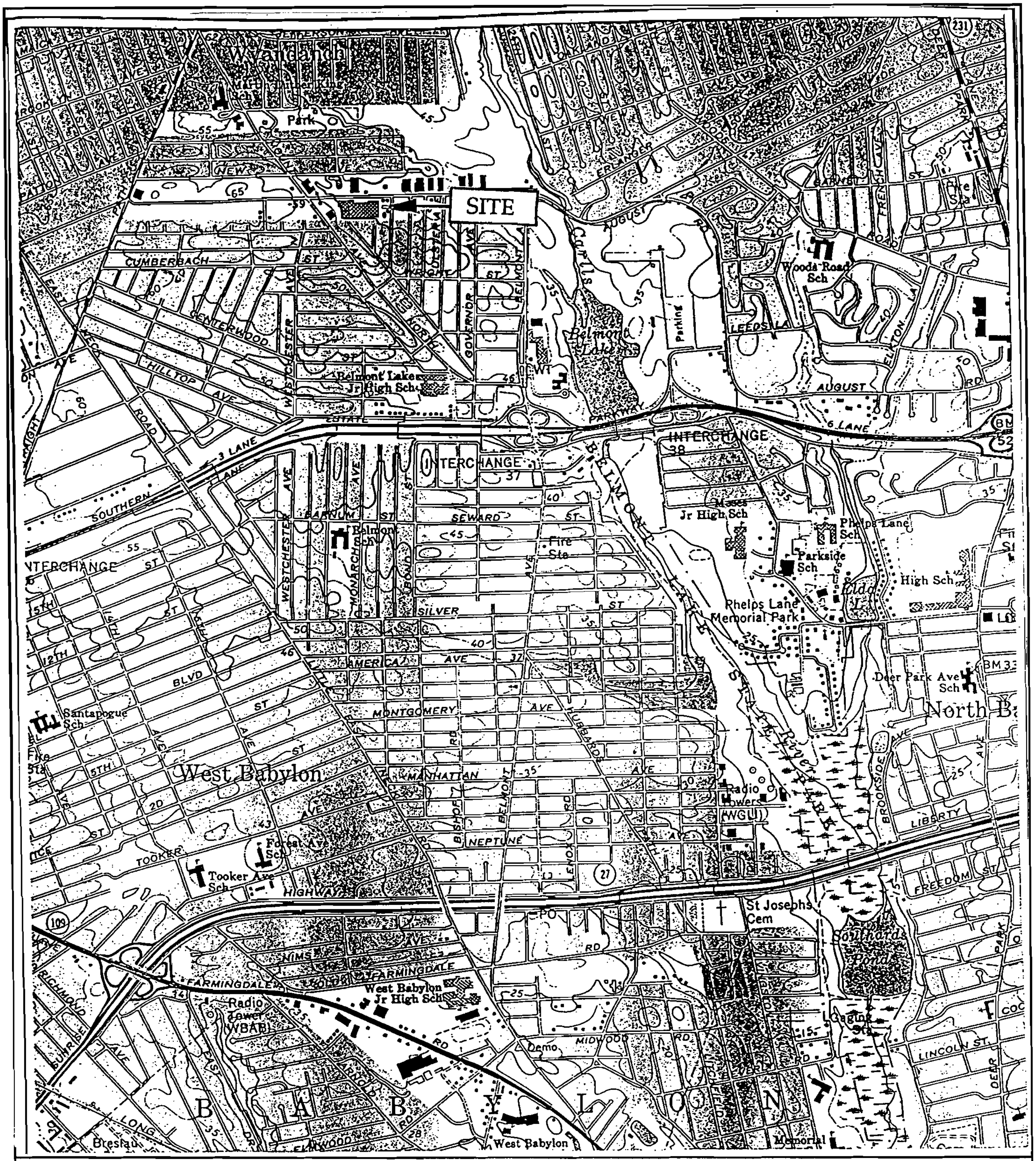
Paul T. Bartlett

Paul T. Bartlett, P.E.
Vice President

Reviewed By:

Eileen A. Furlong
Vice President
Waste Site Programs

FIGURES



USGS 7.5' Series Topographic

Bay Shore West
New York Quadrangle

GEC Goldman Environmental Consultants, Inc
60 Brooks Drive
Braintree, MA 02184
(617) 356-9140

SITE LOCUS MAP

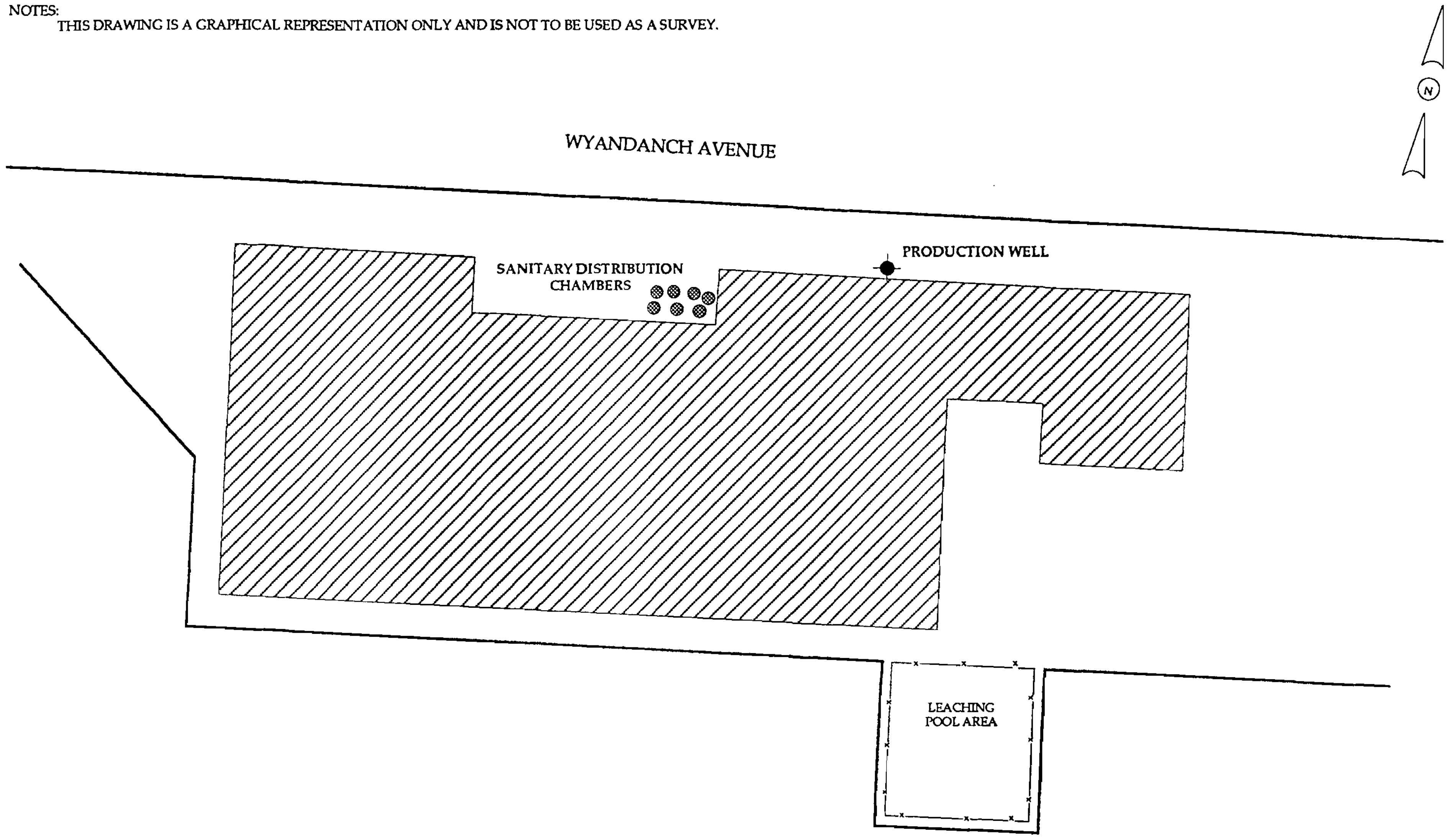
248 WYANDANCH AVENUE
WYANDANCH, NEW YORK
Project No. 444-010-95

FIGURE 1

SCALE
1 : 25 000

N

NOTES:
THIS DRAWING IS A GRAPHICAL REPRESENTATION ONLY AND IS NOT TO BE USED AS A SURVEY.



SITE PLAN

JAMECO INDUSTRIES
248 WYANDANCH AVENUE
WYANDANCH, NEW YORK

JOB NUMBER: 444-006-94	SCALE: 1" = 100' ±
DATE: SEPTEMBER 30, 1994	DRAWN BY: JRD
	CHECKED BY

GEC Goldman Environmental Consultants, Inc.
60 Brooks Drive
Braintree, MA 02184
(617) 356-9140

2
FIGURE

NOTES:
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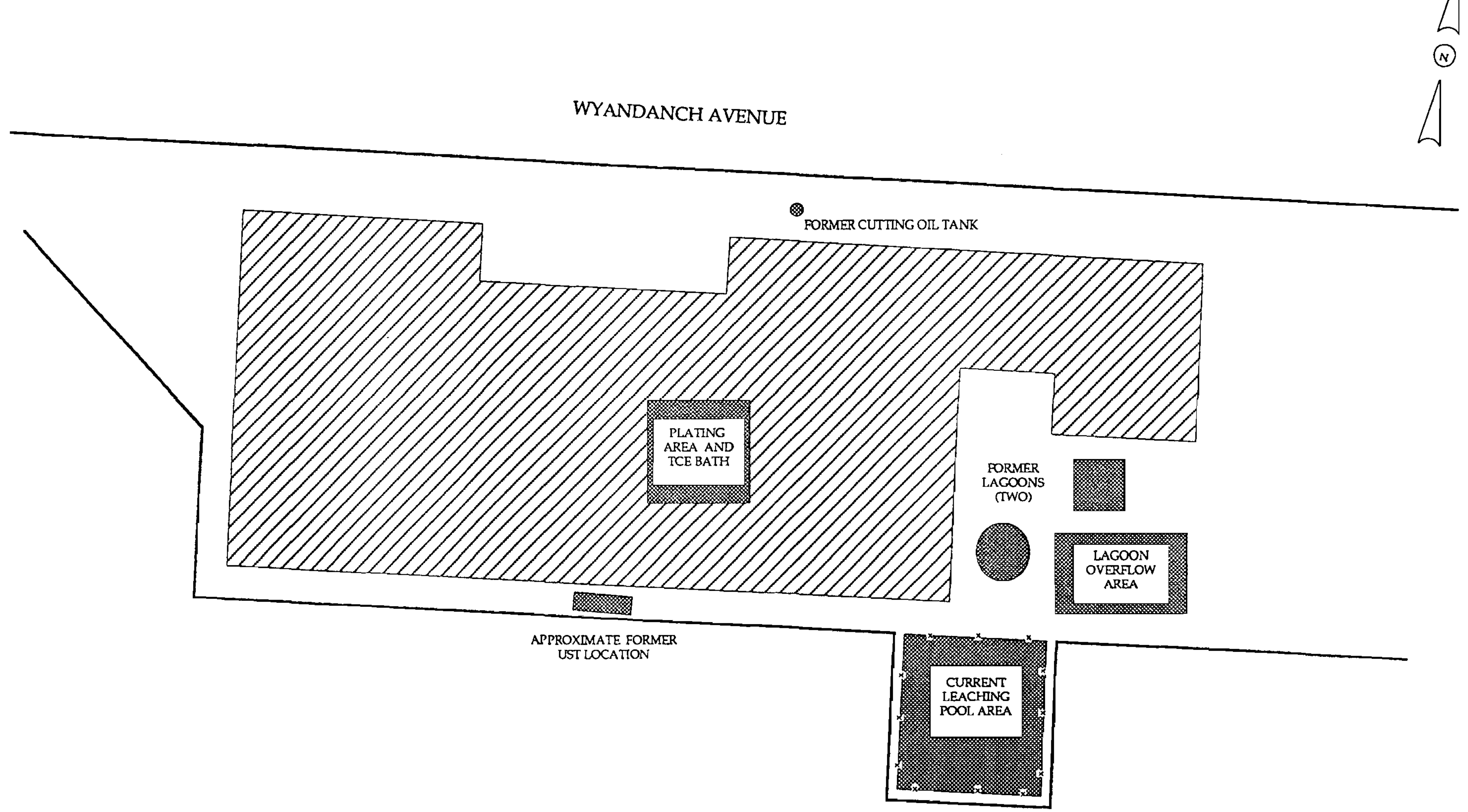

SUSPECTED CONTAMINANT SOURCE AREAS

JAMECO INDUSTRIES
248 WYANDANCH AVENUE
WYANDANCH, NEW YORK

JOB NUMBER: 444-006-94	SCALE: 1" = 100' ±
DATE: SEPTEMBER 30, 1994	DRAWN BY: JRD
	CHECKED BY

GEC
Goldman Environmental Consultants, Inc
60 Brooks Drive
Braintree, MA 02184
(617) 356-9140

3
FIGURE

NOTES:
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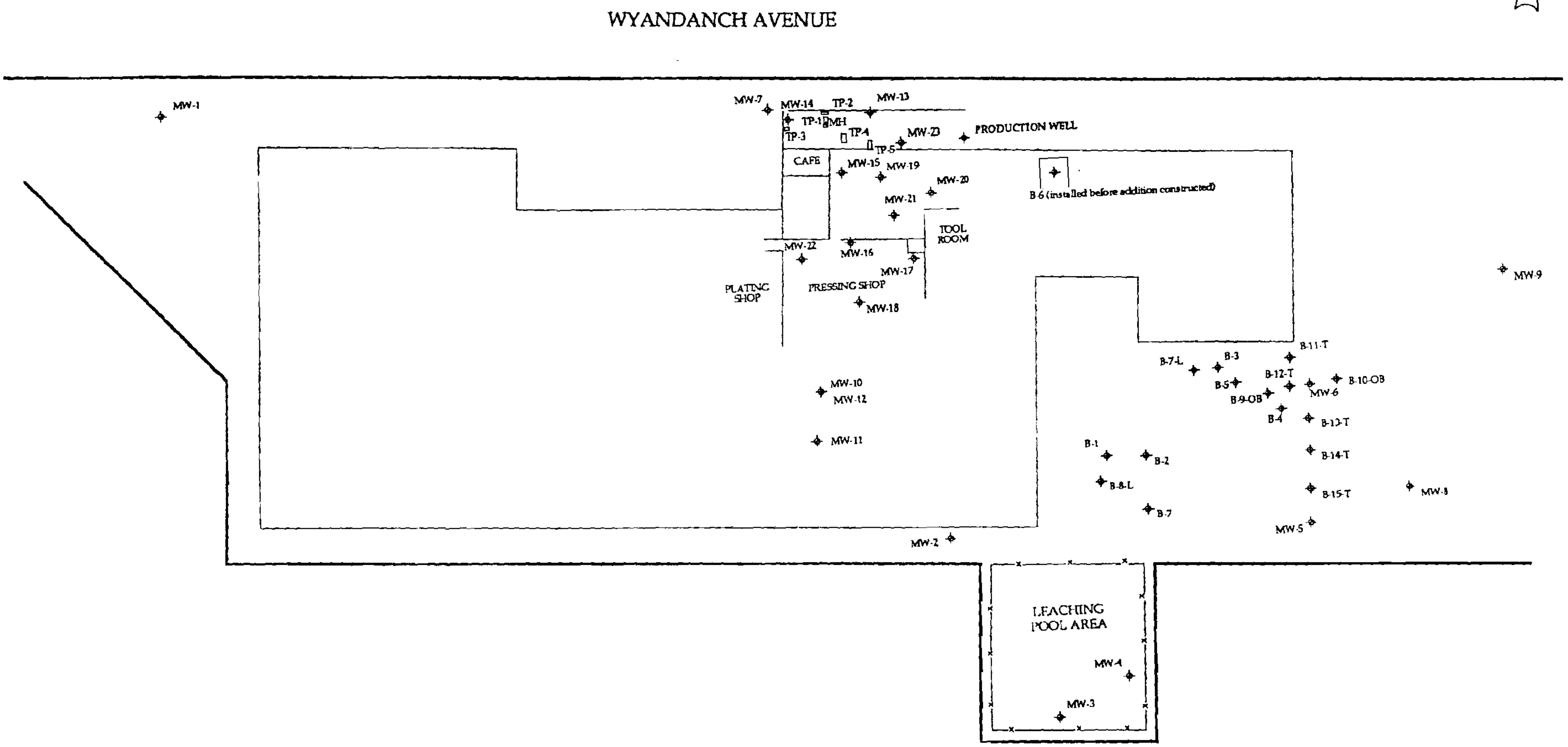


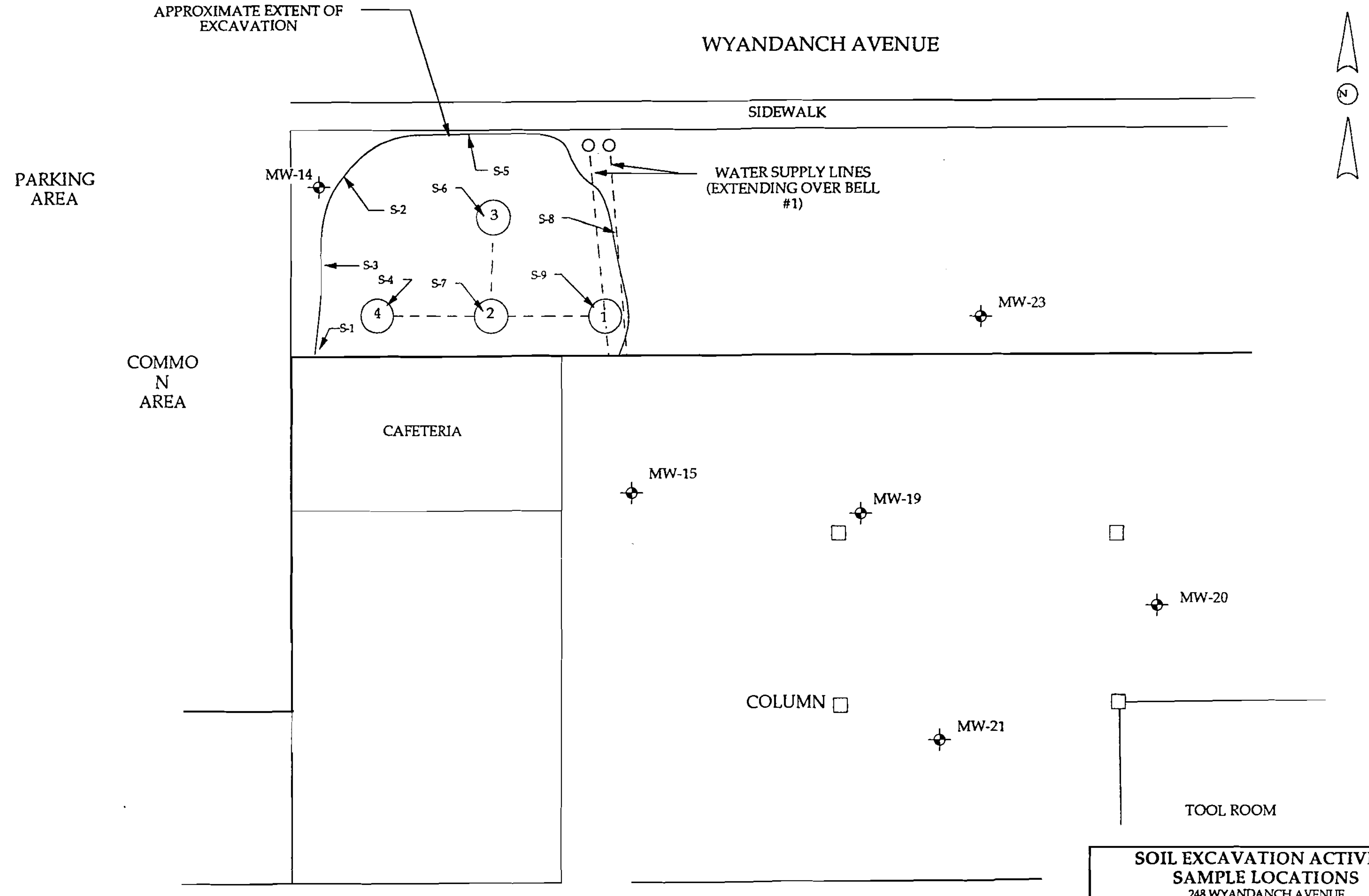
SAMPLE LOCATIONS

JAMECO INDUSTRIES
248 WYANDANCH AVENUE
WYANDANCH, NEW YORK

JOB NUMBER: 444-006-94	SCALE: 1" = 100' ±
DATE: AUGUST 9, 1995	DRAWN BY: JRD
	CHECKED BY

GEC Goldman Environmental Consultants, Inc.
60 Brooks Drive
Braintree, MA 02184
(617) 356-9140

4
FIGURE



LEGEND

1 FORMER LOCATION OF CONCRETE "BELLS"

⌖ MONITORING WELL

SOIL EXCAVATION ACTIVITY
SAMPLE LOCATIONS
248 WYANDANCH AVENUE
WYANDANCH, NEW YORK

JOB NUMBER: 444-009D-95
DATE: JUNE 30, 1995
DRAWN BY: JRD
REVISED:
CHECKED BY:

GEC Goldman Environmental Consultants, Inc.
60 Brooks Drive
Braintree, MA 02184
(617) 356-9140

5
FIGURE

NOTES:
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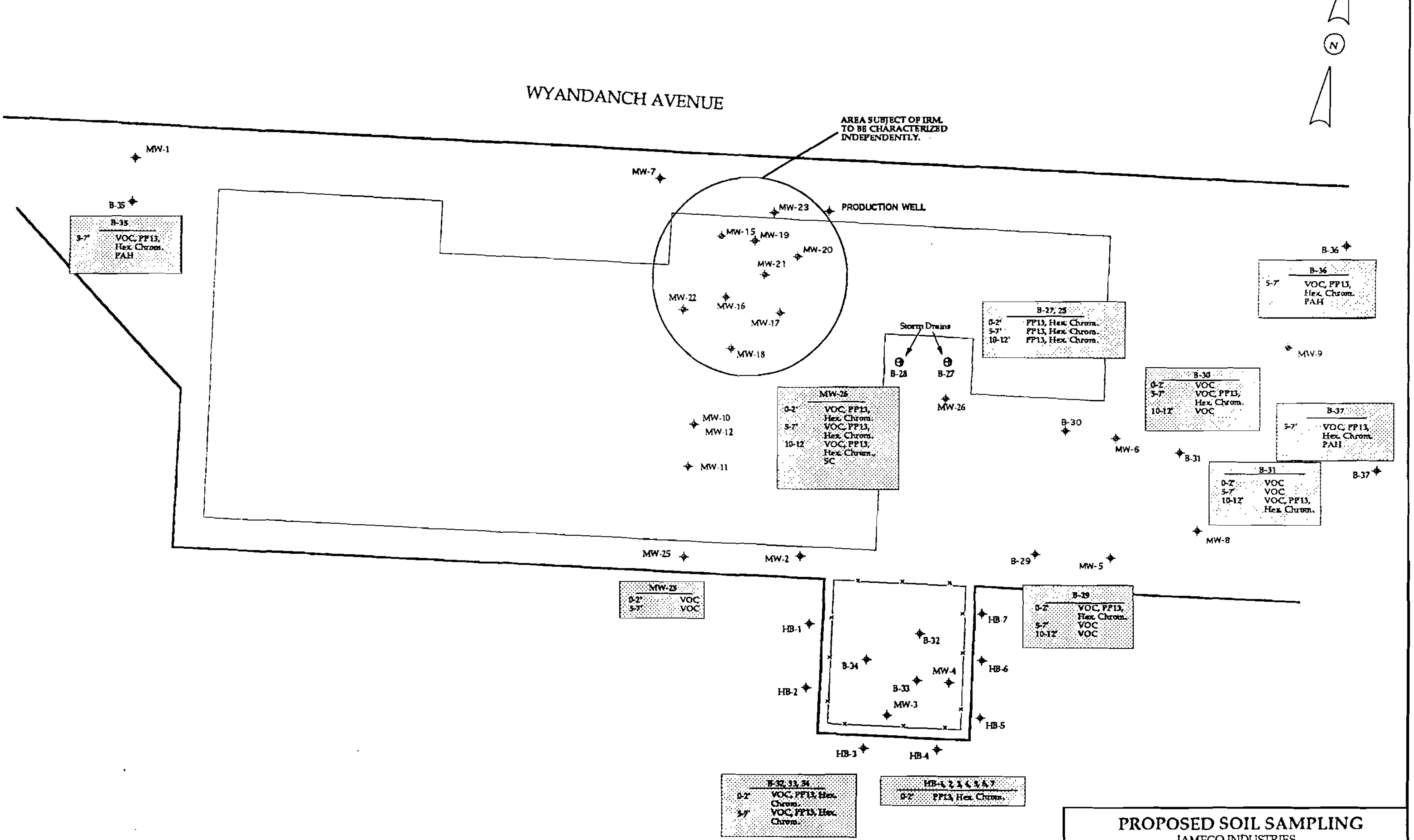


MONITORING WELL LOCATIONS INCLUDED FOR REFERENCE.

KEY

VOC = Volatile Organic Compounds via USEPA Method 8260
SC = Sediment Characteristics included: Cation exchange capacity, total organic matter, and sieve analysis
PP13 = 13 Priority Pollutant Metals (Total)
Hex Chrom. = Total Hexavalent Chromium

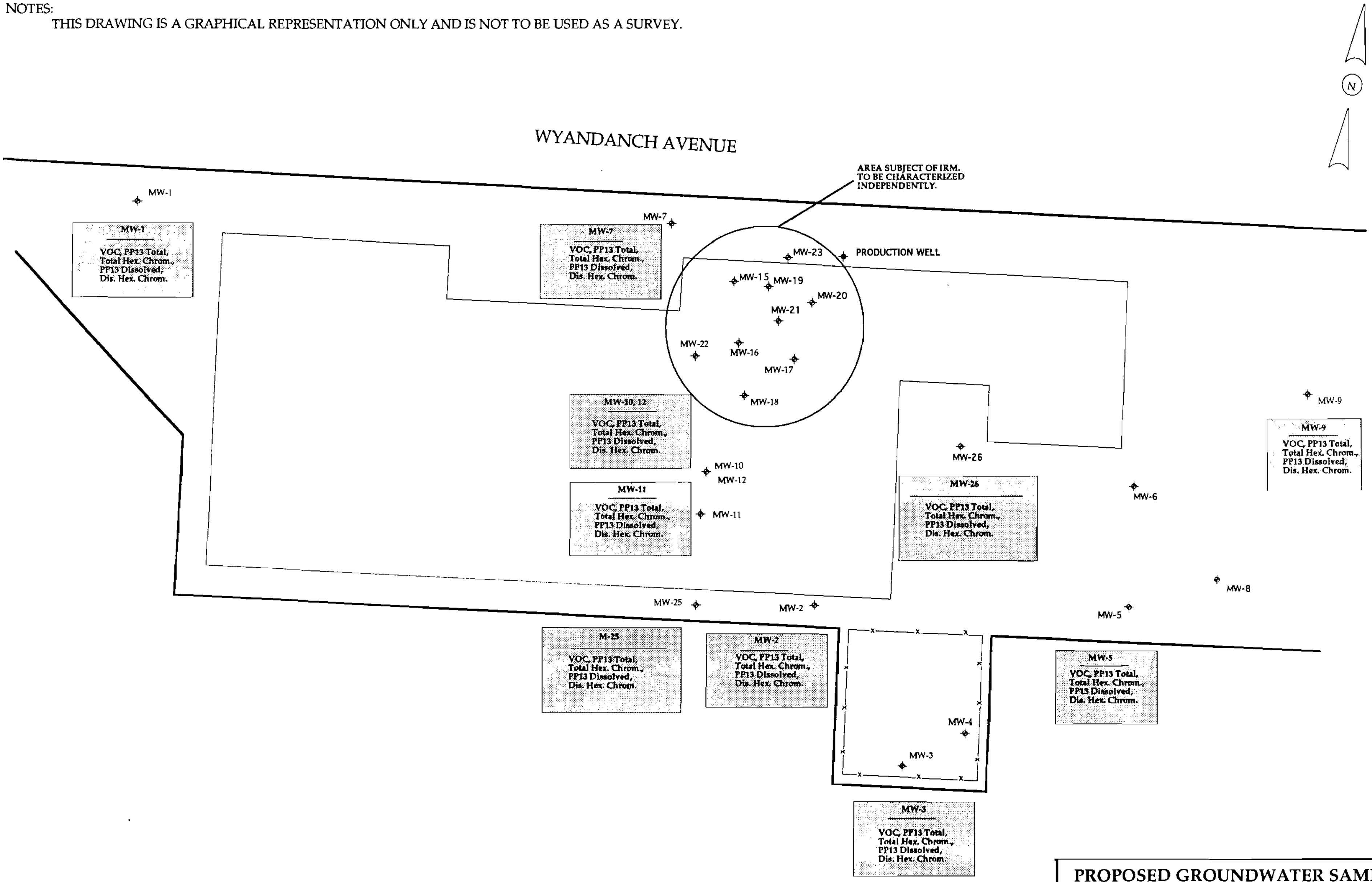
PROPOSED SOIL SAMPLING
JAMECO INDUSTRIES
248 WYANDANCH AVENUE
WYANDANCH, NEW YORK

JOB NUMBER: 444-006-94	SCALE: 1" = 100' ±
DATE: JANUARY 30, 1996	DRAWN BY: JD
	CHECKED BY: SB

GEC Goldman Environmental Consultants, Inc.
15 Pacella Park Drive
Randolph, MA 02368
(617) 961-1200 or (800) 446-2014

6
FIGURE

NOTES:
THIS DRAWING IS A GRAPHICAL REPRESENTATION ONLY AND IS NOT TO BE USED AS A SURVEY.



KEY

VOC = Volatile Organic Compounds via USEPA Method 8260
SC = Sediment Characteristics included: Cation exchange capacity, total organic matter, percent moisture, and seive analysis
PP13 Total = 13 Priority Pollutant Metals (Total)
PP13 Dissolved = 13 Priority Pollutants (Dissolved)
Total Hex. Chrom. = Total Hexavalent Chromium
Dis. Hex. Chrom. = Dissolved Hexavalent Chromium
PAH = Polynuclear Aromatic Hydrocarbons via USEPA Method 8270

PROPOSED GROUNDWATER SAMPLING

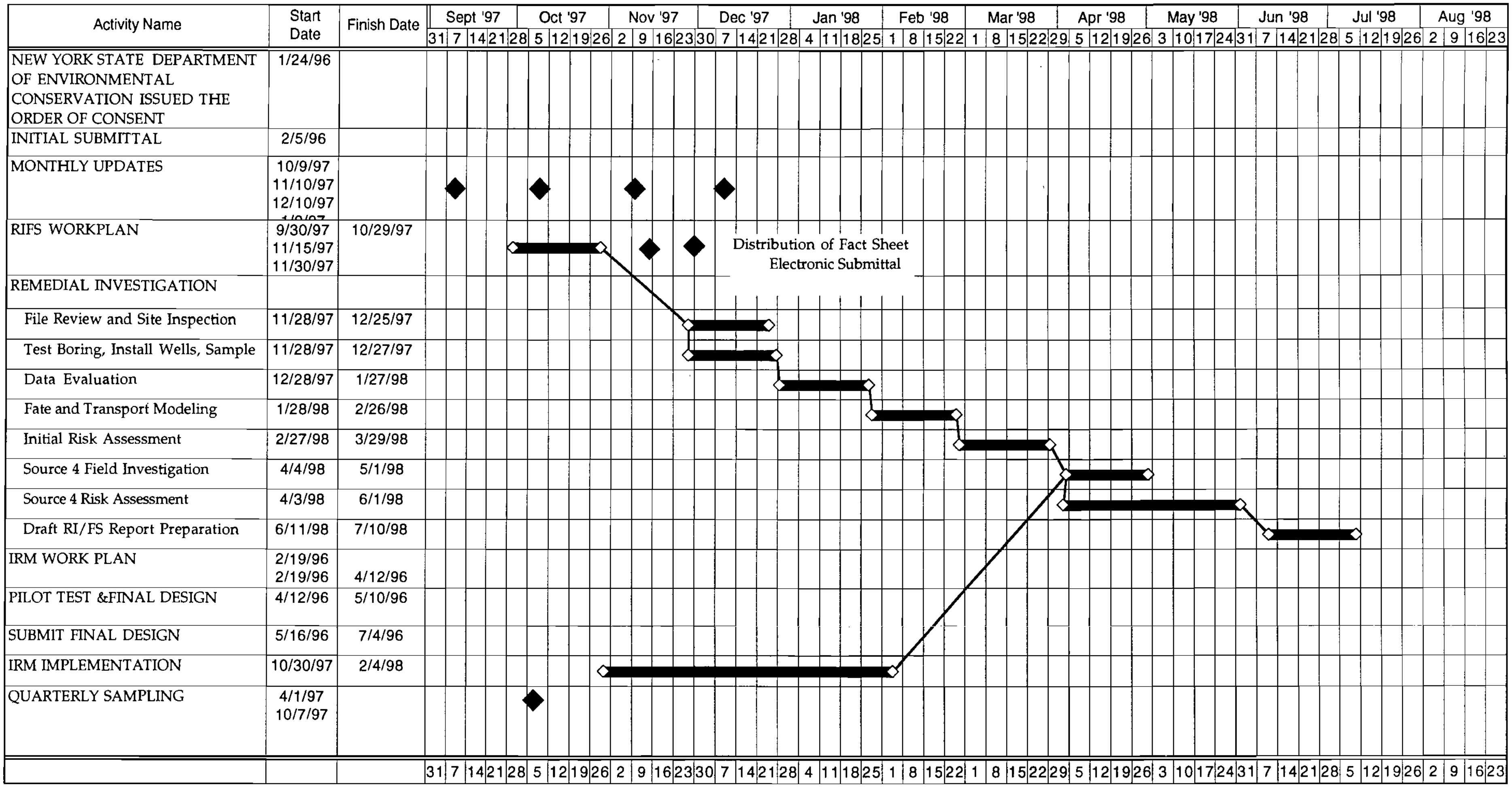
JAMECO INDUSTRIES
248 WYANDANCH AVENUE
WYANDANCH, NEW YORK

JOB NUMBER: 444-006-94	SCALE: 1" = 100' ±
DATE: JANUARY 30, 1996	DRAWN BY: JCB
	CHECKED BY

GEC Goldman Environmental Consultants, Inc
60 Brooks Drive
Braintree, MA 02184
(781) 356-9140

7
FIGURE

Figure 8
RI/FS Schedule



Activity Name	Start Date	Finish Date
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION ISSUED THE ORDER OF CONSENT	1/24/96	
INITIAL SUBMITTAL	2/5/96	
MONTHLY UPDATES	10/9/97 11/10/97 12/10/97	
RIFS WORKPLAN	9/30/97 11/15/97 11/30/97	10/29/97
REMEDIAL INVESTIGATION		
File Review and Site Inspection	11/28/97	12/25/97
Test Boring, Install Wells, Sample	11/28/97	12/27/97
Data Evaluation	12/28/97	1/27/98
Fate and Transport Modeling	1/28/98	2/26/98
Initial Risk Assessment	2/27/98	3/29/98
Source 4 Field Investigation	4/4/98	5/1/98
Source 4 Risk Assessment	4/3/98	6/1/98
Draft RI/FS Report Preparation	6/11/98	7/10/98
IRM WORK PLAN	2/19/96 2/19/96	4/12/96
PILOT TEST &FINAL DESIGN	4/12/96	5/10/96
SUBMIT FINAL DESIGN	5/16/96	7/4/96
IRM IMPLEMENTATION	10/30/97	2/4/98
QUARTERLY SAMPLING	4/1/97 10/7/97	

Prepared by: HB
Reviewed by: SB

TABLES

Table 1
Initial Analytical Summary
of Soil Metal Analyses
December 22, 1981
Jameco Industries, Wyandanch, New York
(units, parts per million, ppm, mg/kg)

Sample Identification	Nickel	Total Chromium	Hexavalent Chromium	Copper
B-1				
Serial 1 (2-4)	7	10.0	ND	10.0
Serial 2 (4-6)	8.1	14.0	ND	12.0
Serial 3 (6-8)	48	92.0	ND	290.0
Serial 4 (8-10)	42	100.0	ND	76.0
Serial 5 (10-12)	57	130.0	ND	93.0
Serial 6 (14-15)	44	200.0	ND	76.0
Serial 7 (19-20.5)	34	100.0	ND	37.0
B-2				
Serial 1 (2-4)	8	14.0	ND	13.0
Serial 2 (4-6)	170	240.0	ND	170.0
Serial 3 (6-8)	110	39.0	ND	32.0
Serial 4 (8-10)	130	330.0	ND	260.0
Serial 5 (14-16)	58	230.0	ND	77.0
B-3				
Serial 1 (2-4)	560	1340.0	ND	920.0
Serial 2 (4-6)	77	150.0	ND	98.0
Serial 3A (6-8)	500	1460.0	ND	960.0
Serial 3B (6-8)	110	200.0	ND	79.0
Serial 4 (14-16)	5.8	35.0	ND	38.0
B-4				
Serial 1 (2-4)	5.8	7.5	ND	3.6
Serial 2 (4-6)	4.1	4.0	ND	2.0
Serial 3 (6-7.5)	6.6	5.9	ND	2.8
Serial 4 (8-10)	12	8.1	ND	4.4
B-5				
Serial 1 (2-4)	170	26.0	ND	22.0
Serial 2 (4-6)	59	71.0	ND	39.0
Serial 3 (6-8)	75	25.0	ND	29.0
Serial 4	99	340.0	ND	170.0
B-6				
Serial 1 (4-6)	3	3.8	ND	2.1
B-7				
Serial 1 (14-15)	34	71.0	ND	150.0

Notes:

"Serial" interpreted to mean "sample". The depth interval (where available) is enclosed in parenthesis ( ).
Information on this table is summarized from previous investigations.

Prepared by GB/PT/HB
Reviewed by SB
Last Revised 8/18/97

Table 2
Summary of Soil Analyses for Metals from Borings (Total)

NOVEMBER 1991

Jameco Industries, Wyandanch, New York

(units, parts per million, ppm, mg/kg)

Sample Identification	Depth	Aluminum	Arsenic	Barium	Chromium Total	Cobalt	Copper	Lead	Magnesium	Manganese	Mercury	Nickel	Selenium	Thallium	Vanadium	Zinc
B-7-L LAGOON	2 - 4	4,763	5.5	18.38	1046.89	6.05	893.35	87.77	421.20	87.77	0.063	332.39	5.5	ND	2.57	375.33
BORINGS	4 - 6	3,074	12.25	15.45	326.85	7.15	260.74	29.36	374.55	29.36	0.178	111.56	4	ND	1.96	92.36
	6 - 8	1,898	6.87	12.04	294.24	6.55	241.99	ND	329.50	ND	0.016	123.79	2.7	ND	ND	100.75
B-8-L LAGOON	2 - 4	4,857	1.2	19.66	114.91	7.6	5643.26	ND	303.50	ND	0.06	161.91	5	ND	4.45	71.08
BORINGS	4 - 6	3,793	7.8	22.95	3423.63	9.45	3375.84	420.46	152.70	420.46	0.055	962.09	1	ND	ND	859.16
	6 - 10	1,078	2.15	13.02	119.8	6	194.3	ND	104.65	ND	0.012	65.38	4.8	671.2	ND	46.62
B-9-OB OVERFLOW AREA	0 - 4	4,067	9.67	27.24	89.81	8.55	234.5	21.47	353.85	21.47	0.095	69.94	3.35	2123.19	3.98	185.62
B-10-OB OVERFLOW AREA	0 - 4	6,423	170.85	24.4	347.98	7.45	283.7	30.70	357.95	30.70	0.139	469.99	2.5	ND	4.51	170.85
B-11-T TRENCH	0 - 3	5,651	27.75	17.99	0.6	7.35	39.65	ND	350.65	73.80	0.066	16.89	3.35	2179.34	5.25	46.22
B-12-T TRENCH	0 - 5	4,434	9.62	29.67	749.51	9.85	654.21	84.73	969.40	100.05	0.044	227.13	1.86	3619.69	1.5 4.66	290.68
B-13-T TRENCH	0 - 4	4,262	7.42	61.57	736.19	7.2	646.6	71.64	412.6	60.95	0.312	378.19	2.9	ND	2.22	243.71
B-14-T TRENCH	0 - 4	4,632	8.62	20.27	44.76	5.55	140.28	ND	313.85	51.10	0.071	33.1	3.5	ND	4.34	44.03
B-15-T TRENCH	0 - 4	3,917	8.45	241.73	170.53	8.3	337.53	24.16	248.5	30.70	0.116	106.23	5.5	ND	3.18	128.78
SLUDGE		4,455	5.8	40.35	3801.93	9.65	3645.68	556.37	178.4	24.45	0.068	999.65	2.25	ND	ND	975.48
SEDIMENT		782	2.7	6.66	8.49	8.1	26.51	ND	304.9	25.55	ND	65.02	4.82	472.63	3.29	69.47

Notes:

Information on this table is summarized from previous investigations.

Prepared by GB/PT/HB
Reviewed by SB
Last Revised 8/18/97

Table 2 (continued)
Summary of Soil Analyses for Metals from Borings (Total)

NOVEMBER 1991

Jameco Industries, Wyandanch, New York

(units, parts per million, ppm, mg/kg)

Sample Identification	Depth	Aluminum	Arsenic	Barium	Chromium Total	Cobalt	Copper	Lead	Magnesium	Manganese	Mercury	Nickel	Selenium	Thallium	Vanadium	Zinc
MW-1																
	4 - 6	1,321	1.85	6.55	5.87	7.35	6.15	ND	384.00	52.70	0.003	16.19	1.31	1099	0.58	2.51
	9 - 11	506	8.25	4.12	4.12	7.15	6.46	ND	131.00	22.10	0.001	2.55	1.35	ND	ND	2.58
	14 - 16	779	1.42	3.9	3.4	5.85	3.25	ND	174.00	20.40	0.034	ND	2.65	ND	3.45	11.00
	19 - 21	642	2.45	3.67	3.67	6.75	4.06	ND	82.00	13.50	ND	28.18	3.41	750	ND	4.64
MW-2																
	4 - 6	3,183	2.67	9.36	29.93	8.3	76.75	ND	1164.00	28.95	0.059	52.7	1.95	1688	2.94	32.12
	9 - 11	1,260	2.52	6.48	33.94	7.15	77.71	ND	1284.00	30.15	0.068	42.1	2.65	2290	1.6	27.89
	14 - 16	1,595	2.75	5.12	28.62	6.3	54.09	ND	1041.00	22.60	0.031	60.39	2.3	2932	5.08	8.44
	19 - 21	559	1.2	3.19	5.7	5.35	14.6	ND	218.00	25.15	0.012	8.46	1.65	ND	ND	11.21
MW-3																
	4 - 6	829	4.5	3.09	2.99	6.3	6.15	ND	65.75	21.70	0.028	5.83	5.2	380	ND	5.03
	9 - 11	1,896	6.75	6.38	8.13	6.95	14.25	ND	128.25	34.20	0.001	18.27	3.55	1040	1.06	7.53
	14 - 16	876	8.75	5.92	19.57	6.9	40	ND	92.30	29.15	0.001	13.42	2.3	1969	ND	12.07
	19 - 21	743	7.7	6.45	27.2	6.25	65.4	ND	122.00	19.50	ND	40.57	3.87	1462	ND	15.51
MW-4																
	4 - 6	2,849	2.7	5.72	9.43	6.35	3.25	ND	136.45	25.40	ND	28.65	3.25	1641	4.19	16.55
	9 - 11	1,083	1.875	6.49	57.06	4.63	83.05	ND	128.90	18.05	ND	33.7	2.7	1124	1.24	11.94
	14 - 16	752	1.3	9.77	68.15	7.3	89.67	ND	107.15	17.10	0.003	37.9	2	1212	0.54	11.47
	19 - 21	715	0.67	5.9	43.73	6.35	90.59	ND	124.10	14.00	0.044	42.52	1.05	1014	1.84	11.97
MW-5																
	4 - 6	2,238	6.52	92.86	118.4	8.1	213.61	10.57	397.25	48.40	0.146	80.33	4	1579	0.99	80.56
	9 - 11	1,406	5	4.62	15.96	7.75	10.22	ND	200.15	42.45	0.02	42.11	1.6	ND	1.5	14.56
	14 - 16	554	3.9	6.49	5.42	6.55	12.21	ND	79.60	7.85	0.14	8.36	1.3	750	ND	19.04
	19 - 21	477	2.55	7.25	3.4	7.5	8.13	ND	78.55	7.20	1.352	20.71	2.7	522	ND	6.85
MW-6																
	4 - 6	2,337	12.25	8.05	361.3	7.85	245.26	41.48	202.65	21.15	0.207	225.6	2.7	960.2	ND	126.99
	9 - 11	1,256	4.7	4.89	15.44	7.15	29.62	ND	161.05	24.60	ND	60.73	1.1	1642.4	2.04	13.53
	14 - 16	619	1.75	3.49	27.73	5.85	8.98	ND	125.6	5.85	0.023	13.98	0.98	495.1	ND	5.03
	19 - 21	563	1.44	5.96	6.09	7.35	9.17	ND	128.5	7.35	ND	13.18	3.35	550.5	ND	4.58

Notes:
Information on this table is summarized from previous investigaitons

Prepared by AA/HB
Reviewed by SB
Last Revised 8/18/97

Table 3
Summary of Soil Analyses
for Metals from Borings (TCLP)
NOVEMBER 1991
Jameco Industries, Wyandanch, New York

(units, parts per million, ppm, mg/l)

Sample Identification	Depth	Arsenic	Barium	Cadmium	Chromium Total	Lead	Mercury	Selenium	Silver
B-7-L	2 - 4	0.53	13.67	ND	3.14	ND	0.004	1.55	ND
	4 - 6	0.78	29.99	ND	2.01	ND	ND	1.3	ND
	6 - 8	0.24	20.84	ND	10.05	ND	ND	0.96	ND
B-8-L	2 - 4	0.54	15.87	ND	0.84	ND	ND	1.42	ND
	4 - 6	0.6	29.62	ND	50.55	7.11	0.011	0.3	ND
	6 - 8	0.55	29.62	ND	2.06	ND	0.002	2.25	ND
B-9-OB	0 - 4	0.74	100	ND	0.47	5.00	0.2	1.16	ND
B-10-OB	0 - 4	0.75	19.76	ND	0.47	ND	ND	1.3	ND
B-11-T	0 - 3	0.51	13.27	ND	0.6	ND	ND	1.16	ND
B-12-T	0 - 5	0.92	16.17	ND	0.85	ND	0.001	1.6	ND
B-13-T	0 - 4	0.86	31.19	ND	10.95	ND	0.008	2	ND
B-14-T	0 - 4	0.68	25.84	ND	1.61	ND	ND	1.6	ND
B-15-T	0 - 4	0.78	97.72	ND	ND	ND	0.001	1.3	ND
SLUDGE		0.65	26.42	ND	91.8	14.09	0.043	1.54	ND
SEDIMENT		0.59	13.92	ND	ND	ND	ND	2.18	ND

Notes:

Information on this table is summarized from previous investigations

Prepared by AA/HB

Revised by SB

Last Revised 8/18/97

Table 3 (continued)
Summary of Soil Analyses for Metals from Borings (TCLP)
NOVEMBER 1991
Jameco Industries, Wyandanch, New York
(units, parts per million, ppm, mg/l)

Sample Identification	Depth	Arsenic	Barium	Cadmium	Chromium Total	Lead	Mercury	Selenium	Silver
MW-1	**4 - 6**	0.62	13.22	ND	ND	ND	ND	1.35	ND
	9 - 11	0.2	0.91	ND	1.89	ND	ND	1.43	ND
	14 - 16	0.56	28.42	ND	2.72	ND	ND	1.15	ND
	19 - 21	0.22	25.49	ND	1.42	ND	ND	1.53	ND
MW-2	**4 - 6**	0.75	16.74	ND	0.78	ND	ND	1.42	ND
	9 - 11	1.06	14.89	ND	1.26	ND	ND	1.55	ND
	14 - 16	1.06	19.75	ND	1.72	ND	0.003	1.3	ND
	19 - 21	0.74	24.85	ND	1.07	ND	ND	1.65	ND
MW-3	**4 - 6**	0.35	0.53	ND	1.41	ND	0.001	2.04	ND
	9 - 11	0.88	0.81	ND	0.82	ND	ND	1.58	ND
	14 - 16	0.59	2.48	ND	1.88	ND	ND	1.59	ND
	19 - 21	0.64	21.62	ND	2.38	ND	ND	1.35	ND
MW-4	**4 - 6**	0.92	25.14	ND	6	ND	ND	1.35	ND
	9 - 11	1.1	21.25	ND	2.7	ND	ND	1.16	1.49
	14 - 16	0.51	23.57	ND	3.45	ND	0.001	1.35	ND
	19 - 21	0.27	22.93	ND	3.59	ND	ND	0.96	ND
MW-5	**4 - 6**	0.69	35.07	ND	0.25	ND	ND	2.1	ND
	9 - 11	0.67	18.82	ND	4.1	ND	ND	1.35	ND
	14 - 16	0.22	34.38	ND	2.91	ND	0.001	2.2	ND
	19 - 21	0.67	35.26	ND	3.01	ND	0.002	1.95	ND
MW-6	**4 - 6**	ND	17.01	ND	3.24	ND	0.001	1.4	ND
	9 - 11	0.62	16.84	ND	2.75	ND	ND	3.38	ND
	14 - 16	0.66	16.96	ND	2.57	ND	ND	2.15	ND
	19 - 21	0.49	69.88	ND	2.94	ND	0.001	1.6	ND

Notes:

Information on this table is summarized from previous investigations

Prepared by AA/HB

Reviewed by SB

Last Revised 8/18/97

Table 4
Metal Concentrations
In "Leaching Pool Sediments"
November 1991
Jameco Industries, Wyandanch, New York
(units, parts per million, ppm, mg/kg)

Sample Identification	Nickel	Chromium Total	Chromium TCLP	Barium Total	Barium TCLP	Zinc	Copper
LP-1	326	474	5.08	287	29.7	104	182
LP-2	754	800	21.75	330	35.2	317	496
LP-3	1095	1336	38.48	373	21.4	468	299
LP-4	938	1095	30.08	765	33.5	236	280

Notes:

All samples were collected by AKRF during an investigation conducted in 1991.
All samples were collected from within leaching pools in the leaching pool gallery.

Information on this table is summarized from previous investigations.

Prepared by SB/AA/HB
Reviewed by SB
Last Revised 8/19/97

Table 5
Metals Concentrations in Discolored Soil Samples
November 1991
Jameco Industries, Wyandanch, New York
(units, parts per million, ppm, mg/kg)

Sample Identification	NIckel Total	Nickel TCLP	Chromium Total	Chromium TCLP	Lead Total	Lead TCLP	Zinc Total	Zinc TCLP	Copper Total	Copper TCLP
B-8-GREEN	1,000	NA	3,802	92	556	14	975	NA	3,646	NA
LP-GRAB	2,652	NA	2,867	47	158	ND	675	NA	906	NA

Notes:

GEC was not able to determine exact sample locations. Approximate sample locations were in the vicinity of leaching pools.

Information on this table summarized from previous investigations.

Prepared by SB/AA/HB
Reviewed by SB
Last Revised 8/19/97

Table 6
Summary of Ground Water Analyses for Metals (Dissolved)
Jameco Industries, Wyandanch, New York
(units, parts per million, ppm, mg/L)

Sample Identification	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
MW-1													
5/23/94	ND	ND	ND	ND	ND	ND	0.021	ND	ND	ND	ND	ND	0.11
1/27/95	ND	0.12	0.0079	0.024	0.17	0.2	0.12	ND	0.14	ND	ND	ND	0.48
MW-2													
5/23/94	ND	ND	ND	ND	1.9	2.11	0.039	ND	4.31	ND	ND	ND	0.56
1/27/95	ND	0.023	ND	0.018	3.6	1.9	0.066	0.00033	5	ND	ND	ND	0.48
MW-3													
5/23/94	ND	ND	ND	ND	ND	0.566	ND	ND	1.84	ND	ND	ND	0.10
1/27/95	ND	ND	ND	ND	0.21	4.4	ND	ND	3.4	ND	ND	ND	0.62
MW-4													
MW-5													
5/23/94	0.033	0.01	ND	ND	0.025	0.481	0.013	0	0.226	ND	ND	ND	0.38
1/27/95	ND	0.055	ND	0.012	0.12	0.87	0.028	ND	0.28	ND	ND	ND	0.57
MW-6													
5/23/94	ND	ND	ND	ND	0.575	<.01	0.708	0.161	ND	1.24	ND	ND	0.20
MW-7													
5/23/94	ND	ND	ND	ND	ND	0.004	ND	ND	ND	ND	ND	ND	0.02
1/27/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-8													
5/23/94	ND	ND	ND	0.005	ND	<.01	ND	ND	ND	0.076	ND	ND	0.01
MW-9													
5/23/94	ND	ND	ND	0.005	ND	ND	0.004	ND	ND	ND	ND	ND	0.02
1/27/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.03
MW-10													
7/6/94	ND	ND	ND	ND	ND	ND	ND	ND	0.1	ND	ND	ND	0.01
MW-11													
7/6/94	ND	ND	ND	ND	0.02	0.12	0.002	ND	0.06	ND	ND	ND	0.36
MW-12													
5/23/94	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
7/6/94	ND	ND	ND	ND	0.83	1.9	ND	ND	2.5	ND	ND	ND	0.80
1/27/95	0.18	0.11	0.019	0.082	18	21	0.31	0.0013	21	0.0055	ND	ND	5.60
Standard*	0.003**	0.025	0.003	0.01	0.05	0.2	0.025	0.002	No Stnd.	0.01	0.05	.004**	0.30

Notes:

Standard* refers to the groundwater standard for each element for Class GA groundwaters (6NYCRR Parts 700-705)

** refers to a Guidance value where no Standard exists

MDL - Method Detection Limit ND - Not Detected NA - Not Analyzed NS - Not Sampled

MDL - Ranged from 0.00020 ppm to 0.2 ppm depending on analysis and element.

Laboratory reports and methodologies were not available for samples prior to 1/27/95.

Complete reports for 1/27/95 sampling are included with GEC's Quarterly Monitoring Report.

Information on this table is summarized from previous investigations.

Prepared by SB/AA/HB
Reviewed by SB
Last Revised 8/19/97

Table 7
Summary of Ground Water Analyses for Metals (Total)
Watts Co., Wyandanch, New York
(units, parts per million, ppm, mg/L)

Sample Identification	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Hexavalent Chromium	Copper	Lead	Mercury	Nickel	Selenium	Silver	Thallium	Zinc
MW-1														
5/23/94	32	0.019	ND	ND	0.029	0.02	0.026	0.035	0	ND	ND	ND	ND	0.173
1/27/95	ND	0.042	ND	0.0068	0.065	ND	0.084	0.056	0.00029	0.042	ND	0.01	ND	0.250
4/19/95	ND	0.035	ND	0.0061	0.040	NA	0.054	0.044	ND	ND	ND	ND	ND	0.16
7/24/95	ND	0.048	ND	0.0077	0.052	ND	0.071	0.044	0.00034	ND	ND	ND	ND	0.18
MW-2														
5/23/94	0.038	0.007	ND	ND	8.88	0.24	3.16	0.087	0	4.49	ND	ND	ND	0.747
1/27/95	ND	0.03	ND	0.014	4	ND	3.8	0.079	0.00048	5.7	ND	0.01	ND	0.700
4/19/95	ND	0.060	ND	0.021	4.9	NA	3.5	0.11	0.00044	4.3	ND	ND	ND	0.69
7/24/95	ND	0.054	ND	0.019	3.9	ND	4.1	0.10	0.0013	3.6	ND	ND	ND	0.67
MW-3														
5/23/94	ND	ND	ND	ND	0.119	0.02	0.597	ND	ND	1.75	ND	ND	ND	0.109
1/27/95	ND	ND	ND	ND	0.32	ND	4.5	ND	ND	3.5	ND	0.011	ND	0.680
4/19/95	ND	ND	ND	ND	0.20	NA	2.8	ND	ND	2.0	ND	ND	ND	0.37
7/24/95	ND	ND	ND	ND	0.061	ND	6.6	ND	0.0002	4.2	ND	ND	ND	0.89
MW-5														
5/23/94	0.040	0.029	ND	ND	0.117	0.02	0.639	0.022	0	0.373	ND	ND	ND	0.582
1/27/95	ND	0.046	ND	0.0066	0.1	ND	0.73	0.020	ND	0.23	ND	0.013	ND	0.480
4/19/95	ND	0.049	ND	0.0081	0.13	NA	0.92	0.038	ND	0.27	ND	ND	ND	0.42
7/24/95	ND	0.048	ND	0.007	0.10	ND	0.75	0.018	0.00022	0.19	ND	ND	ND	0.36
MW-7														
5/23/94	ND	0.005	ND	ND	ND	0.01	ND	0.006	ND	0.025	ND	ND	ND	0.026
1/27/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.011	ND	ND
4/19/95	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND
7/24/95	ND	ND	ND	0.0052	ND	ND	0.013	ND	ND	ND	ND	ND	ND	0.035
MW-9														
5/23/94	ND	ND	ND	ND	ND	0.01	ND	0.005	0	ND	ND	ND	ND	0.034
1/27/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.011	ND	0.024
4/19/95	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	0.025
7/24/95	ND	0.013	ND	ND	0.017	ND	0.019	0.010	ND	ND	ND	ND	ND	0.10
MW-12														
5/23/94	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
1/27/95	0.18	0.11	0.019	0.082	18	ND	21	0.310	0.0013	21	0.0055	ND	ND	5.600
4/19/95	ND	0.10	0.015	0.059	14	NA	25	0.23	0.0013	22	ND	ND	ND	4.7
7/24/95	0.16	0.073	0.011	0.05	10	ND	13	0.16	0.0013	16	ND	ND	ND	3.0
Standard*	**0.003****	**0.025**	**0.003**	**0.01**	**0.05**	**0.05**	**0.2**	**0.025**	**0.002**	**No Stnd.**	**0.01**	**0.05**	**.004****	**0.300**

Notes:

Samples were analyzed via the following SW-846

Standard* refers to the groundwater standard for each element for Class GA groundwaters (6NYCRR Parts 700-705)

** refers to a Guidance value where no Standard exists

MDL - Method Detection Limit ND - Not Detected NA - Not Analyzed NS - Not Sampled

MDL - Ranged from 0.00020 ppm to 0.2 ppm depending on analysis and element.

Prepared by: AA/HB
Reviewed by: SB
Last Revised 8/19/97

Table 8
SUMMARY OF GROUNDWATER ANALYSIS FOR VOLATILE ORGANIC COMPOUNDS
Watts Co., Wyandanch, New York
(units parts per billion [ppb], µg/kg)

Sample Identification	Chloro-methane	Chloro-form	1,1-dichloro-ethane	cis-1,2-dichloro-ethene	Ethyl Benzene	Methylene Chloride	4-Methyl-2-pentanone	1,1,2,2-Tetra-chloroethane	Tetrachloro ethene	Toluene	1,1,1-Trichloro ethane	1,1,2-Trichloro ethane	Trichloro ethene	1,2,4-Trimethyl benzene	Vinyl Chloride	Xylenes (total)
MW-1																
6/91	ND	ND	ND	ND	ND	ND	7	ND	ND	ND	11	ND	ND	ND	ND	ND
5/23/94	ND	ND	ND	ND	NA	0.2	NA	ND	ND	ND	30	ND	ND	ND	ND	NA
1/27/95	ND	ND	ND	ND	NA	ND	NA	ND	ND	ND	0.6	ND	ND	ND	ND	NA
4/19/95	ND	ND	ND	ND	ND	1	NA	0.3	ND	ND	0.6	ND	ND	ND	ND	ND
7/24/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7	ND	ND	ND	ND	ND
10/12/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1/17/96	ND	ND	ND	ND	ND	7.1	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-2																
6/91	ND	ND	ND	ND	ND	ND	ND	ND	1500	ND	12	ND	5400	ND	ND	ND
5/23/94	ND	ND	ND	ND	NA	0.3	NA	ND	28	ND	4	0.4	1200	0.2	12	NA
1/27/95	ND	ND	ND	ND	NA	ND	NA	ND	26	ND	ND	ND	180	ND	33	NA
4/19/95	ND	ND	ND	ND	ND	ND	NA	ND	11	ND	ND	ND	46	ND	6	ND
7/24/95	ND	ND	ND	ND	ND	ND	ND	ND	0.5	ND	ND	ND	5	ND	ND	ND
10/12/95	ND	ND	ND	ND	ND	6.7	ND	ND	ND	ND	ND	ND	21	ND	ND	ND
MW-3																
6/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5/23/94	ND	ND	ND	ND	NA	0.2	NA	ND	ND	ND	ND	ND	10	ND	ND	NA
1/27/95	ND	ND	ND	ND	NA	ND	NA	ND	ND	ND	ND	ND	4	ND	ND	NA
4/19/95	ND	ND	ND	ND	ND	ND	NA	ND	25	ND	ND	ND	170	ND	ND	ND
7/24/95	ND	ND	ND	ND	ND	ND	ND	ND	4	ND	ND	ND	12	ND	ND	ND
10/12/95	ND	ND	ND	ND	ND	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1/17/96	1.8***	ND	ND	ND	ND	8.1	NA	ND	17	ND	ND	ND	5.3	ND	ND	ND
MW-5																
6/91	ND	ND	ND	ND	2	6	46	ND	30	14	30	ND	17	ND	ND	5
5/23/94	ND	ND	ND	ND	NA	0.3	NA	ND	9	0.9	0.2	ND	14	ND	5	NA
1/27/95	ND	ND	ND	ND	NA	ND	NA	ND	5	ND	ND	ND	5	ND	0.5	NA
4/19/95	ND	ND	ND	ND	ND	ND	NA	ND	4	ND	ND	ND	5	ND	ND	ND
7/24/95	ND	ND	ND	ND	ND	ND	ND	ND	280	ND	ND	ND	9	ND	ND	ND
10/12/95	ND	ND	ND	ND	ND	11	ND	ND	11	ND	ND	ND	5.6	ND	ND	ND
MW-7																
6/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5/23/94	ND	ND	ND	ND	NA	0.3	NA	ND	30	ND	ND	ND	4	ND	ND	NA
1/27/95	ND	ND	ND	ND	NA	ND	NA	ND	39	ND	ND	ND	3	ND	ND	NA
4/19/95	ND	ND	ND	ND	ND	ND	NA	ND	15	ND	ND	ND	0.6	ND	ND	ND
7/24/95	ND	ND	ND	ND	ND	ND	ND	ND	13	ND	ND	ND	0.8	ND	ND	ND
10/12/95	ND	ND	ND	ND	ND	12	ND	ND	51	ND	ND	ND	9.7	ND	ND	ND
1/17/96	ND	ND	ND	2.9	ND	7.6	NA	ND	17	ND	ND	ND	1.3	ND	ND	ND
MW-9																
6/91	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5/23/94	ND	ND	ND	ND	NA	ND	NA	ND	2	ND	ND	ND	0.3	ND	ND	NA
1/27/95	ND	ND	ND	ND	NA	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA
4/19/95	ND	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
7/24/95	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
10/12/95	ND	ND	ND	ND	ND	11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1/17/96	ND	58	ND	ND	ND	8.8	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-12																
6/91	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5/23/94	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1/27/95	ND	ND	ND	ND	NA	370	NA	ND	120	ND	ND	ND	3300	ND	ND	NA
4/19/95	ND	ND	ND	ND	ND	ND	NA	ND	400	ND	ND	ND	1500	ND	58	ND
7/24/95	ND	ND	ND	ND	ND	ND	ND	ND	100	ND	ND	ND	1800	ND	54	ND
10/12/95	ND	ND	ND	ND	ND	11	ND	ND	75	ND	6.7	ND	1700	ND	17	ND
1/17/96	ND	13	ND	ND	ND	8	NA	ND	75	ND	5.3	ND	1400	ND	ND	ND

Notes:

Standard* refers to the groundwater standard for each element for Class GA groundwaters (6NYCRR Parts 700-705)

MDL - Method Detection Limit NA - Not Analyzed ND - Not Detected NS - Not Sampled

MDL - Ranged from 0.20 ppb to 2 ppb depending on analysis and element.

No compounds were detected above detection limits for samples from 6/91 and 5/18/94.

Wells that were not sampled on specific dates were not included in the sample identification column.

Laboratory analyses were conducted via EPA Method 8260 or 542 or equivalent.

Complete laboratory reports for 1/27/95 sampling are included in GEC's Quarterly Monitoring Report.

Information on this table is summarized from previous investigations.

Acetone, methyl-t-butyl-ether, 2-butanone and 2-hexanone were detected in several samples. These results were not tabulated as they are considered laboratory contaminants and not representative of site conditions.

* Reported as total 1,2-dichloroethene

** No guidance value exists

*** detected below quantitation limit

Prepared by PT/HB
Reviewed by SB
Revised 8/19/97

TABLE 9
SUMMARY OF SOIL ANALYTICAL RESULTS - SOIL EXCAVATION ACTIVITIES
WATTS, INC. - JAMECO INDUSTRIES
248 WYANDANCH AVENUE
WYANDANCH, NY
(VOC units presented in µg/kg)

Sample Location	Sample Identification	Sampling Date	USEPA Method	Sampling Depth	Xylenes	RDL	cis-1,2-DCE	RDL	sec-Butylbenzene	RDL	n-Butylbenzene	RDL	Naphthalene	RDL	1,3,5-TMB	RDL	1,2,4-TMB	RDL	p-Isopropyltoluene	RDL	n-Propylbenzene	RDL	TPH (mg/kg)	RDL	Cyanide (mg/kg)	RDL	Sulfide (mg/kg)	RDL	pH (dimensionless)	RDL
LT-1	LT-1	5/10/95	***	8'	3300	760	2600	760	ND	3800	ND	3800	ND	3800	7300	3800	20000	3800	ND	3800	ND	3800	61000**	15000	ND	0.25	600	5	7	N/A
TP-4	TP-4 (10')	5/10/95	***	10'	35	10	ND	10	230	50	450	50	ND	50	960	50	770	50	370	50	89	50	8800**	100	ND	0.25	ND	0.20	5.7	N/A
TP-3	TP-3 (11')	5/10/95	8260/8100	11'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	100	NA	NA	NA	NA	NA	NA
MW-15	MW-15 (5-7')	5/16/95	8260/8100	5-7'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	38	NP	NA	NA	NA	NA	NA	NA
MW-15	MW-15 (10-12')	5/16/95	8260/8100	10-12'	110	20	ND	5	130	100	ND	100	130	100	620	100	1100	100	ND	100	ND	100	23000	NP	NA	NA	NA	NA	NA	NA
MW-15	MW-15 (15-17')	5/16/95	8260/8100	15-17'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	190	NP	NA	NA	NA	NA	NA	NA
MW-16	MW-16 (10-12')	5/17/95	8260/8100	10-12'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	4.4	NA	NA	NA	NA	NA	NA
MW-16	MW-16 (15-17')	5/17/95	8260/8100	15-17'	ND	1	ND	1	ND	5	ND	5	ND	5	ND	5	ND	5	ND	5	ND	5	30	NP	NA	NA	NA	NA	NA	NA
MW-16	MW-16 (20-22')	5/17/95	8260/8100	20-22'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	5	NA	NA	NA	NA	NA	NA
MW-17	MW-17 (10-12')	5/17/95	8260/8100	10-12'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	4.8	NA	NA	NA	NA	NA	NA
MW-17	MW-17 (20-22')	5/17/95	8260/8100	20-22'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	4.6	NA	NA	NA	NA	NA	NA
MW-18	MW-18 (10-12')	5/18/95	8260/8100	10-12'	ND	6.4	ND	6.4	ND	32	ND	32	ND	32	ND	32	ND	32	ND	32	ND	32	ND	4.5	NA	NA	NA	NA	NA	NA
MW-18	MW-18 (20-22')	5/18/95	8260/8100	20-22'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	4.5	NA	NA	NA	NA	NA	NA
MW-19	MW-19 (5-7')	5/22/95	8260/8100	5-7'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	100	NA	NA	NA	NA	NA	NA
MW-19	MW-19 (10-12')	5/22/95	8260/8100	10-12'	72	20	ND	20	ND	100	120	100	ND	100	270	100	470	100	190	100	ND	100	13000*	100	NA	NA	NA	NA	NA	NA
MW-19	MW-19 (15-17')	5/22/95	8260/8100	15-17'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	800*	100	NA	NA	NA	NA	NA	NA
MW-20	MW-20 (10-12')	5/22/95	8260/8100	10-12'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	100	NA	NA	NA	NA	NA	NA
MW-20	MW-20 (20-22')	5/23/95	8260/8100	20-22'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	100	NA	NA	NA	NA	NA	NA
MW-21	MW-21 (10-12')	5/23/95	8260/8100	10-12'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	100	NA	NA	NA	NA	NA	NA
MW-21	MW-21 (20-22')	5/24/95	8260/8100	20-22'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	100	NA	NA	NA	NA	NA	NA
MW-22	MW-22 (10-12')	5/24/95	8260/8100	10-12'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	100	NA	NA	NA	NA	NA	NA
MW-22	MW-22 (20-22')	5/24/95	8260/8100	20-22'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	100	NA	NA	NA	NA	NA	NA
MW-23	MW-23 (10-12')	5/25/95	8260/8100	10-12'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	100	NA	NA	NA	NA	NA	NA
MW-23	MW-23 (20-22')	5/25/95	8260/8100	20-22'	ND	5	ND	5	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	25	ND	100	NA	NA	NA	NA	NA	NA

NOTES:

NP = Information not provided by laboratory

Data points below RDL were listed as ND (not detected)

RDL = Reporting Detection Limit

TPH = Total Petroleum Hydrocarbons as analyzed by EPA Method 8100. Units presented in mg/kg (parts per million).

N/A = Not Applicable

NA = Not Analyzed

ND = Not Detected

1,3,5-TMB = 1,3,5-Trimethylbenzene

1,2,4-TMB = 1,2,4-Trimethylbenzene

* TPH identified as motor oil.

** TPH identified as No. 2 fuel oil and/or diesel.

*** Samples were analyzed by EPA Methods 9040; 1010; 7.3; 9095; 8260; 8100M; and the following Methods via TCLP: 6010; 7470/7471; 8260; 8270; 8080; and 8150.

Samples TP-3 and TP-4 were collected from test pits; sample LT-1 was collected from a concrete leaching tank. The test pits and leaching tank were located between Wyandanch Avenue and the northerly wall of the building adjacent to the valve shop.

Prepared by AA/HB
Reviewed by SB
Revised 8/13/97

Table 10

SOIL ANALYSES SUMMARY
SOIL EXCAVATION ACTIVITIES

Jameco Industries, Wyandanch, NY
July, 1995
(unit, parts per million [ppm], mg/kg)

Sample Location	Sample Date	USEPA Method	Petroleum Identified	Petroleum Hydrocarbons	RDL	Sample Location Summary
S-1	7/24/95	8100M	Motor Oil	16,000	1,000	West wall of excavation, adjacent to building, 10-12' depth
S-2	7/24/95	8100M	Motor Oil	8,800	1,000	NW corner of excavation, 10-12' depth
S-3	7/25/95	8100M	Motor Oil	22,000	1,000	West wall of excavation,~8' depth, near MW-14
S-4	7/25/95	8100M	Motor Oil	39,000	1,000	Beneath Bell #4, ~14' depth, ~20' from W building corner, 8' out from building
S-5	7/25/95	8100M	Motor Oil	75,000	1,000	Sidewall along sidewalk, ~8' depth, 30 from west end of building
S-6	7/25/95	8100M	Motor Oil	40,000	1,000	Beneath Bell #3, ~11' depth
S-7	7/26/95	8100M	Motor Oil	8,500	1,000	Beneath Bell #2, ~11' depth
S-8	7/26/95	8100M	None	ND	100	East sidewall of excavation near Bell #1, 8' depth, 15' out from building. Beneath water lines
S-9	7/26/95	8100M	Motor Oil	23,000	1,000	Beneath Bell #1, ~11'depth

Notes:

RDL = Reported Detection Limit
ND = Not Detected above Reported Detection Limit

Prepared by AA/HB
Reviewed by SB
Revised 8/19/97

TABLE 11
SUMMARY OF GROUND WATER ANALYTICAL RESULTS-SOIL EXCAVATION ACTIVITIES
WATTS, INC. - JAMECO INDUSTRIES
248 WYANDANCH AVENUE
WYANDANCH, NY
(VOC units presented in µg/l)

Sample Location	Sampling Date	USEPA Method	Chlorobenzene	RDL	PCE	RDL	TCE	RDL	cis-1,2-DCE	RDL	Toluene	RDL	Acetone	RDL	p-Isopropyl toluene	RDL	1,2,4-Trimethyl benzene	RDL	1,2,3-Trichloro benzene	RDL	TPH (mg/kg)	RDL
MW-14	5/25/95	8260/8100	ND	3.5	48	1.5	6.6	1.0	51	1.0	ND	1.5	ND	10.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
MW-15	5/25/95	NA	Water samples were not collected from MW-15 due to the detection of 1.09 feet of free-phase petroleum on the water table.																			
MW-16	5/25/95	8260/8100	ND	3.5	ND	1.5	3.6	1.0	8.8	1.0	7.0	1.5	72	10.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
MW-17	5/25/95	8260/8100	ND	3.5	4.7	1.5	ND	1.0	5.6	1.0	ND	1.5	ND	10.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
MW-18	5/25/95	8260/8100	ND	3.5	ND	1.5	ND	1.0	ND	1.0	48	1.5	250	10.0	4.6	1.0	ND	1.0	1.2	1.0	ND	1.0
MW-19	5/25/95	NA	Water samples were not collected from MW-19 due to the detection of 1.63 feet of free-phase petroleum on the water table.																			
MW-20	5/25/95	8260/8100	ND	3.5	13	1.5	3.5	1.0	1.2	1.0	ND	1.5	ND	10.0	ND	1.0	ND	1.0	ND	1.0	30*	1.0
MW-21	5/25/95	8260/8100	ND	3.5	37	1.5	4.5	1.0	29	1.0	ND	1.5	ND	10.0	ND	1.0	1.8	1.0	ND	1.0	ND	1.0
MW-22	5/25/95	8260/8100	23	3.5	ND	1.5	ND	1.0	1.4	1.0	47	1.5	40	10.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0
MW-23	5/25/95	8260/8100	ND	3.5	23	1.5	4.5	1.0	3.4	1.0	ND	1.5	ND	10.0	ND	1.0	ND	1.0	ND	1.0	ND	1.0

NOTES:

PCE=Tetrachloroethene
TCE = Trichloroethene
1,2-DCE = 1,2-Dichloroethene
Data points below RDL were listed as ND (not detected)
RDL=Reporting Detection Limit
NA = Not Analyzed. ND = Not Detected above Reported Detection Limit

TPH = Total Petroleum Hydrocarbons as analyzed by EPA Method 8100. TPH units presented in mg/kg (parts per million).
* TPH identified as motor oil.

Prepared by PT/HB
Reviewed by SB
Last Revised 8/19/97

Table 12
SOIL SAMPLING AND ANALYSIS PLAN

Test Boring	Depth Interval (feet)	ANALYSES			
		*VOCs**	*13 Priority Pollutant Metals*	*Total Hex. Chromium*	*Sediment Characteristics***
MW-25	0-2	x			
	5-7	x			
	10-12				x
B-27	0-2	x	x	x	
	5-7	x	x	x	
	10-12	x	x	x	
B-28	0-2	x	x	x	
	5-7	x	x	x	
	10-12	x	x	x	
B-29	0-2	x	x	x	
	5-7	x			
	10-12	x			
B-30	0-2	x			
	5-7	x	x	x	
	10-12	x			
B-31	0-2	x			
	5-7	x			
	10-12	x	x	x	
B-32	0-2	x	x	x	
	5-7	x	x	x	
B-33	0-2	x	x	x	
	5-7	x	x	x	
B-34	0-2	x	x	x	
	5-7	x	x	x	
HB-1	0-3"	x	x	x	
	2"	x			
HB-2	0-3"	x	x	x	
	2"	x			
HB-3	0-3"	x	x	x	
	2"	x			
HB-4	0-3"	x	x	x	
	2"	x			
HB-5	0-3"	x	x	x	
	2"	x			
HB-6	0-3"	x	x	x	
	2"	x			
HB-7	0-3"	x	x	x	
	2"	x			

* VOCs = volatile organic compounds via USEPA Method 8260.
PAHs = polynuclear aromatic hydrocarbons via USEPA Method 8270.
Petroleum Hydrocarbons = petroleum hydrocarbons via Petroleum Scan.
Total Al and Cr = total aluminum and chromium
** Sediment Characteristics included: Cation exchange capacity, total organic matter, percent moisture, and seive analysis

Prepared by SB/HB
Reviewed by SB/EF
Revised 8/18/97

Table 13
GROUNDWATER SAMPLING AND ANALYSIS PLAN

Well Number	Depth Interval (feet)	ANALYSES*						
		VOCs	*13 Priority Pollutant Metals (Total)*	*Total Hex. Chromium*	*13 Priority Pollutant Metals (Dissolved)*	*Dis. Hex. Chromium*	*PAH(2)*	*Petroleum Scan*
MW-1	overburden	X(1)	X(1)	X(1)	X	X		
MW-2	overburden	X(1)	X(1)	X(1)	X	X		
MW-3	overburden	X(1)	X(1)	X(1)	X	X		
MW-4	overburden							
MW-5	overburden	X(1)	X(1)	X(1)	X	X		
MW-6	overburden							
MW-7	overburden	X(1)	X(1)	X(1)	X	X		
MW-8	overburden							
MW-9	overburden	X(1)	X(1)	X(1)	X	X		
MW-10	90 to 100	X	X	X	X	X		
MW-11	50 to 60	X	X	X	X	X		
MW-12	overburden	X(1)	X(1)	X(1)	X	X		
MW-13	DESTROYED							
MW-14	DESTROYED							
MW-15	overburden	X	RIFS investigations associated with the release of cutting oil will be conducted during the second phase of site investigations. This later phase of investigation will include sampling of wells MW-15 thorugh MW-23.				X	X
MW-16	overburden	X					X	
MW-17	overburden	X					X	X
MW-18	overburden	X					X	
MW-19	overburden	X					X	X
MW-20	overburden	X					X	
MW-21	overburden	X					X	X
MW-22	overburden	X					X	
MW-23	overburden	X					X	X
MW-25	overburden	X	X	X	X	X		
GP-101	overburden to 50'	X (2)			X(5)	X(5)		
GP-102	overburden to 50'	X (2)			X(5)	X(5)		
GP-103	overburden to 50'	X (2)			X(5)	X(5)		
GP-104	overburden to 50'	X (2)			X(5)	X(5)		
GP-105	overburden to 50'	X (2)			X(5)	X(5)		

* VOCs = volatile organic compounds via USEPA Method 8260.
PAHs = polynuclear aromatic hydrocarbons via USEPA Method 8270.
Petroleum Hydrocarbons = petroleum hydrocarbons via Petroleum Scan.
Total Al and Cr = total aluminum and chromium
(1) Sampled as part of the Quarterly Sampling
(2) Polycyclic Aromatic Hydrocarbons

Prepared by SB/HB
Reviewed by SB/EF
Revised 8/18/97

Table 14
Summary of QC Sampling and Analysis Plan
Jameco Facility

MATRIX	Laboratory Analytical Parameters	Investigative Samples	*Field Duplicates*	*Field Blanks*	*Trip Blank*	*Matrix Total*
SOIL	VOCs	30	3	NA	3	36
	13 P.P. Metals (total)	30	3	2	NA	35
	Hex. Chrome (total)	30	3	2	NA	35
	PAHs	10	1	1	NA	12
Ground Water	VOCs	30	3	3	3	36
	13 P.P. Metals (total)	10	2	2	NA	16
	Hex. Chrome (total)	10	2	2	NA	16
	13 P.P. Metals (dissolved)	35	3	3	NA	41
	Hex. Chrome (dissolved)	35	3	3	NA	41
	PAHs	9	1	1	NA	11
	Petroleum Scan	5	1	1	NA	7

* VOCs = volatile organic compounds via USEPA Method 8260.
PAHs = polynuclear aromatic hydrocarbons via USEPA Method 8270.

Prepared by SB/HB
Reviewed by SB/EF
Revised 8/18/97

APPENDIX A
QAPjP Plan

QAPjP
ATTACHMENT A

GEC's QA/QC and IEA's QA/QC

QUALITY ASSURANCE PROJECT PLAN (QAPjP)
JAMECO INDUSTRIES, INC.
248 WYANDANCH AVE
WYANDANCH, NEW YORK

September 17,1997

Prepared For:

New York State Department of Environmental Conservation

and

Camille Gagnon
Watts Industries, Inc.
P.O. Box 6431
South Main Street
Franklin, NH 03235

GEC **Goldman Environmental Consultants, Inc.**
60 Brooks Drive
Braintree, MA 02184-3839
781-356-9140
FAX 781-356-9147
EMail: gec@wn.net

QUALITY ASSURANCE PROJECT PLAN

248 WYANDANCH AVENUE
WYANDANCH, NEW YORK

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1.0 Project Description

This Quality Assurance Project Plan (QAPjP) describes activities, procedures and measures that will be taken to assure quality and accuracy of analytical data relative to the Remedial Investigation/Feasibility Study (RI/FS) Work Plan including the performance of assessment and subsurface investigations to be conducted at the JAMECO facility. A complete description of the RI/FS is included in pages 16 through 49 of the attached Work Plan.

2.0 Project Organization

A Project Organization chart has been included as Figure 1 of this QAPjP. As the chart indicates, quality assurance will be the responsibility of Eileen A. Furlong, GEC's Vice President of Waste Site Programs. Mrs. Furlong's resume is included with Attachment A of this Plan. GEC intends to use IEA and their Monroe, Connecticut laboratory. IEA is a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified laboratory for general and CLP analyses.

3.0 Quality Assurance Objectives for Data Measurement

As described in the Sampling and Analysis Plan section of the attached RI/FS Work Plan, sampling will be conducted during the performance of a test boring program, a groundwater investigation and an evaluation of surficial soil conditions. All activities are being conducted in order to determine the risk posed to the public health, safety, welfare and the environment by site contaminants.

GEC's QA/QC Plan is attached as Attachment A to this QAPjP. In addition, IEA's Quality Assurance Plan is also included with Attachment A.

4.0 Sampling Procedure

GEC's sampling plan is described in Section VII of the attached RI/FS Work Plan. In addition, Standard Operating Procedures for the collection of soil and groundwater samples is included as Attachment B to this QAPjP.

5.0 Sample and Document Custody Procedures

Standard Operating Procedures for Sample and Document Custody Procedures are included at Attachment B to this QAPjP. All samples will be forwarded to IEA via overnight shipment or will be delivered on the same day to assure that samples are received by the laboratory within 24 hours of collection.

6.0 Calibrations Procedures and Frequency

Sample calibration procedures and frequency are determine by TMA with cooperation of GEC. A description of these procedures is included in Attachment A.

7.0 Analytical Procedures

Analytical procedures to be followed during the completion of this RI/FS are described in Section VII of the RI/FS. As noted in the preceding paragraphs, this RI/FS will be conducted in coordination with two IRM's at the site. As such, a significant amount of information regarding site soil, groundwater and air (indoor and soil gas) will be obtained. Analytical procedures are described in IEA's documentation, attached as Attachment A to this QAPjP. Also included in Attachment A is a listing of the method reporting limits for specific analytes and laboratory analyses.

8.0 Data Reduction, Usability and Reporting

Data Reduction, Usability and Reporting procedures are described in IEA's documentation, attached as Attachment A to this QAPjP. In addition, GEC's QAO will review all data and analytical procedures to assure that data collection has been conducted in accordance with GEC's QA/QC procedures, provided in Attachment A.

9.0 Internal Quality Control Checks

Internal Quality Control Checks are described in IEA's documentation, included as Attachment A to this QAPjP. In addition, GEC's QAO will review all data and analytical procedures to assure that data collection has been conducted in accordance with GEC's QA/QC procedures, attached as Attachment A.

10.0 Performance and System Audits

GEC's and IEA's Performance and System Audit procedures are described in GEC's Standard Operating Procedure for QA/QC and in IEA's documentation, attached as Attachment A to this QAPjP. In addition, GEC's QAO audits laboratory practices and systems initially and as warranted as part of GEC's ongoing commitment to attaining data quality objectives.

11.0 Preventative Maintenance

GEC's and IEA's Preventative Maintenance procedures are described GEC's Standard Operating Procedure for QA/QC and in IEA's documentation, attached as Appendix A to this QAPjP. In addition, GEC's QAO audits laboratory practices and systems initially and as warranted as part of GEC's ongoing commitment to attaining data quality objectives.

12.0 Data Measurement Assessment Procedures

GEC's and IEA's Data Measurements procedures are described in GEC's Standard Operating Procedure for QA/QC and in IEA's documentation, attached as Attachment A to this QAPjP. In addition, GEC's QAO audits laboratory practices and systems initially and as warranted as part of GEC's ongoing commitment to attaining data quality objectives.

As part of the Data Measurement and Assessment Procedures, GEC will evaluate data suitability. Data suitability findings will be forwarded to NYSDEC prior to submission of the final RI/FS report.

13.0 Corrective Action

GEC's and IEA's Corrective Action procedures are described in GEC's Standard Operating Procedure for QA/QC and in IEA's documentation, attached as Attachment A to this QAPjP.

14.0 Quality Assurance Reports and Management

Upon completion of site activities, GEC documents all potential quality assurance concerns as a means of reporting and managing quality assurance. Items included in this reporting might include a statistical analysis of suspect data, presence of analytes in method or trip blanks, or the unexplained absence of known contaminants. Information of this nature is included in IRM and RI/FS Progress Reports.

Respectfully submitted,
Goldman Environmental Consultants, Inc.

Prepared By:	Reviewed By:
Samuel W. Butcher Vice President, Operations	Eileen A. Furlong Vice President, Waste Site Programs

IEA
An Aquarion Company

IEA-CT Laboratory Quality Assurance Program

prepared by

Marsha K. Culik
Quality Assurance Manager

for

IEA Corporation
Monroe, Connecticut

This document has been prepared by IEA Corporation and will be updated annually. The material contained herein is not to be disclosed to, or made available to any third party without the prior expressed written approval of the Corporate Quality Assurance Director.

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1.0 QUALITY ASSURANCE PROGRAM-IDENTIFICATION FORM

Document Title: **IEA-CONNECTICUT QUALITY ASSURANCE PROGRAM PLAN**

Corporate Address:
IEA Connecticut
200 Monroe Turnpike
Monroe, Connecticut 06468

Company Official: Mr. Michael V. Bonomo
Title: Director of Operations
Telephone: (203) 261-4458

Company Official: Mr. Jeffrey C. Curran
Title: Laboratory Manager

Company Official: Ms. Marsha K. Culik
Title: Quality Assurance Manager

Plan Coverage: IEA-Connecticut Laboratory including the following functions:

- Administration
- Sample Receipt
- GC Laboratories
- Quality Assurance
- Data Entry
- Report Production
- Computer Systems
- Inorganics Laboratories
- GC/MS Laboratories
- Facilities and Safety
- Sample Preparation Laboratories

Concurrences:

Name: Mr. Michael Bonomo
Title: Director of Operations
Signature: Michael V. Bonomo
Date: 11/30/95

Name: Mr. Jeffrey Curran
Title: Laboratory Manager
Signature: Jeffrey C. Curran
Date: 11/30/95

Name: Ms. Marsha Culik
Title: Quality Assurance Manager
Signature: Marsha K. Culik
Date: Nov. 30 1995

Name: Mr. David Houle
Title: President - IEA
Location: Cary, North Carolina
Signature: David C. Houle
Date: 12/4/95

2.0 INTRODUCTION

2.1 Background

Industrial & Environmental Analyst's, Inc. (IEA) is a full-service environmental organization specializing in laboratory analytical services and field support services.

The IEA organization is a network of seven (6) integrated environmental laboratories located throughout the Eastern United States with over 300 employees, making it one of the top ten environmental testing companies in the United States. The corporation serves a broad range of industries including environmental consulting and engineering firms, state and federal agencies, pharmaceutical, petroleum, and electronic component manufacturers. In support of these activities the corporation presently maintains environmental laboratory certifications in over twenty five state programs. IEA Corporate headquarters are located in Cary, North Carolina.

IEA is a wholly-owned subsidiary of the AQUARION Company, headquartered in Bridgeport, Connecticut. AQUARION is listed on the New York Stock Exchange and has annual revenues exceeding 100 million. It is also the largest investor-owned water utility in the country.

The IEA laboratories are located as follows:

IEA/Connecticut	Monroe
IEA/Illinois	Schaumburg
IEA/North Carolina	Cary
IEA/NC-Radiological	Morrisville
IEA/Massachusetts	N. Billerica
IEA/New Jersey	Whippany

Detailed information such as mailing addresses and telephone numbers for each of the laboratories is presented in Table 2.2.1.

HISTORY OF IEA

IEA was founded in 1977, in Burlington, Vermont, as a water resources testing facility in support of IBM's facility in Essex Junction, Vermont. IEA served the IBM site exclusively for three years performing ultrapure water analysis, wastewater treatment and pollution control. In 1982, IEA opened a second facility in Research Triangle Park (RTP), North Carolina in order to provide desired services from the IBM facility in RTP. In 1984 IEA expanded its market and began serving the developing environmental testing market. By 1985 IEA had expanded to a full service laboratory offering complete soil and water analysis, field sampling, groundwater analysis and evaluation of hazardous waste. The North Carolina laboratory, which serves as IEA's corporate headquarters, is located in Cary, North Carolina.

In the fall of 1988, IEA positioned itself as one of the leading laboratories in the country by qualifying for the USEPA Contract Laboratory Program (CLP). This development created a favorable position for winning major consulting engineering contracts. As such, IEA grew rapidly and expanded its commercial client base considerably. Due to the rapid increase in demand for environmental services IEA sought potential buyers in 1989 in order to provide resources for future expansion. As a result, IEA was purchased by The Aquarion Corporation, based in Bridgeport, Connecticut in 1989. Aquarion is a New York Stock Exchange-listed corporation that traces its roots to 1857. It has the distinction of being the largest investor-owned water utility in the nation. Annual revenues of Aquarion exceed 100 million.

Since the initial purchase, IEA has acquired several existing environmental laboratories which were operated in strategic locations along the Eastern United States. As a result, IEA now offers very comprehensive environmental testing services including mixed waste radiological testing and a full range of chemical testing performed in support of DOD, DOE, RCRA, CERCLA, NPDES, TSCA and SDWA regulations.

This plan is intended to describe the quality assurance program of the IEA-Connecticut facility located at 200 Monroe Turnpike, Monroe, Connecticut. IEA operates a corporate wide quality assurance program (Doc.# QAQ00102.NET) and this facility QA program complies with the requirements set forth in the corporate program. In some cases, the requirements in the facility QA program may be more stringent than the corporate program, but in no case can they be less stringent.

TABLE 2.1.1 IEA NETWORK LOCATIONS

North Carolina
Corporate Headquarters
3000 Weston Parkway
Cary, NC 27513
(919) 677-0090
(919) 677-0427 (Fax)
(800) 444-9919

Connecticut
200 Monroe Turnpike
Monroe, CT 06468
(203) 261-4458
(203) 268-5346 (Fax)

North Carolina
Radiological Laboratory
120 South Center Court
Suite 300
Morrisville, NC 27560
(919) 460-8505
(919) 469-2646 (Fax)

New Jersey
628 Route 10
Whippany, NJ 07981
(201) 428-8181
(201) 428-5222 (Fax)

Massachusetts
149 Rangeway Road
N. Billerica, MA 01862
(617) 272-5212
(508) 667-7871 (Fax)
(800) 950-5212

Illinois
126 West Center Court
Schaumburg, IL 60195
(708) 705-0740
(708) 705-1567 (Fax)
(800) 933-2580

2.2 Definition of Terms

A number of terms are used within this document to describe the corporate QA program in effect at IEA laboratories. To ensure effective communication, the following terms are being defined:

Accuracy	- the degree of agreement of a measurement with an accepted reference or true value. Accuracy is usually expressed as the difference between the measurement and the true value. It is a measurement of the bias in a system.
Analytical Report Turnaround Time	- in order to ensure proper communication is maintained, IEA has defined analytical report turnaround times to be always based upon calendar days, not business days. Analytical holding times are also based on calendar days.
Audit	- a systematic check to determine the quality of some function or activity. Audits may be of two basic types, performance audits or system audits. Performance audits involve a quantitative comparison of the labs results to that of a proficiency sample containing known concentrations of analytes. A system audit is a qualitative evaluation that normally consists of an on-site review of a laboratory's quality assurance system and physical facilities.
Batch	- the basic unit for analytical quality control. It is defined as a group of samples which are analyzed together with the same method sequence and the same lots of reagents and with the manipulations common to each sample within the same time period or in continuous sequential time periods. Samples in each batch should be of similar composition (matrix). At IEA laboratories, the maximum batch size has been set at 20 samples. At IEA's smaller laboratories where the number of samples received daily may be low, samples received in a given <u>week</u> may be combined into one analytical batch. Due to holding time constraints, individual samples may be extracted on different days as compared to other samples in the batch. If this is the case, a method blank must be performed daily with every sample extraction. The other QC samples such as MS and MSD are only performed for the total analytical batch.
Comparability	- a measure of the confidence with which one data set can be compared to another.
Completeness	- a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under routine operating conditions.
Data Quality Objectives	- during the planning phase of a project requiring laboratory support, the data user must establish the quality of data required from the investigation. Such statements of data quality are known as data quality objectives (DQOs). The DQOs are qualitative and quantitative statements of the quality of data required to support specific decisions or regulatory actions.
Data Validation	- a systematic effort to review data to identify any outliers or errors and thereby cause deletion or flagging of suspect values to assure the validity of the data to the user. This process may be done by manual or computer methods.
Field Blank	- contaminant free water, or appropriate matrix, used during sampling activities to determine if there is any potential for sample contamination associated with the field sampling or equipment.
Library Search	- a technique used by which a mass spectrum of an unknown compound is compared to the mass spectrum of compounds contained in a computer library in an effort to identify

unknown compounds. Compounds identified in this manner are referred to as "tentatively identified compounds" (TICs).

Matrix Spike	- the process of adding a known amount of analyte to a sample and analyzing the sample. The amount of analyte recovered is calculated as a percent recovery. This technique is used to assess accuracy of analysis.
Matrix Spike Duplicate	- a second matrix spike is compared to the results of the matrix spike to assess precision of the analysis.
Method Blank	- contaminant free water, or appropriate matrix, taken through the entire analytical process to determine if there is any contamination associated with the analytical procedures.
Method Detection Limit (MDL)	- the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
Practical Quantitation Limit (PQL)	- is the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine operating conditions.
Precision	- a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is usually expressed in terms of standard deviation.
Quality Assurance (QA)	- the total integrated program put in place to assure the reliability of data generated in the laboratory.
Quality Control (QC)	- the routine application of specific, well-defined procedures which ensure the generation of data which fulfill the objectives of the QA program.
Quality Assurance Program Plan (QAPP)	- a written assembly of management policies, objectives, principles and general procedures which outline how the laboratory intends to generate data of known and accepted quality.
Quality Assurance Project Plan (QAPjP)	- a written document, which presents, in specific terms, the policies, organization, objectives, functional activities and specific QA/QC activities designed to achieve the data quality objectives of a <u>specific project</u>. There are 16 essential elements which EPA has mandated to be addressed in a project plan.

Relative Percent - relative percent difference (RPD) is used as the measure of precision between Difference
(RPD) sample duplicates. The formula utilized to calculate RPD is as follows:

Relative Percent Difference (RPD)

$$RPD = \frac{\text{(Sample Result - Duplicate Result)}}{\text{Mean of Sample and Duplicate Results}} \times 100$$

Note: RPD is expressed as the absolute value obtained from the above formula.

Representativeness	- the degree to which data accurately and precisely represents a characteristic of a population, parameter variations at a sampling point, or an environmental condition.
Standard Operating Procedure (SOP)	- a detailed, written description of how a laboratory executes a particular procedure or method. It is intended to standardize the performance of the procedure.
Surrogates	- generally, organic compounds which are not target analytes, that are added to samples to assess analytical performance of a method. These compounds are spiked into all blanks, samples and spiked samples prior to analysis. Percent recoveries are calculated for each surrogate.
Trip Blank	- contaminant free water, or appropriate matrix, which accompanies bottles and samples during shipment to assess the potential for sample contamination during shipment. Trip blanks are not opened in the field.
Tuning	- a technique used in GC/MS procedures to verify that the instrument is properly calibrated to produce reliable mass spectral information.

2.3 Purpose

The IEA-Connecticut quality assurance program serves as an operational charter for the organization. It defines the purpose, organizational structure, and operating principles of the laboratory and presents an overview of the key elements of the quality assurance program. This quality assurance program will be reviewed and modified as necessary on an annual basis. Any deviation from this program must be approved in writing by the facility QA manager and copied to the President.

This quality assurance program has been prepared according to guidelines presented in the USEPA document entitled "Guidelines and Specifications for Preparing Quality Assurance Program Plans", Office of Monitoring Systems and Quality Assurance, Office of Research and Development, USEPA, (QAMS-004/80), EPA-600/8-83-024, June, 1983.

2.4 Scope

This QA program applies to the generation of analytical data at the IEA-Connecticut lab location. Since the vast majority of environmental client needs are driven by various federal and state regulations, the program has been designed to meet the requirements of the following programs:

Clean Water Act (CWA)
Clean Air Act (CAA)
Safe Drinking Water Act (SDWA)
Resource Conservation and Recovery Act (RCRA)
Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

This Quality Assurance Program Plan (QAPmP) covers laboratory operation at IEA-Connecticut. The purpose of this QAPmP is to provide information on laboratory operations as required for specific Quality Assurance Project Plans (QAPjPs), and to provide the basis for the Quality Assurance Program at IEA-Connecticut. This program is based on the IEA Corporate Quality Assurance Program Plan (Doc# QAQ00102.NET).

This QA program applies to the generation of analytical data utilized for environmental monitoring and assessment programs. The major types of laboratory support for government regulations are as follows:

- Analysis and characterization of environmental (soil, sediment, water and air) and waste samples per the Resource Conservation and Recovery Act (RCRA) for either compliance, disposal or delisting purposes.

- Analysis of drinking water samples in support of the Safe Drinking Water Act (SDWA).

- Analysis of environmental samples in accordance with contracts with the USEPA CLP program and various state agencies (CERCLA and NYSDEC).

- Analysis of environmental samples (soil, sediment, water and air) for contaminants such as those compounds found on the EPA priority pollutant list, target compound list, etc. for site assessment purposes.

- Analysis of waste stream samples in accordance with NPDES requirements.

3.0 QUALITY ASSURANCE POLICY STATEMENT

It is the intention of IEA corporation to consistently produce analytical data of known and documented quality at all network laboratories which fully meet clients' data quality objectives.

The contents of the QA program describe the activities which are utilized in order to ensure this commitment is maintained.

IEA Quality Policy

"Management and staff are committed to maintaining a carefully controlled analytical environment in order to ensure the consistent generation of accurate data which meets or exceeds the data quality objectives of our clientele."

IEA recognizes that maintaining a proper ethical standard is an important element of an effective quality assurance program. In order to ensure that all personnel understand the importance the company places on maintaining high ethical standards at all times, IEA has established an "Ethics Policy" and it is presented for your information. This policy is used to set the standard within the organization for day-to-day performance. Each employee is requested to sign the ethics policy, signifying agreed compliance with it's stated purpose. Copies of all signed ethics policy statements are maintained in personnel files.

IEA ETHICS POLICY

The management of IEA corporation recognizes our responsibility to clients and fellow employees to ensure that fair and ethical business practices are followed at all facilities.

Our clients have placed their trust in our organization to continually provide high quality data which is valid, defensible and represents sound professional judgement at all times. In order to meet this responsibility it is imperative that high ethical standards be maintained at all times by all employees.

The management and staff are committed to maintaining a carefully controlled analytical environment which assures the consistent generation of accurate data which meets the data quality objectives of our clientele.

The following represents the IEA ethics policy which has been adopted to clearly identify the corporate position on ethical practices. Failure to comply with this policy cannot and will not be tolerated.

The Company and all its Employees will:

- Fully comply with all applicable federal, state, and local laws and regulations.
- Produce analytical products that are accurate, defensible and which represent sound professional judgement at all times.
- Provide employees with guidance and an understanding of the ethical and quality standards required in the environmental industry. In this regard, all employees should feel free to identify any ethical misconduct without fear of retribution. Any employee involved in any form of ethical misconduct will be subject to immediate disciplinary action including potential termination of employment.
- Present services to clients in a confidential, honest and forthright manner and strive to deliver quality products at a fair price.
- Treat employees equitably by compensating them fairly, acknowledging their scientific contributions, and providing them opportunities for professional growth and development.
- Offer employment opportunities to qualified candidates regardless of their race, creed, color, sex or age.
- Be a responsible corporate citizen of the community by operating in an environmentally sound manner at all times.
- Maintain all facilities in a safe and professional manner through maintenance of a safety awareness program and provide the necessary safety equipment and training to protect all employees from preventable injury and chemical exposure.

4.0 QUALITY ASSURANCE MANAGEMENT

4.1 Introduction

The management of IEA-Connecticut is committed to the execution of the quality assurance program described in this document. The officers of IEA as well as lab directors and lab managers are required to comply with the program's stated goals, requirements and responsibilities.

In addition, each staff member has a responsibility to ensure compliance at all times with the QA program.

4.2 Assignment of Responsibilities

The primary objective of the network quality assurance program is to ensure that systems are in place such that all network laboratories consistently generate high quality analytical data.

Additionally, the QA program provides a mechanism to identify and implement policies to improve the quality of products and services. Records must also be maintained to document the laboratory's performance.

Quality assurance at IEA is monitored at both the corporate and laboratory levels. IEA's network quality assurance program is led by the president of IEA. The QA program at each network lab is directed by the QA manager at that facility, who reports directly to the laboratory's director and indirectly to the president. Figure 4.2.1 presents the organizational structure of network quality assurance functions and Figure 4.2.2 illustrates the overall general management of the corporation.

The following provides a listing of responsibilities and authority of key managerial personnel. Section 5 of the Appendix presents the organizational structure of the IEA-Connecticut facility.

Director of Operations

Responsibility:

All corporate directors and managers comply with the quality assurance program and require similar compliance by all staff personnel.

Ensure that all laboratory operations under their control are active participants in attaining the network quality assurance objectives.

Ensure compliance with methods and procedures as written.

Timely compliance with any corrective action requirements.

Ensure that instrument tunings and calibrations are performed at the required frequency and that instrument maintenance and logbooks are maintained in an orderly manner.

Authority:

Maintain the authority to suspend or terminate employees for dishonesty, or non-compliance with established QA policies and procedures.

The directors' or managers' authority is granted from a vice president of IEA, to whom they report.

Laboratory Manager

Responsibility:

Ensure compliance with methods and procedures as written.

Ensure that analytical procedures are performed in accordance with the requested method and SOPs.

Oversee preparation of analytical reports and data review.

Authority:

Maintain the authority to suspend or terminate employees for dishonesty, or non-compliance with established QA policies and procedures.

Authority is granted from the Director of Operations, to whom they report.

Laboratory Quality Assurance Manager

Responsibility:

Responsible for recommending pertinent additions to the network QA program.

Responsible for monitoring and assessing compliance of the laboratory with the requirements contained in the QA program.

Function as a liaison between the corporate QA director and laboratory staff at their facility.

Represent the laboratory during all external audits conducted by clients or regulatory agencies.

Conduct semi-annual audits and inspections to assess compliance with established methods, policies and procedures. Results of these audits are reported to the network QA director and the laboratory director.

Maintain a document control system containing current policies and procedures utilized by the laboratory.

Maintain various certification programs for the laboratory.

Review laboratory performance on various QC proficiency samples submitted to laboratories by state and federal agencies.

Inform local and corporate management of the status of the QA program at the particular facility through a monthly QA report.

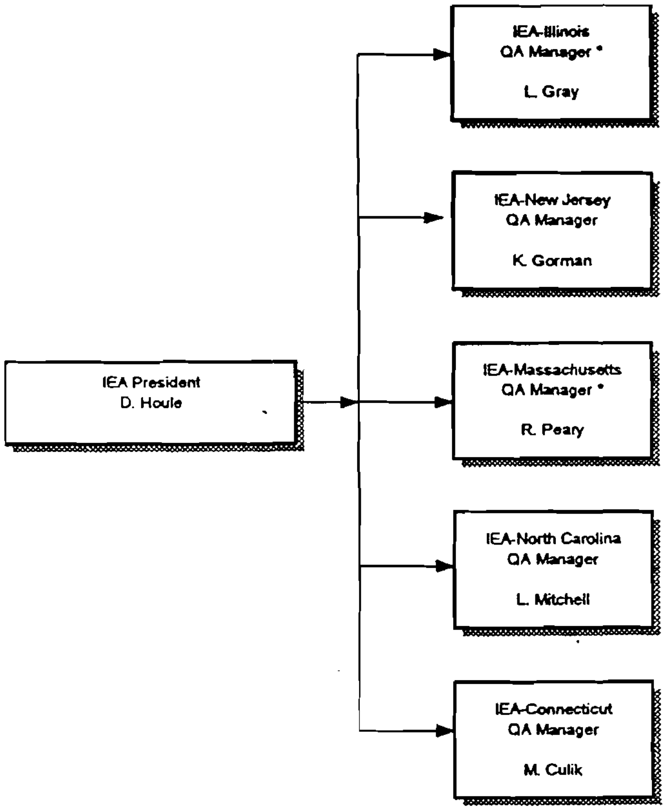
Investigate all inquiries relative to data quality issues and follow up on corrective action if necessary.

Authority:

The quality assurance staff has the authority to stop or change any analytical procedure in order to assure that data quality is maintained.

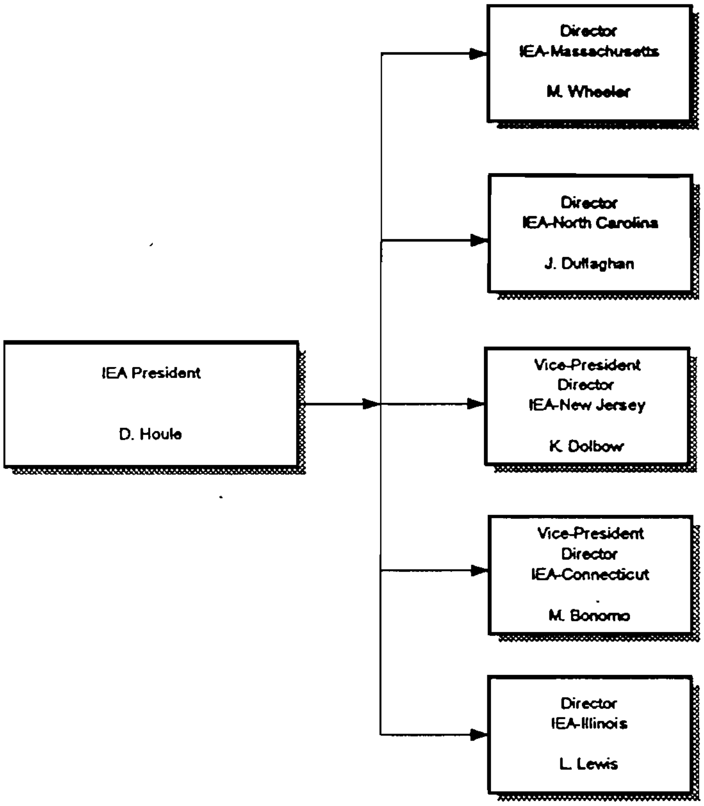
The authority of the QA staff is granted by the director of the facility.

FIGURE 4.2.1 NETWORK QUALITY ASSURANCE ORGANIZATIONAL CHART



* Above positions are part-time QA positions. These individuals also have operational responsibilities.

FIGURE 4.2.2 NETWORK ORGANIZATIONAL CHART



4.3 Communications

The quality assurance department communicates internally and externally through various means. Communication can take place via telephone, memoranda or take the form of audit reports. At the present time, the quality assurance department participates in a weekly conference call to discuss relevant issues and disseminate information.

In addition, various quality assurance reports are routinely generated as discussed in section 4.5.

4.4 Document Control

A system of document control is essential to provide the framework necessary to ensure that methods and procedures are followed in a consistent manner.

IEA has developed a centralized document control system which is maintained for the entire network and is administered by the corporate staff located at the Cary, North Carolina facility. The document control system provides for the following:

- A unique document control number for each document
- A central location for all documents
- A systematic method for distribution of approved documents
- A tracking system for existing documents
- Identification of document revisions
- A mechanism for periodic review of documents
- Archival of outdated material
- A focal point for information exchange
- Facilitates the establishment of standardized methods and procedures

A detailed description of the document control system is contained in IEA document number QAS00101.NET. This document is available for inspection and review during a site visit. The Quality Assurance Manager is responsible for ensuring that the document control system is properly managed. Any new or revised document must be submitted to the QA Manager for review and distribution.

It is the responsibility of all members of the laboratory to maintain complete records of all operations performed. All records shall be neat and organized. All laboratory records are the property of the laboratory and shall not be removed from the premises without permission from supervisors. All records are considered confidential and must be safeguarded. Unauthorized changes, loss or destruction of records can be grounds for dismissal from the laboratory. Consult the IEA, Inc. Ethics Policy regarding integrity of data and employee conduct.

Measurement records must be recorded in pre-printed record logs or pre-printed measurement logs. This policy will facilitate the organization and archival of all laboratory data for future reference.

All injection forms, instrumentation forms, sample prep forms, QC forms, etc. which are used to process samples and measurement results are described and attached to each analytical SOP. The SOP specifies where these records and forms are cataloged and stored.

All measurement data is recorded in logbooks or on pre-printed log sheets in permanent ink. Transcriptions will be avoided whenever possible. The record will reflect the measurement performed and all appropriate details for conclusions related to the measurement. The record must be initialed and dated by the individual performing the measurement on the day the measurement is performed. Corrections shall be made by drawing a single line through the error, initialing and dating the error. All forms will be reviewed by the QA Manager annually. If it is found that the document does not meet the requirements of the SOP, the discrepancy is forwarded to the group/section leader through the corrective action process (reference SOP on Corrective Action Reports -QAS00501.CT). Further detail on laboratory document control is found in the SOP on Document Control - QAS00301.CT.

4.5 QA Program Assessment

The quality assurance program can only accomplish its objectives if management and staff are committed to adherence to the program. In order to assess continued compliance and to identify strong and weak points of the program, the network QA director conducts annual assessments at each location.

Each quality assurance manager conducts an annual audit of the particular laboratory. A copy of the audit along with any proficiency test results obtained are submitted to the president.

A written status report is prepared monthly by each of the facility QA managers. A copy of this report is issued to the facility laboratory director as well as the corporate president. The corporate staff provides a summary of these reports each month to upper management. A typical status report would include such information as:

- Changes in the quality assurance program
- Summary of proficiency results at each network lab
- Summary of on-time report issuance
- Changes in certification status
- Summary of system audits conducted at each network lab
- Significant QA concerns and recommendations for resolution
- Accomplishments since the previous report

4.6 Additional Lab Policies to Achieve QA Objectives

In addition to policies and procedures specified in other sections of this document there are numerous policies and standard procedures which have been implemented to ensure that data of known quality is continually generated by all network laboratories. Examples and a brief description of a few of these additional policies are presented below:

4.6.1 Participation in EPA Water Supply and Water Pollution Proficiencies

The USEPA currently operates a Water Supply (WS) and a Water Pollution (WP) proficiency program. Each program consists of the issuance of proficiency samples twice in a calendar year. Analysis of proficiency samples on the second set of samples in a year are only required by EPA for those parameters which the laboratory failed during the first round in a given year. As part of IEA's QA program, full participation and analysis of all appropriate parameters is required of all IEA labs regardless of past performance. This serves as an important indicator on the continuing quality of data being generated at each facility.

The laboratory also participates in the NYSDOH proficiency testing program for Potable Water, Hazardous Waste and CLP. The lab currently analyzes quarterly organic PE samples from EPA for the CLP program.

4.6.2 Corporate Laboratory Performance Evaluation Program

In addition to participating in various agency sponsored performance evaluation programs such as Water Supply (WS) and Water Pollution (WP) studies, the corporate quality assurance office conducts additional performance evaluation studies.

Periodically, performance evaluation samples are submitted to each laboratory for parameters which are not addressed in other performance evaluation programs (ie. TCLP testing). In this type of testing, the laboratory is aware the samples are performance check samples but the "true" concentration values are unknown. The results are submitted to corporate QA for evaluation and a report is issued on the findings. Corrective actions are taken if required, as a result of these test findings.

4.6.3 Routine Use of QC Check Samples

One of the most important goals of a strong quality assurance program is to ensure that data of known quality is consistently generated during day-to-day operations. IEA accomplishes this through the routine inclusion of a QC check sample in every inorganic analytical batch which includes metals and wet chemistries. For organic testing including GC and GC/MS a QC check sample is analyzed at the frequency required in the particular method. Section 8 in the Appendix provides QC check sample requirements for selected methods. A QC check sample is an artificially prepared sample which contains the analytes of interest. The source of the standards used for preparation of the check sample must be independent (either another vendor or a different lot from the same vendor) from those used to prepare a calibration curve. The QC check sample is an important mechanism to confirm the method is being executed properly during routine analysis. The QC check also serves as a useful tool in identifying possible problems such as matrix interference, degraded analytical standards, and inaccurate standard preparation.

In certain cases, reliable QC check samples are not available for a particular procedure. In such cases, the QA manager has the authority to waive this requirement for that particular test. The QA manager must document this waiver in writing.

4.6.4 Central Solvent Monitoring Program

IEA has established a central monitoring program for commonly used solvents within the corporation. Prior to use, a specific lot number of these solvents is provided to the laboratory for testing. The solvents are concentrated and tested for the presence of interfering substances relative to their intended use. If the particular lot of solvent passes the defined acceptance criteria, the vendor is notified and the solvent lot is reserved for use by the entire corporation. The approved lot numbers are provided to all laboratories and only approved solvents can be employed. IEA Document # QAS00400.NET describes the details of the solvent approval program and is available for review during a site audit.

4.6.5 Quality Assurance Final Report Review

An integral portion of the overall quality assurance program is the consistent monitoring of final reports as they leave IEA facilities. Each QA manager is responsible for reviewing 5 percent of the final data reports issued each month. The reports to be reviewed are picked at random. The reports are reviewed for typographical errors, technical clarity and overall presentation.

4.6.6 Lateness of Data Reports

IEA recognizes that one cannot overlook the timeliness of data generation when assessing the quality of our services from our client's perspective. High quality data, when delivered several weeks late is not acceptable. In recognition of this, IEA monitors the lateness of all reports on a monthly basis from each of its laboratory operations. The actual report shipment date is compared to the date originally projected to the client. This information is gathered monthly through the QA department and a monthly report is issued to each laboratory director and to corporate management. This monitoring program serves to identify service trends, and to ensure that corrective action will be taken before problems occur.

4.6.7 Method Detection Limit Verification

Each laboratory is required to perform a method detection limit study for all commonly performed test methods. The study must be performed during the initial setup and verification of the particular method. In addition, the MDL study must be conducted in the event of a major change in the technique or instrumentation. The results of the MDL studies must be fully documented and available for review upon request. The quality assurance manager is responsible for maintaining such records. Specific state certification programs may require MDLs to be determined annually. If this is the case, the laboratory will comply with this requirement.

4.6.8 Establishment of IEA Good Laboratory Practices

In order to ensure that various procedures are executed in a consistent and comprehensive manner, IEA has developed a series of procedures which fall into the category of "Good Laboratory Practices". These practices have been endorsed by the corporation for routine use at each laboratory facility and are defined in various standard operating procedures throughout the organization. Examples of a few of these "Good Lab Practices" are presented below for the reader's information:

A. Standardized logbook requirements (Doc# QAS01201.NET)

Preprinted pages
Prenumbered pages
Dedicated logbooks per test method
Bound logbooks
Use of black ink only
Document controlling of logbooks
Archival of old logbooks
Acceptance criteria in logbook
Making corrections
Secondary review of logbook entries

B. Balance calibration (Doc# QAS01002.NET)

Unique identifier for each balance
Balance must be checked daily with use and documented
Acceptance ranges are established for each balance
Balance must be checked in the weight range normally used
All balances must be professionally serviced and calibrated annually

C. Temperature monitoring requirements for lab apparatus (Doc# QAS00801.NET)

Refrigerators, freezers and lab ovens are checked each work day
Unique identifier assigned for each unit
Acceptance ranges are established for each unit
Thermometers used in monitoring must be calibrated to a NIST traceable thermometer annually, at a minimum. State certification requirements may require more frequent calibration
All thermometers are immersed in appropriate media to avoid temperature fluctuations during measurement

D. Correcting data and general laboratory records (Doc# QAS01300.NET)

All entries must be entered in black ink.
"White Out" is not to be used at any time within the laboratory for alteration or correction of lab documents
Corrections are made using a one-line strikeout
All corrections are initialed and dated by the data editor

E. Handling reagents and analytical standards (including the following)

Recording receipt and expiration dates
Documenting preparation of reagents and standards
Labelling requirements
Disposal

F. Cleaning procedures for sample containers and laboratory glassware (Doc# QAS01400.NET) (including the following)

Cleaning sample containers
Cleaning inorganic glassware
Procedures for cleaning organic glassware

G. Requirements for general lab calibration curves (including the following)

In cases where the referenced analytical method does not provide specific guidance or requirements for development of initial or continuing calibration curves, the following procedure is to be utilized by the laboratory.

All standard calibration curves must consist of a minimum of three points. Any deviation from this must be approved in writing by the facility QA manager.

All calibration points must be recalculated using the generated curve and all calibration points must be within 10% of the expected value for the curve to be considered acceptable.

Concentration of compounds or analytes must fall within the calibration range of the curve to be acceptable for quantitation for inorganic and organic methodology.

H. Method blank subtraction

Subtraction of method blanks from sample results is not permitted unless specifically authorized by the laboratory QA manager.

4.6.9 Quality Control Charts

Maintaining quality control charts is currently not mandatory under IEA's corporate quality assurance program, however, many state certification programs require them. As a result, laboratories are required to comply with such state certification requirements.

5.0 PERSONNEL QUALIFICATIONS

5.1 Introduction

IEA's management is very proud of its highly qualified and professional staff. The IEA-CT staff consists of over 50 professionals and support personnel which include:

Analytical Chemists
Quality Assurance Specialists
Computer Systems Analysts
Environmental Technicians
Customer service Staff
Account Executives

5.2 Education and Experience

In order to ensure that employees have sufficient education and experience to perform a particular task, requirements have been defined for each laboratory position.

The personnel who are responsible for operations of sample analyses and data validation are outlined in Section 5 of the Appendix. Section 1 of the appendix presents professional profiles of key personnel within the IEA-Connecticut organization. Profiles of additional IEA staff members are available for review during a facility visit or are available upon special request.

Throughout the years, IEA has performed sophisticated environmental analysis for a significant number of large corporations. Examples of relevant experience are available upon request.

5.3 Training

IEA is committed to furthering the technical and interpersonal skills of employees at all levels. Technical training is accomplished within each laboratory by management to ensure method comprehension. It is at these training sessions that staff is updated on all current technical advances. It is IEA policy that all new personnel must demonstrate competency in performing a particular method through the analysis of QC check samples prior to the analyst conducting analysis independently on client samples. New analysts may conduct analysis on client samples along with another experienced analyst prior to the completion of the training period. All laboratory personnel are required to acknowledge through signature that they have read and understood the SOP's that are appropriate for their particular area.

All laboratory personnel must have adequate education, training, and experience to carry out their responsibilities. The QA Manager and the Laboratory Management will periodically review the training needs of the staff and make recommendations for any additional training. Each department within the laboratory is responsible for personnel training. Training sessions are scheduled on a monthly basis. Each training session, whether it be individual or group training must be documented utilizing the forms attached to the corporate SOP for Employee Training QAS01600.NET. The completed forms must be submitted to the Human Resource department for placement into the employee training files. Included in the training process is analyst proficiency testing. A successful QC check sample must be analyzed and documented for each analyst. This information is on file with the QA Manager.

5.4 Certifications

Table 5.4.1 presents the state certifications held by the IEA-Connecticut laboratory. Many states certify laboratories for specific parameters or tests within a category (i.e. method 325.2 for wastewater). The information in the following table indicates the lab is certified in a general category of testing such as drinking water or wastewater analysis. The laboratory should be contacted directly if parameter-specific certification information is required.

IEA-CT currently participates in the USEPA Superfund Contract Laboratory Program (CLP). The lab is also approved to perform work for the Army Corps of Engineers which validates laboratories on a project-by-project basis.

This document is updated annually; therefore, it is likely that additional certifications, beyond those listed, may be currently available. This information can be obtained easily by calling the specific laboratory (See Table 2.2.1 for phone) and asking for the QA manager.

TABLE 5.4.1

STATE CERTIFICATIONS

In some instances it may be necessary for environmental data to be reported to a regulatory authority with reference to a certified laboratory. For your convenience, the laboratory identification numbers for the IEA-Connecticut laboratory are provided in the following table. Many states certify laboratories for specific parameters or tests within a category (i.e. method 325.2 for wastewater). The information in the following table indicates the lab is certified in a general category of testing such as drinking water or wastewater analysis. The laboratory should be contacted directly if parameter-specific certification information is required.

IEA-Connecticut
Certification Summary (as of June 1993)

State	Responsible Agency	Certification	Lab Number
Connecticut	Department of Health Services	Drinking Water, Wastewater	PH-0497
Kansas	Department of Health and Environmental Services	Drinking Water, Wastewater/Solid, Hazardous Waste	E-210/E-1185
Massachusetts	Department of Environmental Protection	Potable/Non-Potable Water	CT023
New Hampshire	Department of Environmental Services	Drinking Water, Wastewater	252891
New Jersey	Department of Environmental Protection	Drinking Water, Wastewater	46410
New York	Department of Health	CLP, Drinking Water, Wastewater, Solid/ Hazardous Waste	10602
North Carolina	Division of Environmental Management	Wastewater	388
Rhode Island	Department of Health	Chemistry...Non-Potable Water and Wastewater	A43
California	Department of Health Services	Hazardous Waste	1778

6.0 FACILITIES, EQUIPMENT AND SERVICES

6.1 Introduction

The following describes the physical facility of the IEA-Connecticut laboratory.

6.2 Facilities

IEA-Connecticut

The laboratory currently maintains a staff of approximately 50 environmental professionals and occupies a facility of approximately 13,000 sq. ft. Separate laboratory areas are dedicated to GC instrumentation, GC/MS instrumentation, extractions for organic parameters, sample preparation for metals analysis, metals analysis and wet chemistries.

The volatiles analysis laboratory containing GC/MS instrumentation has a separate air handling system which is maintained at a positive pressure at all times. The organic sample preparation laboratory has a separate HVAC system that creates negative pressure in the area. This design results in a contaminant-free environment for trace-level volatiles analysis.

Critical instrumentation such as GC/MS units, ICP's, AA's, data systems and gas chromatographs are tied into an uninterruptable power supply system (UPS) to minimize instrument downtime and damage for short duration power interruptions.

The floor plan of the analytical laboratory is included in Section 4 of the Appendix.

Security of Facilities

The laboratory is secured by a card key access system. Only authorized IEA-CT personnel have access to the facility. All visitors must sign in with the receptionist and must be accompanied by an IEA-CT employee.

The sample receipt and storage area is under the responsibility of the sample custodian. This area is a locked, secure area opened by the sample control department each day. A walk-in refrigeration unit and 10 locked commercial refrigerator units are used to house samples waiting for analysis. Samples for volatile analysis are stored in separate units. Locked laboratory refrigerators, located throughout the laboratory, are used to maintain sample extracts or laboratory reagents. Each laboratory refrigerator is dedicated to sample, sample extract, or reagent storage.

6.3 Equipment

The following is a summary listing of equipment utilized at the IEA-CT facility. A more detailed listing is presented in Table 6.3.1.

Analytical instrumentation at IEA-Connecticut includes:

9 Gas Chromatographs/Mass Spectrometers (GC/MS)
5 Gas Chromatographs (GC)
3 Atomic Absorption Spectrometers (Graphite Furnace/AA)
2 Inductively Coupled Argon Plasma (ICP) Emission Spectrometer
2 Mercury analyzers
2 Gel Permeation Chromatographs
2 Infrared Spectrometer (IR)
1 Total Organic Halide (TOX) Analyzer
1 Total Organic Carbon Analyzer
1 Automated Analyzer for Wet Chemistries
1 LIMS (Laboratory Information System)
Automated Data Acquisition Management System (ADAM)

Table 6.3.1-Laboratory Equipment Listing

WET CHEMISTRY

Equipment Name	Manufacturer	Model Number	Serial Number
Centirfuge	DYNAC	0101	16846
Spectrophotometer, UV-VIS	Perkin-Elmer	35	34630
IR-Spectrophotometer	Perkin-Elmer	1310	134423
Turbidimeter	Hach Company	2100A	851017142
TOC Analyzer	Xertex-Dohrmann	DC-80	HF2029
TOX Analyzer	Xertex-Dohrmann	MC3 A,B	MF 2106
Fluorometer	Sequoia-Turner Corp.	112-003	D 01491
pH/ISE Meter	Orion	SA 720	SR45A
pH/ISE Meter	Beckman	12	0232578
Conductivity Meter	Cole-Parmer Instrument	1484-20	1421
Flash Point Apparatus	Precision Scientific	Pensky-Martin	10 Au-12
Oven	Fisher Scientific	55G	291
Oven	VWR	1320	0701090
Incubator	Blue M Electric	100 A	IN1-1362
Bio Refrigerator	Frost Queen	R20/L	00029
BOD Incubator (2)	Precision Scientific	FU199JRW2/FU178RRW2	FLC02662
Midi Distillation Setup (2)	Andrews Glass Co.	110-10-R	A4W0309/0209
D.O. Meter	YSI	51A	0241
Autoclave	Market Forge	STM-E	034200
COD Reactor	HACH	45600	920300006892
Muffle Furnace	Thermolyne	-	-
TKN block digestor	Scientific Instruments	AD-4020	8915049
Digital Hot Plate/Stirrer	PMC	730	0298E
Digital Hot Plate/Stirrer	PMC	730	0299E
Semiautomated Analyzer	LACHAT	Quikchem	125360

Table 6.3.1-Laboratory Equipment Listing

METALS

Equipment Name	Manufacturer	Model Number	Serial Number
Mercury Analyzer	Spectro-Products	HG4	4708
Mercury Analyzer	Jarrell-Ash	QS1	1210031
ICP-Trace	Jarell-Ash	JA61T	349490
ICP-Simultaneous	Jarrell-Ash	JA61	67782
Furnace AA	Perkin-Elmer	Z3030	3131
Furnace AA	Perkin-Elmer	Z5100	130911
Furnace AA	Perkin-Elmer	Z5100 PC	135141

ORGANIC EXTRACTIONS

Equipment Name	Manufacturer	Model Number	Serial Number
Gas Chromatograph	Perkin-Elmer	8320	83N546502
Gel Permeation Chromatograph	ABC	1002B	7323
Gel Permeation Chromatograph	ABC	AP1000	9228
Refrigerator	WW	4EF	F3978U
Oven	ASP	D 1142	144011
Oven	ASP	D 1162	149010
Sonicator	Sonics & Materials	SM500	6892
Sonicator	Sonics & Materials	VCX-400	00030C
Sonicator	Tekmar	TM500	7264
Auto Sampler	Perkin-Elmer	AS100	95234
Rotary Evaporator	BUCH I	R-114	-
Seporatory Funnal Shaker	Glas-Col	Series 100	F715-10-B5J

Table 6.3.1-Laboratory Equipment Listing

GC/MS VOLATILES

Equipment Name	Manufacturer	Model Number	Serial Number
Purge & Trap	Tekmar	LSC 2000	91318021
Purge & Trap	Tekmar	ALS 2016	91322002
Purge & Trap	Tekmar	LSC 2000	91203019
Purge & Trap	Tekmar	ALS 2016	91232007
Tube Desorber	Envirochem	810TD	268153
Tube ALS	Envirochem	MTD	MT-1005
Purge & Trap	Tekmar	LSC 4000	254
Purge & Trap	Tekmar	ALS	372
Purge & Trap	Tekmar	LSC-2	1824
Computer/Data System	Hewlett Packard	425T	3048T147545
Data System-Enviroquant	Hewlett-Packard	Vectra XM2	-
Data System -Enviroquant	Hewlett-Packard	Vectra	-
Terminal	Hewlett Packard	X-window	3048T18725
Terminal	Hewlett Packard	X-window	3048T18726
Disc Drive	Hewlett Packard	7914	—
Disc Drive	Hewlett Packard	7914	—
P&T	Tekmar	LSC-2	227
P&T	Tekmar	4000	192
P&T	Tekmar	4000	398
P&T	Tekmar	LSC-2	1324
P&T	Tekmar	ALS	679
P&T	Tekmar	ALS	494
P&T	Tekmar	ALS	1068
GC/MS	Hewlett Packard	5995B	2217A00358
GC/MS	Hewlett Packard	5995C	2413A00659
GC/MS	Hewlett Packard	5995C	2413A00430
GC/MS	Hewlett-Packard	5890 Series II/5972 MSD	-
Equipment Name	**Manufacturer**	**Model Number**	**Serial Number**
GC/MS	Hewlett-Packard	5890 Series II/5972 MSD	-
Terminal	Hewlett Packard	45849A	2530A13541
Terminal	Hewlett Packard	35751	2643A07666

Table 6.3.1-Laboratory Equipment Listing

CRT	Hewlett Packard	35731A	8633K26810
Printers (partial list)	Hewlett Packard	2934A	2635A32940
Printers	Hewlett Packard	2934A	2715A43948
Printers	Hewlett Packard	2225A	2512S30379
Printers	Hewlett Packard	2225A	2510S32359
Terminal	Hewlett Packard	35751	2630A06622
CRT	Hewlett Packard	35731A	8610K20516
Magnetic Tape Unit	Hewlett Packard	7970E	N/A
Scanning Interface	Hewlett Packard	59824A	N/A
Scanning Interface	Hewlett Packard	59824A	N/A
Cart. Tape Unit	Hewlett Packard	7914	N/A
5010 Auto Desorber	Tekmar	14-2150-000	133-GT
Cart. Tape Unit	Hewlett Packard	7914	N/A

Table 6.3.1-Laboratory Equipment Listing

GC/MS SEMI-VOLATILE

Equipment Name	Manufacturer	Model Number	Serial Number
Gas Chromatograph	Hewlett Packard	5890	7518A05422
Gas Chromatograph	Hewlett Packard	5890	2728A14615
Auto Sampler	Hewlett Packard	76732A	2441A03468
Mass Selective Detector	Hewlett Packard	5970	2513A00923
Mass Selective Detector	Hewlett Packard	5970	2716A10638
Computer Terminal	Hewlett Packard	150 II	2720Y05798
Computer Terminal	Hewlett Packard	150 II	2720Y03266
Computer Terminal	Hewlett Packard	150 II	2530A13540
Scanning Interface (2)	Hewlett Packard	59824A	—
Tape Drive	Hewlett Packard	9144	—
Disc Drive	Hewlett Packard	7958	—
9 Track Magnetic Tape	Hewlett Packard	7970E	—
9 Track Magnetic Tape	Hewlett Packard	7970E	—
Computer	Hewlett Packard	HP1000A	—
Computer	Hewlett Packard	HP1000	—
Printer	Hewlett Packard	2934A	2524A19296
Printer	Hewlett Packard	2235A	2814A11816
Printer	Hewlett Packard	2225A	2618S30681
Printer	Hewlett Packard	2934A	2643A35608
Autosampler	Hewlett-Packard	7673A	2546A01489
GC	Hewlett-Packard	5890A	—
MSD	Hewlett-Packard	5971A	3040A01426
Autosampler	Hewlett-Packard	7673	3120A28431
Computer	Gateway	386/25 DX	365201578025
Terminal	Hewlett Packard	36731A	8635K28238
GC/MS/MSD	Hewlett-Packard	5890 SeriesII/5972MSD	-
Data System -Enviroquant	Hewlett-Packard	Vectra XM2	-

Table 6.3.1-Laboratory Equipment Listing

GAS CHROMATOGRAPHY

Equipment Name	Manufacturer	Model Number	Serial Number
GC	Hewlett-Packard	5890	2541A06301
GC	Hewlett-Packard	5890	2750A14840
Autosampler	Hewlett-Packard	7673A	2546A00709
Autosampler	Hewlett-Packard	7673A	3123A25128
Autosampler	Hewlett-Packard	7673A	2718A0653A
Integrator	Hewlett-Packard	3396A	2804A01106
Integrator	Hewlett-Packard	3393A	2332A00D80
GC	Hewlett-Packard	5890 Series II	3121A35826
GC	Hewlett-Packard	5890 Series II	3235A44989
Data System	Hewlett-Packard	HP1000A	3020A05230
Terminals (3)	Hewlett-Packard	35741A	—
Printers (3)	Hewlett-Packard	35741A	—
Tape Drive	Hewlett Packard	9144	2724E13732
Data System-Enviroquant	Hewlett-Packard	Vectra XM2	-

6.4 Instrument Maintenance

Where it is economically feasible, the IEA-CT laboratory has service contracts for major instruments. These contracts provide routine preventive maintenance according to the manufacturer's requirements. Additionally the laboratory maintains an inventory of expendable parts and supplies to minimize downtime and to allow laboratory personnel to make minor repairs if necessary.

Each analytical measurement SOP lists the preventive maintenance schedule for each instrument which is to be followed by in-house and extramural repair contractors. In addition, each measurement group must maintain a log of all in-house and extramural preventive maintenance activities. Table 6.4.1 presents examples of general measures which are performed throughout the laboratory.

Table 6.4.1 Laboratory Preventative Maintenance

GC/MS SYSTEMS		
EQUIPMENT	ACTION PERFORMED	FREQUENCY
Hewlett-Packard 5995 GC/MS	Check oil level in mechanical pumps	Weekly
	Check water level and operating condition in the Neslab cooling units	Weekly
	Check compressed air gas supply	Daily
	Check helium gas supply	Daily
	Check carbon dioxide gas supply	Daily
	Change the oil in the mechanical pumps	Every 6 months
	Inspect the pump hoses and replace if required	Every 6 months
	Change oil in the diffusion pump	Every 6 months
	Change foreline and exhaust trap absorbent	Every 6 months
	Inspect and refill the calibration sample vial with PFTBA	Every 6 months
	Vacuum fan grills and filters	Every 6 months
	Check fore and separator pump pressures	Weekly
	Ion source cleaning and filament replacement	As needed
	Column replacement and conditioning	As needed
	Column cutting and reinstallation	As needed
	Manual tuning	As needed
	Change compressed air gas supply	As needed
	Change helium gas supply	As needed
	Change carbon dioxide gas supply	As needed
	Recharge Neslab cooling units	As needed
	Replace electron multiplier	As needed
	Remove and clean or replace jet separator	As needed

Table 6.4.1 Laboratory Preventative Maintenance

EQUIPMENT	ACTION PERFORMED	FREQUENCY
Hewlett-Packard 5970 MSD / 5971 MSD/5972 MSD	Check oil level in mechanical pumps	Weekly
	Change the oil in the mechanical pumps	Every 6 months
	Inspect the pump hoses and replace if required	Every 6 months
	Change oil in the turbo pump	Every 6 months
	Change exhaust trap absorbent	Every 6 months
	Inspect and refill the calibration sample vial with PFTBA	Every 6 months
	Vacuum fan grills and filters	Every 6 months
	Ion source cleaning and filament replacement	As needed
	Manual tuning	As needed
	Replace electron multiplier	As needed
	Clean out transfer line to GC	After every column removal
Hewlett-Packard 5890 GC	Check helium gas supply	Daily
	Change split vent trap	Every 3 months
	Column replacement and conditioning	As needed
	Column cutting and reinstallation	Daily or as needed
	Change helium gas cylinder	As needed
	Change liner and septum	Daily or as needed
	Clean injection port	As needed

Table 6.4.1 Laboratory Preventative Maintenance

EQUIPMENT	ACTION PERFORMED	FREQUENCY
Hewlett-Packard 7672A Autosampler	Inspect and correct injector alignment	After reseating
	Inspect syringe	Daily
	Check compressed air gas supply	Daily
	Inspect and adjust tension on sample tray	Daily
	Change rinse vials	Daily
	Change waste vials	Weekly
	Replace syringe	As needed
	Sand injector post	As needed
	Realign autosampler on brackets	As needed
	Change compressed air cylinder	As needed
Hewlett-Packard 7673A Autosampler	Inspect syringe	Daily
	Inspect seating of injector	Daily
	Change rinse vials	Daily
	Change waste vials	Weekly
	Replace syringe	As needed
	Reset control box	As needed
Tekmar Purge and Trap Sample Concentrators and Autosamplers	Inspect spargers and fittings	Daily
	Check purge flow	Daily
	Inspect line and valve temperatures	Daily
	Change and condition trap	As needed
	Adjust purge flow	As needed
	Rinse or clean sparging vessels	As needed
	Rinse sample lines	As needed
	Bake out trap	After each analysis, extend as needed
	Replace lines and fittings	As needed
	Adjust line and valve temperatures	As needed

Table 6.4.1 Laboratory Preventative Maintenance

EQUIPMENT	ACTION PERFORMED	FREQUENCY
Envirochem Air Sample Concentrator and Autosampler	Inspect fittings	Daily
	Check flows	Daily
	Inspect line and valve temperatures	Daily
	Change and condition internal traps	As needed
	Adjust flow	As needed
	Bake out trap	After each analysis, extend as needed
	Replace lines and fittings	As needed
	Adjust line and valve temperatures	As needed

GC SYSTEMS		
EQUIPMENT	ACTION PERFORMED	FREQUENCY
Hewlett-Packard 5890A GC (GC-1,4,5 Dual ECD)	Check gas supply	Daily
	Check breakdown criteria	As required by run sequence
	Vacuum filters and grills	Quarterly
	Column replacement and conditioning	As needed
	Column cutting and reinstallation	As needed
	Change gas cylinders	As needed
	Change liner and septum	As needed
	Replace guard column	As needed
	Clean injection port	As needed
	Recondition ECD	As needed
	Change ECD vent absorbent traps	Quarterly

Table 6.4.1 Laboratory Preventative Maintenance

EQUIPMENT	ACTION PERFORMED	FREQUENCY
Hewlett-Packard 5890A GC (GC-3 FID/NPD)	Check gas supply	Daily
	Vacuum filters and grills	Quarterly
	Column replacement and conditioning	As needed
	Column cutting and reinstallation	As needed
	Change gas cylinders	As needed
	Change liner and septum	As needed
	Clean injection port	As needed
	Replace or reactivate the NPD collector	As needed
Hewlett-Packard 7673A Autosampler	Inspect syringe	Daily
	Inspect seating of injector	Daily
	Inspect rinse and waste vials	Daily
	Vacuum filters and grills	Quarterly
	Replace syringe	As needed
	Change rinse and waste vials	As needed

Table 6.4.1 Laboratory Preventative Maintenance

EQUIPMENT	ACTION PERFORMED	FREQUENCY
Perkin-Elmer AS-100B Autosampler	Inspect syringe	Daily
	Inspect rinse and waste vials	Daily
	Check flushing efficiency	Daily
	Clean or replace syringe	As needed
	Change rinse and waste vials	As needed
	Change diverter valve septum	As needed

METALS SYSTEMS		
Graphite Furnace	Clean contact rings, furnace housing and quartz windows	Daily
	Inspect, clean or replace graphite tubes	As needed
	Replenish matrix modifiers	Daily
	Check lamp alignments and energies	Daily
	Clean mirrors for the optical sensors	Weekly
	Clean windows on furnace housing	Weekly
	Inspect contact rings for excessive wear	Monthly
Inductively Coupled Plasma	Change capillary and pump tubing	Twice weekly
	Replace liquid argon tank	As required
	Reprofile via slit micrometer	Per manual
	Replace and realign plasma torch	As needed
	Clean nebulizer and spray chamber	As needed
	Check primary imaging mirror	Weekly
Mercury Analyzer	Clean sample cell and tubing	Monthly
	Check sparger condition	Daily
	Check level of mercury scrubber solution	Daily
	Replace lamps	As required

WET CHEMISTRY SYSTEMS

EQUIPMENT	ACTION PERFORMED	FREQUENCY
pH Meters	Clean electrode if calibration has deteriorated	As needed
	Store pH electrodes in pH 7.0 buffer	Daily
	Check ISE electrodes and meter	Per manual
Analytical Balances	Surfaces cleaned and covered	Daily
	Calibrated and cleaned by manufacturer	Semi-annually
	Accuracy checked by class "S" weights	Prior to use
Conductivity Meters	Instrument surfaces inspected and cleaned	Daily
	Calibrated using 0.01M potassium chloride	Daily
	Spare cells on inventory	As needed
Spectrophotometers	Instrument cleaned	Daily use
Total Organic Halogen Analyzer (TOX)	Instrument cleaned	Daily use
	Perform cell performance checks	Daily
	Flush cells and check heated tapes	Daily
	Inspect sample boats, inlet and exit tubes, o-rings and seals	Daily
Autoanalyzer Systems	Clean all components and flush system	Daily use
	Inspect all pump tubes and sample lines	Daily use
	Inspect line coils, heating baths and filters	Weekly
	Inspect all colorimeter filters	Weekly
	Inspect and clean chemical manifolds	Monthly

7.0 DATA GENERATION

7.1 Introduction

There are numerous policies and standard procedures which have been implemented to ensure that data of known quality is continually generated by the IEA-CT laboratory. The IEA Corporate and Laboratory Facility Quality Assurance Plans are examples of documents which are generated. Guidelines for the facility QA plans are detailed in section 7.2.1 of the Corporate Quality Assurance Program Plan Doc#QAQ00102.NET.

7.2 Quality Assurance Project Plans

Quality Assurance Project Plans (QAPjP) are developed to meet contract and agency requirements on a project specific basis. These plans discuss specific terms, policies, objectives and QA activities designed to achieve the data quality objectives of the project.

All QA project plans are written in accordance with the following USEPA Document: USEPA Guidelines and Specification for Preparing Quality Assurance Project Plans. QAMS-005/80, Washington DC: USEPA, Quality Assurance Management Staff, October 17, 1980.

Guidelines for preparing QA project plans are also detailed in the Corporate Quality Assurance Program Plan Doc#QAQ00102.NET.

7.3 Methods

IEA-CT utilizes a wide variety of analytical methods. A listing of general analytical capabilities is presented in Table 7.3.1. Section 8 of the Appendix lists the analytical method and detection limits associated with various analytical procedures.

Each department is required to have a written standard operating procedure (SOP) in use which describes how the requirements of the method are met. All SOPs must be prepared in accordance with IEA Doc.#QAS00200.NET.

Analytical methodologies and quality assurance protocols in use are based on the following guidelines:

"Methods of Organic Chemical Analysis of Municipal and Industrial Wastewater", Federal Register Vol. 49, No. 209, October 26, 1984;

"Test Methods for Evaluating Solid Waste", SW-846 Third Edition, September 1986, USEPA, plus updates;

"Standard Methods for the Examination of Water and Wastewater" 1985, 14th, 15th and 16th Edition;

"Methods for Chemical Analysis of Water and Wastes" March 1983, EMSL, EPA;

"Manual of Analytical Methods for the Analysis of Pesticides in Humans and Environmental Samples", EPA 600/8-80-038, June 1980;

Organic Analysis: Multi-media, Multi-Concentration-IFB-CLP, January 1991, Document Number OLM01.9 (plus revisions);

Organic Analysis: Multi-media, Multi-Concentration-IFB-CLP, Document Number OLM03.1

Inorganic Analysis: Multi-media, Multi-Concentration-IFB-CLP, Document Number ILM03.0, ILM04.0;

"Handbook for Analytical Quality Control in Water and Wastewater Laboratories", EPA-600/4-79-019, March 1979;

National Enforcement Investigation Center Policies and Procedures Manual, EPA-330/9/78/001-R, Revised May 1986

"Manual for the Certification of Laboratories Analyzing Drinking Water", April 1990, EPA/570/9-90/008.

"EML Procedures Manual", HASL-300, November 1990, 27th Edition.

"Prescribed Procedures for Measurement of Radioactivity in Drinking Water", EPA-600/4-80-032, August 1980.

"Health and Environmental Chemistry: Analytical Techniques, Data Management, and Quality Assurance" LA-10300-M, Vol. 1-3 Manual, Los Alamos National Laboratory, April 1992.

"Radiochemical Analytical Procedures for Analysis of Environmental Samples," EMSL-LV 0539-17.

TABLE 7.3.1

IEA-CT ANALYTICAL CAPABILITIES

I. ORGANICS-GC/MS

Volatile Organics-524.2
Volatile Organics-CLP
Volatile Organics-8240
Volatile Organics-8260
Volatile Organics-T01/T02
Volatile Organics-Appendix IX
Acid & Base/Neutrals-8270
Acid & Base/Neutrals-CLP
Acid & Base/Neutrals-Appendix IX
Volatile Organics-624
Acid & Base/Neutrals-625

II. ORGANICS-GC

Misc. DAI - 8015
Organohalide Pesticides & PCBs-608
Organohalide Pesticides & PCBs-8080
Organohalide Pesticides & PCBs-CLP
Organophosphate Pesticides-8140
Organohalide Pesticides & PCBs-Appendix IX
Chlorinated Herbicides-8150
Chlorinated Herbicides-Appendix IX

III. INORGANIC METALS

ICP Metals
Furnace Metals
CLP Metals
Appendix IX Metals
TCLP Metals
Drinking Water Metals

V. INORGANIC WET CHEMISTRY*

Acidity
Alkalinity
Ammonia
Bicarbonate
Biochemical Oxygen Demand (BOD)
Bromide
Chloride
Chlorine Demand
Chlorine Residual
Chemical Oxygen Demand
Color
Conductivity
Chromium (VI)
Cyanide - Amenable
Cyanide - Total
Cyanide (CLP)
Dissolved Oxygen
Flashpoint
Fluoride
Grain Size
Hydrocarbon analysis
MBAS
Nitrate
Nitrite
Odor
Oil and Grease
Paint Filter Test
pH
Phenols
Phosphate
Phosphorus
Settleable Solids
Silica
Specific Gravity
Sulfate
Sulfide
Sulfite
Sludge Volume Index
Tannins and Lignins
Total Dissolved Solids
Total Kjeldahl Nitrogen
Total Organic Carbon
Total Organic Halides
Total Solids
Total Suspended Solids
Turbidity
Volatile Solids
Corrosivity Characteristics
Ignitability Characteristics
EPTOX
TCLP
SPLP
Extactable Organic Halides

Table 7.3.2 SUMMARY OF QC REQUIREMENTS FOR EPA VOLATILE ORGANIC ANALYSIS METHODS

Requirement	Drinking Water Analysis Method 524	Water and Wastewater Analysis Method 624	RCRA Solid Waste Analysis Methods 8240/8260	Superfund Hazardous Waste Analysis CLP SOW OLM01.9	NYSDEC
Tuning	25 ng BFB	50 ng BFB	50 ng BFB	50 ng BFB	50 ng BFB
Frequency	8 hrs	Daily	12 hrs	12 hrs	12 hrs
Criteria	See following page	See following page	See following page	See following page	See following page
Initial Calibration	3-5 standards	3 standards	5 standards	5 standards	5 standards
Maximum % RSD	<20%	<35%	CCC <30%*	<20.5%*	<20.5%*
Minimum RRF	NS	NS	SPCC >0.250-0.300*	0.01-0.500*	0.01-0.500* 10 compounds with max 100% RSD
Continuing Calibration					
Frequency	8 hrs	Daily	12 hrs	12 hrs	12 hrs
Maximum %D	±30%	QC Limits	CCC ±25%*	±25.0%*	±25.0%*
Minimum RRF	NS	NS	SPCC >0.250-0.300*	0.01-0.500*	0.01-0.500*
IS Area	±30% of last CC or ±50% of IC	NS	-50 to +100% of last CC	NS	NS 10 compounds with max 100% RSD
QC Check Sample/LCS					
Frequency	Quarterly	Daily	Each batch or if MS % recovery not in QC limits	NS	Each cat. B SDG
Criteria	QC Limits*	QC Limits*	QC Limits*	QC Limits*	QC Limits*
Method Blank					
Frequency	Daily	Daily	12 hrs	12 hrs	12 hrs
Criteria	<MDL	In control	In control	<CRQL*	<CRQL*
Spikes	Blank spike	Matrix spike	Matrix spike	Matrix spike	Matrix spike
Frequency	Daily or 5%	5%	5%	5% or 1/SDG	5% or 1/SDG
% Recovery	80-120%	QC Limits*	QC Limits*	QC Limits*	QC Limits*
Duplicates	BS duplicate	Field duplicate	MS duplicate or sample duplicate	MS duplicate	MS duplicate MSB required*
Frequency	Quarterly	NS	5%	5% or 1/SDG	5% or 1/SDG
Precision	<20% RSD	NS	SD Limits*	RPD Limits*	RPD Limits*
Sample Analysis					
Holding time	14 days	14 days	14 days	10 days from receipt	7 days from receipt
Internal standards	1 @ 2-10 ug/L	3 @ 30 ug/L	3-4 @ 50 ug/L	3 @ 50 ug/L	3 @ 50 ug/L
Criteria	NS	NS	NS	Area -50 to +100T RT ±30 sec	Area -50 to +100T RT ±30 sec
Surrogate	2 @ 5 ug/L	3 @ 30 ug/L	3 @ 50 ug/L	3 @ 50 ug/L	3 @ 50 ug/L
Criteria	80-120%	NS	See following page	See following page	See following page
Analyte ID	RT ±3x SD window 3 ions ±20%	RT ±30 sec 3 ions ±20%	RRT ±0.06 Ions >10% ±20%	RRT ±0.06 Ions >10% ±20%	RRT ±0.06 Ions >10% ±20%

*For complete information refer to method or protocol

SUMMARY OF VOLATILE SURROGATE RECOVERY LIMITS

Compound	Method 524 (%)	Method 624 (%)	Method 8240 Water (%)	Method 8240 Soil (%)	Method 8260 Water (%)	Method 8260 Soil (%)	CLP SOW Water (%)	CLP SOW Soil (%)
4-Bromofluorobenzene	80-120	NS	86-115	74-121	86-115	72-121	86-115	59-113
1,2-Dichloroethane-d4	80-120	NS	76-114	70-121	NS	NS	76-114	70-121
Toluene-d8	NS	NS	86-110	81-117	88-110	81-117	88-110	84-138
Dibromofluoromethane	NS	NS	NS	NS	86-118	80-120	NS	NS

SUMMARY OF VOLATILE SPIKE RECOVERY LIMITS

Method Compound	Method 524 (%)	Method 624 (%)	Method 8240 (%)	CLP SOW Soil (%)	CLP SOW Water (%)
Benzene	80-120	37-151	37-151	66-142	66-142
Chlorobenzene	80-120	37-160	37-160	75-130	60-133
1,1-Dichloroethane	80-120	59-155	59-155	61-145	59-172
Toluene	80-120	47-150	47-150	76-125	59-139
Trichloroethene	80-120	71-157	71-157	71-120	62-137

SUMMARY OF INSTRUMENT TUNING REQUIREMENTS

BFB Ion Abundance Criteria	NYSDEC 1/91	Method 524 (%)	Method 624 (%)	Methods 8240/8260 (%)	CLP SOW OLM01.8 (%)
50 - % of mass 95	15-40	15-40	15-40	15-40	8.0-40.0
75 - % of mass 95	30-60	30-80	30-60	30-60	33.0-66.0
95	100	100	100	100	100.0
96 - % of mass 95	5-9	5-9	5-9	5-9	5.0-9.0
173 - % of mass 174	<2	<2	<2	<2	<2.0
174 - % of mass 95	>50	>50	>50	<50	50.0-120.0
175 - % of mass 174	5-9	5-9	5-9	5-9	4.0-9.0
176 - % of mass 174	95-101	95-101	95-101	95-101	95.0-101.0
177 - % of mass 176	5-9	5-9	5-9	5-9	5.0-9.0

TABLE 7.3.2 SUMMARY OF QC REQUIREMENTS FOR EPA SEMI-VOLATILE ORGANIC ANALYSIS METHODS

Requirement	Water and Wastewater Analysis Method 625	RCRA Solid Waste Analysis Method 8270	Superfund Hazardous Waste Analysis CLP SOW OLM01.9	NYSDEC
Tuning	50 ng DFTPP	50 ng DFTPP	50 ng DFTPP	50 ng DFTPP
Frequency	Daily	12 hrs	12 hrs	12 hrs
Criteria	See following page	See following page	See following page	See following page
Initial Calibration	3 standards	5 standards	5 standards	5 standards
Maximum %RSD	<35%	CCC <30%*	<20.5%*	<20.5%*
Minimum RRF	NS	SPCC >0.050*	0.01-1.300*	0.01-1.300* 20 compounds Max 100% RSD
Continuing Calibration				
Frequency	Daily	12 hrs	12 hrs	12 hrs
Maximum %D	±20%	CCC ±30%*	±25%*	±25%*
Minimum RRF	NS	SPCC >0.050*	0.01-1.300*	0.01-1.300*
IS Area	NS	-50 to +100% of last CC	NS	NS 20 compounds Max 100% RSD
QC Check Sample/LCS				
Frequency	≤5%	If MS % recovery not in QC limits	Each SDG	Each SDG with cat. B
Criteria	QC Limits*	QC Limits*	QC Limits*	QC Limits*
Method Blank				
Frequency	1 per batch	1 per batch	1 per batch	1 per batch
Criteria	In control	In control	<CRQL*	<CRQL*
Spikes	Matrix spike	Matrix spike	Matrix spike	Matrix spike
Frequency	5%	5%	5% or 1/SDG	5% or 1/SDG
% Recovery	QC Limits*	QC Limits*	QC Limits*	QC Limits*
Duplicates	Field duplicates	MS duplicate or sample duplicate	MS duplicate	MS duplicate MS blank
Frequency	NS	5%	5% or 1/SDG	5% or 1/SDG
Precision	NS	SD Limits*	RPD Limits*	RPD Limits*
Sample Analysis				
Holding Time				
Water extraction	7 days	7 days	5 days from receipt	completed within 5 days from receipt
Soil extraction	NA	14 days	10 days from receipt	completed within 5 days from receipt
Analysis	40 days from extraction	40 days from extraction	35 days from extraction	35 days from extraction
Internal standards	3	6 @ 40 ug/L	6 @ 20 ug/L	6 @ 20 ug/L
Criteria	NS	NS	Area -50/+100% RT ±30 sec	Area -50/+100% RT ±30 sec
Surrogate	3 @ 100 ug/L	6 @ 100-200 ug/L	8 @ 100-150 ug/L	8 @ 100-150 ug/L
Criteria	NS	See following page	See following page	See following page
Analyte ID	RT ±30 sec 3 ions ±20%	RRT ±0.06 Ions >10% ±20%	RRT ±0.06 Ions >10% ±20%	RRT ±0.06 Ions >10% ±20%

*For complete information refer to method or protocol

SUMMARY OF SEMI-VOLATILE SURROGATE RECOVERY LIMITS

Compound	Method 625 (%)	Method 8270 Water (%)	Method 8270 Soil (%)	NYSDEC '91 ASP CLP SOW Water (%)	NYSDEC '91 ASP CLP SOW Soil (%)
Nitrobenzene-d5	NS	35-114	23-120	34-114	23-120
2-Fluorobiphenyl	NS	43-116	30-115	43-116	30-115
p-Terphenyl-d14	NS	33-141	18-137	33-141	18-137
Phenol-d6	NS	10-94	24-113	10-110	24-113
2-Fluorophenol	NS	21-100	25-121	21-110	25-121
2,4,6-Tribromophenol	NS	10-123	19-122	10-123	19-122
1,2-Dichlorobenzene-d4	NS	NS	NA	16-110*	20-130*
2-Chlorophenol-d4	NS	NS	NA	33-110*	20-130*
Perylene-d12	NS	NS	NA	NA	NA

SUMMARY OF SEMI-VOLATILE SPIKE RECOVERY LIMITS

Compound	Method 625 (%)	Method 8270 (%)	NYSDEC '91 ASP[1] CLP SOW Water (%)	NYSDEC '91 ASP CLP SOW Soil (%)
Acenaphthene	47-145	47-145	46-118	31-137
1,4-Dichlorobenzene	20-124	20-124	36-97	28-104
2,4-Dinitrotoluene	D-112	D-112	24-96	28-89
N-Nitroso-di-n-propylamine	D-230	D-230	41-116	41-126
Pyrene	52-115	52-115	26-127	35-142
1,2,4-Trichlorobenzene	44-142	44-142	39-98	38-107
4-Chloro-3-methylphenol	22-147	22-147	23-97	26-103
2-Chlorophenol	23-134	23-134	27-123	25-102
4-Nitrophenol	D-132	D-132	10-80	11-114
Pentachlorophenol	14-176	14-176	9-103	17-109
Phenol	5-112	5-112	12-110	26-90

SUMMARY OF GC/MS INSTRUMENT TUNING REQUIREMENTS					
DFTPP Ion Abundance Criteria	**NYSDEC**	**Method 525 (%)**	**Method 625 (%)**	**Method 8270 (%)**	**CLP SOW (%)**
51 - % of mass 198	30-60	10-80	30-60	30-60	30.0-80.0
68 - % of mass 69	<2	<2	<2	<2	<2.0
70 - % of mass 69	<2	<2	<2	<2	Present
127 - % of mass 198	40-60	10-80	40-60	40-60	25.0-75.0
197 - % of mass 198	<1	<2	<1	<1	<1.0
198	100	100	100	100	100
199 - % of mass 198	5-9	5-9	5-9	5-9	5.0-9.0
275 - % of mass 198	10-30	10-60	10-30	10-30	10.0-30.0
365 - % of mass 198	>1	>1	>1	>1	>0.75
441	<mass 443	<mass 443	<mass 443	<mass 443	<mass 443
442 - % of mass 198	40-110	>50	>40	>40	40.0-110.0
443 - % of mass 442	17-23	15-24	17-23	17-23	15.0-24.0

TABLE 7.3.2 SUMMARY OF QC REQUIREMENTS FOR PESTICIDE/PCB ANALYSIS METHODS

Requirement	Water and Wastewater Analysis Method 608	RCRA SW-846 Solid Waste Analysis Method 8080	Superfund Hazardous Waste Analysis CLP SOW OLM01.8	NYSDEC
Initial Calibration	3 standards	5 standards	3 standards (1 for multicomponent)	3 standards (1 for multicomponent)
Maximum % RSD	<10%	<20%	<10.0-15.0%*	<10.0-15.0%*
DDT/Endrin Breakdown	NS	<20%	<20.0%	<20.0%
Resolution	NS	NS	90-110%*	90-110%*
Continuing Calibration	Mid-level standard	Mid-level standard	Mid-level standard	Mid-level standard
Frequency	Daily	Daily	12 hrs	12 hrs
Maximum %D	±15%	±15%	±25.0%	±25.0%
RT Criteria	NS	NS	±0.05-0.07 min of mean RT	±0.05-0.07 min of mean RT
QC Check Sample/LCS				
Frequency	≤10%	If MS % recovery not in QC limits	NS	Each cat. B SDG
Criteria	QC Limits*	QC Limits*	QC Limits*	QC Limits*
Method Blank				
Frequency	1/batch	1/batch	1/batch	1/batch
Criteria	In control	In control	<CRQL	<CRQL
Spikes	Matrix spike	Matrix spike	Matrix spike	Matrix spike
Frequency	10%	5%	5% or 1/SDG	5% or 1/SDG
% Recovery	QC Limits*	QC Limits*	QC Limits*	QC Limits*
Duplicates	Field duplicate	MSD or sample duplicate	MSD	MSD/MS Blank
Frequency	NS	5%	5% or 1/SDG	5% or 1/SDG
Precision	NS	SD Limits*	RPD Limits*	RPD Limits*
Sample Analysis				
Holding Time				
Water extraction	7 days	7 days	5 days VTSR	Completed within 5 days VTSR
Soil extraction	NA	14 days	10 days VTSR	Completed within 5 days VTSR
Analysis	40 days	40 days	35 days	35 days
Analyte ID	RT within 3x SD of std. RT window	RT within 3x SD of std. RT window	RT ±0.05-0.07 min of std. RT on both columns; Conc. ±25.0%	RT ±0.05-0.07 min of std. RT on both columns; Conc. ±25.0%
Confirmation	2nd column for unknown samples	2nd column for positive ID	2 column required; GC/MS if >10 ng/uL	2 column required; GC/MS if >10 ng/uL

*For complete information refer to method or protocol

SUMMARY OF PESTICIDE SURROGATE RECOVERY LIMITS					
Compound	**Method 508 (%)**	**Method 608**	**Method 8080**	**CLP SOW (%)**	**NYSDEC**
Tetrachloro-m-xylene	NS	NS	Lab limits	60-150	60-150
Decachlorobiphenyl	NS	NS	Lab limits	60-150	60-150
Dibutylchlorendate	NS	NS	Lab limits	NS	

SUMMARY OF PESTICIDE SPIKE RECOVERY LIMITS					
Compound	**Method 608 (%)**	**Method 8080 (%)**	**CLP SOW Water (%)**	**CLP SOW Soil (%)**	**NYSDEC**
gamma-BHC (Lindane)	19-140	19-140	56-123	46-127	46-127
Aldrin	42-122	42-122	40-120	34-132	34-132
Dieldrin	36-146	36-146	52-126	31-134	31-134
4,4'-DDT	25-160	25-160	38-127	23-134	23-134
Endrin	30-147	30-147	56-121	42-139	42-139
Heptachlor	34-111	34-111	40-131	35-130	35-130

TABLE 7.3.2 SUMMARY OF QC REQUIREMENTS FOR EPA METALS ANALYSIS METHODS USING ATOMIC ABSORPTION (AA) SPECTROSCOPY

Requirement	Water and Wastewater Analysis Method 200.0	RCRA Solid Waste Analysis Method 7000	Superfund Hazardous Waste Analysis CLP SOW ILM03.0
Initial Calibration Frequency Criteria	3 standards and a blank Daily r ≥0.995	3 standards and a blank Daily r ≥0.995	3 standards and a blank Daily or every 24 hrs r ≥0.995
Calibration Verification Frequency Criteria	A standard at or near MCL After initial calibration and every 20 samples 90-110% recovery	Mid-range standard Every 10 samples ICV: 90-110% recovery CCV: 80-120% recovery	Mid-range standard Beginning, end, and every 10 samples or every 2 hrs 90-110% recovery Hg: 80-120% recovery
Detection Limits Standard Frequency Criteria	NS NS NS	NS NS NS	Standard at the CRDL or IDL Beginning of each sample run EPA QC limits
Calibration Blanks Frequency Criteria	After each calibration NS	After each calibration NS	Beginning, end, and every 10 samples or every 2 hrs All analytes ≤ CRDL
Preparation Blanks Frequency Criteria	Each digestion batch NS	Each digestion batch NS	1 per SDG or digestion batch All analytes ≤ CRDL
QC Check Sample/LCS Frequency Criteria	NS NS	1 per batch NS	1 per matrix per SDG or digestion batch 80-120% recovery
Matrix Spike Samples Frequency Criteria	10% or 1 per batch NS	5% or 1 per batch NS	5% or 1 per SDG per matrix per level (predigestion) 75-125% recovery
Duplicate Samples Frequency Criteria	10% or 1 per batch NS	5% or 1 per batch NS	5% or 1 per SDG per matrix per level (predigestion) ≤20% RPD for values ≥5 x CRDL ±1 x CRDL for values <5 x CRDL
Furnace Quality Control Frequency Criteria	MSA as needed NS	MSA as needed Serial dilution: 1 per batch per matrix MSA: r≥0.995 5X dilution within ±10%	Duplicate injections on all; Post digestion spikes on all samples, blanks, and LCS; MSA as needed Duplicate injections: ≤20% RSD/CV Spikes: 85-115% recovery MSA: r≥0.995

TABLE 7.3.2 SUMMARY OF QC REQUIREMENTS FOR EPA METALS ANALYSIS METHODS USING INDUCTIVELY COUPLED PLASMA (ICP) SPECTROSCOPY

Requirement	Water and Wastewater Method 200.7	RCRA Solid Waste Analysis Method 6010	Superfund Hazardous Waste Analysis CLP SOW ILM03.0
Initial Calibration Frequency	1 standard and a blank Daily	1 standard and a blank Daily	1 standard and a blank Daily or every 24 hrs
Calibration Verification Frequency Criteria	Mid-range standard Every 10 samples 95-105% recovery	Mid-range standard Every 10 samples and at end 90-110% recovery	Mid-range standard Beginning, end, and every 10 samples or every 2 hours 90-110% recovery
Other Standards Frequency Criteria	Highest mixed standard Before sample analyses 95-105% recovery	Highest mixed standard Before sample analyses 95-105% recovery	Standard at 2 x CRDL or IDL Beginning and end of each run or 2 every 8 hrs EPA QC Limits
Interference Check Sample Frequency Criteria	Beginning, end, and periodic intervals ±1.5 x SD of mean value	Beginning and end of each run or every 8 hours 80-120% recovery	Beginning and end of each run or 2 every 8 hrs 80-120% recovery
Calibration Blanks Frequency Criteria	Every 10 samples ±2 x SD of mean value	Every 10 samples and at end ±3 x SD of mean value	Beginning, end, and 10% of samples or every 2 hrs All analytes ≤CRDL
Preparation Blanks Frequency Criteria	1 per batch NS	1 per batch NS	1 per SDG or digestion batch All analytes ≤CRDL
QC Check Sample/LCS Frequency Criteria	Each IC and weekly 95-105% recovery	Each IC and weekly 90-110% recovery	1 per SDG or digestion batch for each matrix 80-120% recovery
Matrix Spike Samples Frequency Criteria	1 every new sample matrix 90-110% recovery	5% or 1 per batch 75-125% recovery	5% or 1 per SDG per matrix per level (predigestion) 75-125% recovery
Duplicate Samples Frequency Criteria	NS NS	5% or 1 per batch ≤20% RPD for values >10 x IDL	5% or 1 per SDG per matrix per level (predigestion) ≤20% RPD for values ≥5 x CRDL ±1 x CRDL for values <5 x CRDL
Serial Dilution Frequency Criteria	1 every new sample matrix Dilution within ±5%	1 every new sample matrix 4 x dilution within ±10%	1 per SDG per matrix per level 5 x dilution within ±10%

TABLE 7.3.2 SUMMARY OF QC REQUIREMENTS FOR EPA MERCURY ANALYSIS METHODS USING COLD VAPOR ATOMIC ABSORPTION (AA) SPECTROSCOPY

Requirement	Water and Wastewater Analysis Method 245.1/245.5	RCRA Solid Waste Analysis Method 7470/7471	Superfund Hazardous Waste Analysis CLP SOW ILM03.0
Method Detection Limit	0.2 ug/L	0.2 ug/L	CRDL: 0.2 ug/L
Holding Time	28 days	28 days	26 days
Initial Calibration	6: blank and 5 standards	6: blank and 5 standards	5: blank and 4 standards
Frequency	Daily	Daily and every hour of analysis	Daily or every 24 hours
Criteria	r ≥0.995	r ≥0.995	r ≥0.995
Calibration Verification	A standard at or near MCL	Mid-range standard	Independent standard CCV: diff. conc. than ICV, or at near the mid-range
Frequency	After initial calibration and every 20 samples	Every 10 samples	ICV: After initial calibration CCV: 10% or every 2 hours
Criteria	90-110% Recovery	80-120% Recovery	80-120% Recovery
Calibration Blanks			
Frequency	After each calibration	After each calibration	Beginning, end, and every 10 samples or every 2 hours
Criteria	NS	NS	≤CRDL
Preparation Blanks			
Frequency	1 per digestion batch	1 per digestion batch	1/SDG/digestion batch
Criteria	NS	NS	≤CRDL
QC Check Sample/LCS	Blind performance sample	Independent standard	EPA standard
Frequency	1 per year (Optional: 1 per quarter).	Every 15 samples	1/SDG/batch (solid samples only)
Criteria	EPA control limits	80-120% Recovery	80-120% Recovery
Matrix Spike Samples			
Frequency	NS	5% or 1 per batch	5% or 1/SDG/matrix/level
Criteria	NS	NS	75-125% Recovery
Duplicate Samples			
Frequency	10% or 1 per batch	5% or 1 per batch	5% or 1/SDG/matrix/level
Criteria	EPA control limits	NS	≤20% RPD
Other Method Criteria	Method of standard addition	Method of standard addition	Standard at the CRDL or IDL
Frequency	As needed	As needed	Beginning of each sample run
Criteria	NS	NS	EPA control limits

TABLE 7.3.2 SUMMARY OF QC REQUIREMENTS FOR EPA CYANIDE ANALYSIS METHODS

Requirement	Water and Wastewater Analysis Method 335.4	RCRA Solid Waste Analysis Method 9012	Superfund Hazardous Waste Analysis CLP SOW ILM03.0
Method Detection Limit	Titration: 1 mg/L Colorimetric: 0.02 mg/L	Titration: 0.1 mg/L Colorimetric: 0.02 mg/L	CRDL: 10 ug/L
Holding Time	14 days (24 hours when sulfide is present)	14 days	12 days from sample receipt
Initial Calibration(1) Frequency	6 standards and a blank Daily	6 standards and a blank Daily	3 standards and a blank (one standard at the CRDL) Daily
Calibration Verification(2) Frequency Criteria	NS NS NS	Mid-range standard Every 15 samples 85-115% Recovery	CCV: Mid-range standard Beginning, end, and every 10 samples or 2 hours 85-115% Recovery
Other Standards (Distilled) Frequency Criteria	High and low standard 1 each per batch 90-110% Recovery	High and low standard 1 each per batch 90-110% Recovery	Mid-level standard 1 per batch 85-115% Recovery
Calibration Blanks Frequency Criteria	Colorimetric: 1 per batch Use in initial calibration	Colorimetric: 1 per batch Use in initial calibration	Colorimetric: Beginning, end and every 10 samples or 2 hours ≤CRDL
Preparation Blanks Frequency Criteria	Titration: 1 per batch Colorimetric: Not specified Titration: Use in calculation Colorimetric: Not specified	Titration: 1 per batch Colorimetric: Not specified Titration: Use in calculation Colorimetric: Not specified	Titration: 1 per batch Colorimetric: 1 per batch Titration: Use in calculation Colorimetric: ≤CRDL
Laboratory Control Standard Frequency Criteria	NS NS NS	Independent check standard 1 per batch 85-115% Recovery	Distilled independent standard (ICV) 1 per batch 85-115% Recovery
Matrix Spike Samples Frequency Criteria	1 per batch to check distillation efficiency NS	Matrix spike and matrix spike duplicate per batch NS	1 per matrix per concentration level per batch 75-125% Recovery
Duplicate Samples Frequency Criteria	NS NS	1 matrix spike duplicate per batch NS	1 per matrix per concentration level per batch ≤20% RPD for values >5 x CRDL
Other Method Criteria	Verify sample pH ≥12; Check for oxidizing agents and sulfides	Verify sample pH ≥12; Check for oxidizing agents and sulfides	Verify sample pH ≥12; Check for oxidizing agents and sulfides

KEY TO CHART

BS	Blank Spike
CC	Continuing Calibration
CCC	Calibration Check Compounds
CCV	Continuing Calibration Verification
CRDL	Contract-Required Detection Limit
CRQL	Contract-Required Quantitation Limit
CV	Coefficient of Variation
D	Detected
IC	Initial Calibration
ICV	Initial Calibration Verification
IDL	Instrument Detection Limit
IS	Internal Standard
LCS	Laboratory Control Sample
MCL	Maximum Contaminant Level
MDL	Method Detection Limit

KEY TO CHART

MS	Matrix Spike
MSA	Method of Standard Additions
NA	Not Applicable
NS	Not Specified
%D	Percent Difference
%Rec.	Percent Recovery
PQL	Practical Quantitation Limit
r	Correlation Coefficient
RF	Response Factor
RPD	Relative Percent Difference
RRT	Relative Retention Time
RSD	Relative Standard Deviation
RT	Retention Time
SD	Standard Deviation
SDG	Sample Delivery Group
SPCC	System Performance Check Compounds

NOTES

(1) Calibration standards must be distilled for EPA Methods 335.4 and 9012 when sulfides are present in the samples.

(2) CLP SOW specifies that the initial calibration verification standard (ICV) be distilled and analyzed as the laboratory control standard (LSC).

7.4 Standard Operating Procedures

All laboratory activities, from sample receipt to analysis to final report generation, must adhere to the laboratory Standard Operating Procedures (SOPs) which have been developed to provide quality environmental data with adequate documentation to be of known quality and hence of maximum use to our clients. All SOPs provide complete documentation as to how each sample is measured for each parameter. Reference corporate document QAS00200.NET for the IEA corporate format for generating SOPs. Each SOP shall have a unique code in accordance with the IEA corporate document control procedure as outlined in the corporate SOP on document control.

On a regular basis the QA Manager will review data to check for compliance to SOPs. Additionally the QA Manager will review SOPs to ensure they meet the requirements of the methodologies and applicable regulations. If it is found that the document does not meet the requirements, the discrepancy is forwarded to the group/section leader through the corrective action process. (reference SOP on Corrective Action Reports -QAS00501.CT).

In addition to method SOPs, at minimum the laboratory is required to have on file SOPs for the following operations. Many of these SOPs have been generated by the IEA corporate QA department.

Sample Receipt, Logging and Disposal
Chain-of-Custody Procedures
Sample Storage
Security of Samples and Laboratory Facility
Purity of Standards and Standards Preparation Documentation
Maintaining Laboratory Records and Logbooks
Sample Analysis and Data Control Systems
Sample Bottle and Glassware Cleaning Procedures
Laboratory Waste Disposal

An example listing of laboratory SOPs is presented in Section 7 of the Appendix. A complete list of all laboratory SOPs is available upon request.

7.5 Chain-of-Custody

Samples are physical evidence and are handled at IEA according to certain procedural safeguards. For the purposes of legal proceedings, a demonstration to the court that the laboratory is a secure area may be all that is required for the analyzed evidence to be admitted. However, in some cases, the court may require a presentation of the hand-to-hand custody of the samples while they were at the laboratory. In the event that a client requires such a comprehensive chain-of-custody demonstration, upon special request, IEA is capable of producing documentation that traces the in-house custody of the samples from the time of receipt to completion of analysis.

The National Enforcement Investigations Center (NEIC) of EPA defines custody of evidence in the following ways:

- It is in your actual possession; or
- It is in your view, after being in your physical possession; or
- It was in your possession and then you locked or sealed it up to prevent tampering; or it is in a secure area

At IEA-CT, chain of custody begins with shipment of the sample bottles and coolers. IEA-CT has a printed external chain-of-custody form that accompanies each sample shipment. An example of this form is found in Section 2 of the appendix.

Upon receipt of the samples in the laboratory the sample custodian and the sample control group are responsible for obtaining all necessary shipping documentation and verification of all data entered into the laboratory sample custody records. The internal chain of custody form is generated at this point.

All samples and projects entering the laboratory are identified with a job/project number. Individual samples are then identified using the job number and sample counter. The samples are then stored according to the requirements of the analytical protocols (refrigeration).

Preliminary sample receipt notifications are distributed to each department to notify department of sample arrival and facilitate the analysis of parameters with short holding times. Each department has a system of tracking sample analysis throughout their respective departments.

All documentation received with samples is reviewed by the sample custodian at the time of receipt. The project manager then reviews the paperwork again at the time of log-in to the LIMS computer system. If there are any discrepancies noted by the sample custodian, a corrective action report is filled out and submitted to the project manager. The client is then contacted for resolution.

The specific procedures and requirements for receiving samples are specified in the SOP for sample control - "Sample Processing Methods Performed at Sample Arrival" (Doc# SMS00401.CT). IEA's chain-of-custody record is designed to meet the legal requirements of federal, state and local government agencies and the courts of law. The record covers:

- Labeling of sample bottles, packing the shipping container and transferring the shipping container under seal to the custody of a shipper;
- Outgoing shipping manifests;
- The chain-of-custody form completed by the person(s) breaking the shipping container seal, taking the sample, resealing the shipping container and transferring custody to a shipper;
- Incoming shipping manifests;
- Breaking the shipping container's reseal;
- Storing each labeled sample bottle in a secured area;
- Disposition of each sample to an analyst or technician; and
- The use of the sample in each bottle in a testing procedure appropriate to the intended purpose of the sample.

For each link in this process the records indicate the following:

- The person with custody; and
- The time and date each person accepted or relinquished custody.

IEA has implemented the following standard operating procedures with regard to laboratory chain-of-custody:

- Samples are stored in a secure area;
- Non-employee access to the laboratories are controlled through the use of limited access points at each facility. Outside personnel can access the facility either through the front receptionist or the sample receipt area. Other access doors to the laboratory are maintained in a secure manner at all times;
- All visitors to each facility are required to sign-in at the reception area and must be escorted by an IEA representative at all times while in the laboratory;
- Refrigerators, freezers, and other sample storage areas are kept locked, when not in use;
- The designated sample custodian and supervisory personnel control access to the sample storage area(s); and
- Samples remain in secured sample storage until removed for sample preparation or analysis; and
- Upon special request, all transfers of samples into and out of storage are documented through an internal chain-of-custody procedure. This procedure is not normally employed in daily operations but is available upon special request by the client.

7.6 Analytical Calibration Standards

The calibration standards used for instruments and equipment are described in the specific analytical methods, or instrument manufacturers' operational guides. All standard preparations are recorded in a bound "Standards Preparation Log Book" with the lot number, method of preparation, date and analyst's initials. This log provides the internal documentation which traces the internal working standards to primary and secondary (purchased) stocks.

The stock solutions are all kept in a daily monitored 4o C refrigerator with the exception of the organic stock solutions which are kept in a 0o C freezer. Stock calibration standards are coded in the "Prep Log" mentioned above with the analyte, concentration, date prepared, initials, and referenced to the book and page where a description of the preparation can be found and traced. No samples are maintained in the same areas as the standards.

Records on the traceability of the standards are maintained in the office of the Quality Assurance Manager. These records include sources, dates of receipt, lot numbers (if Applicable) and expiration dates (if applicable).

Table 7.6.1 provides an overview of the standard sources, types and preparation by instrument group.

Metals Calibration Standards

Commercially available at 1000 ppm levels from Inorganic Ventures and prepared from primary standard material traceable to EPA A2LA standards. Stock standards solutions are prepared every six months or when needed as multi-element stocks.

Inorganic Calibration Standards

Most calibration standards described in the methodology used ACS Reagent Grade materials. Some reference materials are available from NIST to standardize titrating solutions. Stock solutions are prepared every three months while diluted working standards are prepared daily at the time of analysis. Spike solution preparation is also documented in the solution/standard log book.

Organic Calibration Standards

Pure compounds for organic calibration materials are available through EPA EMSL in Cincinnati, EPA in Research Triangle Park, EPA Las Vegas, Supelco, Inc., Restek, Inc. and Accustandard, Inc. Organic stocks are prepared every six months and diluted working standards are prepared weekly. Stock non-volatile solutions can be prepared every six months and diluted working standards are prepared weekly. Stock non-volatile solutions can be prepared every six months with working standards made weekly. Organic spike solutions are prepared from neat solutions and documented.

pH Calibration Standards

Calibration materials which are certified by the manufacturer to be standardized against NIST Standards are commercially available and are used by the laboratory. Three standards - 4,7, and 10 are used daily to calibrate the pH meters.

Weighing Calibration Standards

Analytical balances are certified annually. Calibration is performed on a weekly or daily basis using class "S" weights (0.50, 5.00, and 50g).

Oven Calibration Standards

Daily calibration by monitoring oven temperature with a thermometer calibrated annually with a NIST Certified Thermometer.

Conductivity Calibration Standard

Conductivity solutions are described in Standard Methods, 15th edition, Section 502.

Turbidity Standards

Formazin solution prepared from CMS neat standard according to EPA Method 180.1-2. Four standards are used to prepare a calibration curve and are made fresh daily. The stock formazin standard is prepared every three months and kept under refrigeration.

Photometer Calibration Standard

Spectronic Standards - Catalog #331-31-50 (wavelength calibration).

Refrigerators

All refrigerators are checked daily for temperature stability. Yearly, the refrigerator thermometers are calibrated against an NIST thermometer. Daily readings are recoreded in a bound logbook.

TABLE 7.6.1 STANDARD SOURCES AND PREPARATION

Inst. Group	Source	Form Received	Storage	Preparation from Source	Laboratory Stock Storage	Preparation Frequency
GC/MS	Restek, Inc. EPA Supelco Accustandard	Neat Solutions > 1000 ppm	Frozen Frozen	Primary stocks are prepared from source stocks	Frozen	Semi-annual
				Intermediate stocks are prepared from primary or source stocks	Refrigerator	Weekly
				Working stocks are prepared from intermediates	N/A	Weekly
GC	Restek, Inc. EPA RTP Supelco Accustandard	Neat Solutions >1000 ppm	Frozen Frozen	Primary stocks are prepared from source stocks	Frozen	Semi-annual
				Intermediate stocks are prepared from primary or source stocks	Refrigerator	Semi-annually
				Working stocks are prepared from intermediates	N/A	Semi-annually
GFAA; ICP	Inorganic Ventures	Solutions of 1000ppm	Room temp.	Primary stocks (1 - 10 ppm) are prepared from source	0.15% HNO_3 at room temperature	Annually
				Intermediate stocks (1ppb - 1 ppm)	0.15% HNO_3 at room temperature	Semi-annually or as needed
				Working stocks	0.15% HNO_3 at room temperature	Daily

7.7 Instrument Calibration Procedures

The proper calibration of instrumentation and equipment is a key element in the quality of the analysis done by the laboratory. Each type of instrumentation and each EPA approved method has specific requirements for the calibration procedures, depending on the analytes of interest and the medium of the sample.

Tables 7.7.1 list in tabular form the procedures which are followed by IEA Connecticut. The calibration protocols meet or exceed the minimum method criteria requirements. If a method calibration requirement is more stringent than those listed in the Quality Assurance Plan, the more stringent will be followed in each case.

Documentation and records on calibrations are maintained in instrument logs and also with the data sets of the samples which are analyzed and related to them. In addition, laboratory department managers monitor the results of the calibration program to ensure the proper implementation at the analyst level.

TABLE 7.7.1 INSTRUMENT CALIBRATION SUMMARY

Analysis	Cal. Type	# Standards	Type of curve	Acceptance/rejection criteria	Frequency
GC Pesticides Herbicides OP pesticides	Initial	5 concentration levels	Linear	$\leq$ 20% RSD	continuing calibration fails
	Continuing	1 standard (mid)		+/- 15% Difference	Daily and every 10 samples
GC/MS quadrupole	Initial	5 concentration levels; tuning with BFB/DFTPP	Linear; tuned to manufacturer's specifications	$\leq$ 20% RSD	continuing calibration failure
	Every 12 hours	1 standard; tuning with BFB/DFTPP		+/- 15% Diff	Daily
AAS Graphite	Initially	5 concentration levels	Linear	>.995 coefficient of variation	continuing calibration failure
	Continuing	1 standard		+/- 95% of value	Every 10 samples
ICP	Initially	5 concentration levels	Linear	According to instrument manufactures's instructions	Quarterly
	Daily	2 levels			
	Continuing	1 standard			Every 10 samples
Lachat Analysis	Initially,Daily	5 concentration levels	Linear	<.995 coefficient of variation	continuing calibration failure
	Continuing	1 standard			Every 10 samples
pH Meters	Initially and daily	2 standards (pH 7 and 4 or 10)	Linear	+/- 95% of value	Daily
	Continuing	1 standard			Every 10 samples

TABLE 7.7.1 INSTRUMENT CALIBRATION SUMMARY

Analysis	Cal. Type	# Standards	Type of curve	Acceptance/rejection criteria	Frequency
Spectrophotometer	Initially and daily	5 concentration levels plus set %T with no cuvette in holder	Linear	<.995 coefficient of variation	Daily
	Continuing	1 standard		+/- 95% of value	Every 10 samples
Infrared Spectrophotometer	Initially and monthly	5 concentration levels	Linear	<.995 coefficient of variation	Daily
	Continuing	1 level		+/- 95% of value	Every 10 samples
Conductivity meter	Daily	3 concentration levels	Linear	<.995 coefficient of variation	Daily
	Continuing	3 concentration levels		+/- 95% of value	Every 10 samples
Turbidimeter	Daily	3 concentration levels	Linear	<.995 coefficient of variation	Daily
	Continuing	3 concentration levels		+/- 95% of value	Every 10 samples
Balance	Daily	3 levels Class "S" weights	Point		Check single weight upon use

8.0 DATA PROCESSING

8.1 Introduction

Data processing is defined as the mechanisms employed for collecting, reviewing, transcribing, reporting and storing of analytical data and related information.

Because of the critical relationship between instrument calibration, the accuracy of the analytical data generated, and specific method protocols that determine data quality, IEA maintains strict controls on the calibration procedures for the various types of analytical equipment. Each type of instrumentation is calibrated prior to sample analysis according to method criteria. Specific criteria for the instrument calibrations must be met before samples may be processed. Corrective action must be taken to remedy any out of control situations.

8.2 Collection

Data in the environmental laboratory make take several forms. Some are manually generated, while others are automated computer outputs. Some examples of typical data are:

Field measurements or observations made on-site during the sample collection effort as part of a monitoring program.

Information provided on chain-of-custody forms such as sampler, sampling date, sample location, sample identification, weather observations and custody transfer information.

Recordkeeping information such as instrument run logs, standards traceability, sample preparation logbooks and balance calibrations which represent information not normally required for inclusion in client reports.

Analytical data produced by various instrumentation such as GC/MS units, gas chromatographs, atomic absorption spectrophotometers, and automated analyzers. This includes various associated outputs such as chromatograms, strip chart recordings and computer tape readouts.

Records of standard calibration curves as well as associated quality control data such as method blanks, matrix spikes, matrix spike duplicate, replicate and QC check samples.

Consistent data collection is achieved through the existence and use of standard operating procedures at each facility. For example, chain-of-custody forms are routinely checked for completeness and if omissions occur, the sampler is contacted for the missing information.

Laboratory data sheets or logbooks have a standard format to ensure that all pertinent information is recorded consistently. These items are regularly monitored to ensure compliance with established requirements.

Outputs from all instruments are monitored for readability and consistency. If clarity is less than desired, corrective actions are undertaken to rectify the output based on instrument manufacturers' recommendations.

The following sections will describe the general procedures which are employed at the IEA-CT laboratory. More specific detail can be found in the standard operating procedures.

Gas Chromatography

Data from the Gas Chromatographs is collected through interfaces and processed by a Hewlett Packard computer system (HP-1000) with RTE-A operating system and 3550A LAS software or and HP Chemstation with Enviroquant software. Data is reviewed at the bench level by the analyst. If all required QC is met then the data is reviewed for chromatographic scaling and dilutions. If necessary reintegrations and rescalings are done using the LAS system or Enviroquant software. The binary result files are then converted to ASCII report files for transfer to the Seedpak system for data report forms generation.

GC/Mass Spectrometry

GC/MS data is collected utilizing Hewlett Packard 1000 RTE, RTA or DOS chemstation computer systems with Aquarius or Environquant software. This software allows for the comparison of sample non-target spectrum against reference library spectra. The most recent NIST/EPA mass spectral library supported by the system must be used. Data is reviewed by the analyst. If the data meets QC requirements, then binary data files are then converted to ASCII report files for transfer to the Seedpak II computer system via the network for data report forms generation.

Atomic Absorption

ICAP metals are analyzed by a Thermo-Jarrel Ash 61 or 61E. The data collected is transfered via a network system to the Seedpak system. Furnace data analyzed by the Perkin Elmer 5100s are collected on PCs and also transferred to the network to the Seedpak system for forms generation. Mercury data is analyzed on the TJA mercury analyzer and entered into Seedpak.

Classical Chemistry

Routine wet chemistry analyses have pre-printed logbooks, such as distillation logs and digestion logs. The less frequent analyses are recorded in analysts' notebooks. Raw data is then entered into the LIMS computer for data calculation. This includes the calibration curve data which may have been previously entered. Semi-automated analyses performed on the Lachat produce calculated final results. These results are then entered into LIMS. Any raw data produced is stored in a central file. Quality control data is manually calculated. Results data is reported off LIMS in the required format.

8.3 Review

Data review can be defined as the process whereby data is accepted or rejected based on specific criteria in order to ensure that the data are adequate for the intended purpose. In most cases, the criteria is defined by the particular analytical method.

Data review is performed prior to release of the data to the client. It is performed as soon as possible after data acquisition in order to provide sufficient time for corrective action if required.

In general, the procedure presented in Figure 8.3.1 is utilized by laboratory personnel throughout the network for data review purposes.

There are numerous policies and standard procedures which have been implemented to ensure that data of known quality is continually generated by the IEA-CT laboratory.

Each analytical SOP details the type and frequency of quality control checks. This includes such items as analysis of client reference standards, matrix spikes, blanks, the use of internal standards and surrogate spikes, etc. All calibrations are checked before sample analysis can begin. If the analytical system does not pass the initial QC limits, then the system is determined to be "out of control", and the cause of the problem must be determined and corrected before measurements can continue. Once the problem is corrected, QC measurements are repeated to verify the calibration. If the system is still out of control, the system is re-examined until the problem is corrected. General requirements are listed below:

Organics

- A minimum of one method blank is analyzed per 20 samples (or batch) per matrix, per concentration level or extraction procedure. A method blank is required every 12 hours for volatile analysis. Blanks and samples are analyzed on the same instrumentation. Pesticides/PCB's also require instrument blanks.
- Holding blanks are placed in volatile refrigerators on a weekly basis. For EPA CLP SOW volatile analysis, holding blanks are analyzed once per SDG.
- A matrix spike/matrix spike duplicate is analyzed at a frequency of one per 20 samples per matrix, per concentration level or per SDG, whichever is more frequent.
- Prior to sample processing, surrogates are added to all samples and method blanks. GC/MS analyses also require the use of internal standards.
- Multi-level initial calibration curves are performed with continuing calibration standards analyzed every 12 hours. Recalibration is required if criteria cannot be met.
- GC/MS system tuning is verified every 12 hours.

Inorganics

- Multi-level calibration is performed on required instrumentation and verified as required.
- Calibration and prep blanks are analyzed at required frequencies.
- A matrix spike and sample duplicate are analyzed every 20 samples/SDG per matrix type.
- A Laboratory Control Sample is analyzed every 20 samples or per batch.
- Multi-level calibrations are performed for all manual and semi-automated wet chemistry methods and verified as required (if applicable).
- Method blanks are analyzed at required frequencies.

The precision and accuracy control limits employed by IEA are based primarily on limits contained in the published methods or required by the U.S. Environmental Protection Agency's Contract Laboratory Program (CLP). When warranted by IEA's historical data, more restrictive control limits are set than those cited by the method or the CLP.

When the CLP protocol is not applicable to analysis of samples, the precision and accuracy requirements for each analytical method are included in the individual laboratory Standard Operating Procedure (SOPs). Examples of data acceptance criteria is detailed in table 7.3.2.

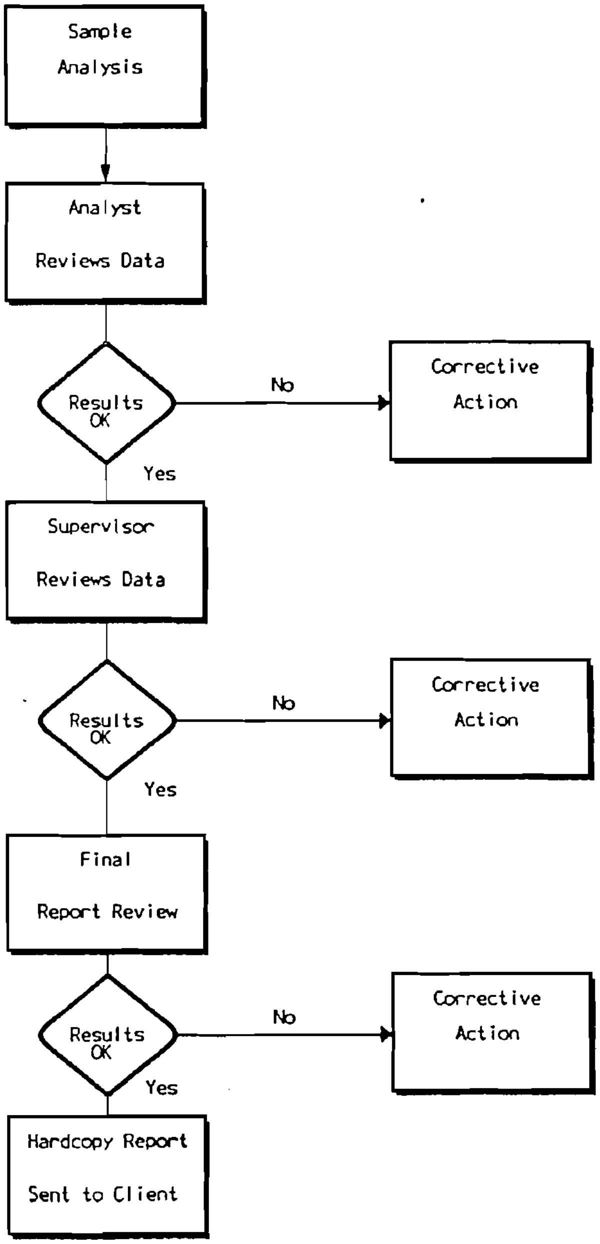
At a minimum, all data will be subject to supervisory review. Sensitive data requires higher level review and release. All releases must be in writing. Oral or Faxed preliminary releases are prohibited unless prior permission of the appropriate supervisor(s) is granted.

Each analytical group in the laboratory is responsible for generating the data for all analyses the group performs. In general the data must first meet all the specific QA/QC associated with the SOP that was used for the analysis prior to any release of the data. The analytical group leader (supervisor) is responsible for the final verification of the data from the analysis.

The laboratory employs a system of QA sign-off sheets called QC Batch Approval Forms and Quality Control Approval Reports (QCAR's), where each analyst must sign off that their respective part of the analysis is complete and meets the QA/QC requirements of the governing SOP. Both the Volatile and semi-volatile RTE computer systems produce batch-specific QC summary reports to check various analytical parameters. Analysis QCAR's are filled with the analysis batches while the final deliverable QCAR's are signed and placed in each job folder along with any Corrective Action Forms (CAF) which details any problems which were encountered in the measurement of samples. Any deviations from SOPs are noted on CAF's and explained in the SDG narrative which is incorporated into the final report. The group leader has final sign-off responsibility on the QCAR and is responsible for assuring the overall quality of the data.

The laboratory Quality Assurance Manager periodically examines data packages at random to ensure that all QCAR's are present and to ascertain that the data package meets the requirements as stated in the SOP. These findings are transmitted to laboratory management via progress reports.

FIGURE 8.3.1 NETWORK DATA REVIEW PROCESS (GENERAL)



8.4 Data and Report Storage

Unless specified otherwise by the client, all analytical data and associated information is stored for a minimum period of three years. Local state data storage requirements may vary from the corporate requirement and must be met by the laboratory if they are more stringent.

Stored information may consist of hardcopy or electronic data stored on a magnetic media.

All hardcopy information is stored at the laboratory that generated the data or off-site at a commercial document storage facility equipped with a professional security system.

All electronic data is stored on-site at the laboratory that generated the data or off-site at a commercial document storage facility equipped with a professional security system and a controlled environment suitable for storage of magnetic media.

Access to archived information is controlled by the appropriate data management custodian or facility manager.

At IEA-Connecticut, reports for the current year are filed in the data management area in filing cabinets. If the report has a larger data package, such as "CLP like" deliverables, it is then stored in numbered boxes. The number of the box is recorded into the cross reference logs and then stored in the locked storage area in the basement. All jobs must be signed out if being taken from the data management area.

8.5 Transcription

Whenever possible, manual data transcription is avoided through the use of electronic data transfer within the laboratories. In cases where manual transcription is employed, information is checked and verified by the supervisor or designee within the department.

It may not be possible to totally eliminate transcription related errors, however, section 4.6.9, paragraphs A and D, list procedures which are designed to minimize their occurrence and impact on data quality.

8.6 Data Reduction

Data reduction includes all processes that change either the form of expression (i.e., the units of measure) or the quantity of data values (rounding). It often involves statistical and mathematical analysis of data and usually results in a reduced subset of the original data set. Data reduction is performed either manually by the analyst or by computer systems interfaced to the analytical instruments. Whenever such procedures are employed within the laboratory network, mathematical procedures have been verified for accuracy of computation.

An example of this would be for CLP data packages, the data is transferred directly onto the Seedpak II system computer software from the Metals, GC and GC/MS systems via the network. The data is further processed and stored in the database. Other relevant data is transfered via the network at this point such as client ID's, etc. All calculations and final results are performed by the Seedpak II software. Many of these calculations are also done at the instrumentation level as a secondary review. Data in the database is sorted by client delivery group for easy retrieval. CLP forms are generated after all data is entered and reviewed. The forms and raw data are compiled into a data package. Tabular results are also generated at this point for level I reports reducing the occurance of typographic errors.

The data associated with each analysis is hardcopied for permanent storage either through the printing of computer files or through hand entry into bound laboratory notebooks. All notebook entries are dated and signed by the analyst.

Job packages which include 20 samples or samples received by the laboratory during a one week time frame will comprise an "SDG". All organic parameter results will be reported in ug/L for aqueous samples and ug/Kg dry weight for soil/sediment samples. Inorganic result units vary according to the methodology.

It is laboratory policy that any and all problems related to client samples and the measurement of client samples be documented in the SDG narrative of the final laboratory report which goes to the client. The mechanism for documenting problems which shall be included in the SDG narrative is described in Section 10.0. It is the responsibility of the data management group to see that information on CAR's is included in the final SDG narrative.

After final review by the department manager, the data is placed in sample control for tracking on the project status sheet. If possible the data is placed into the job folder. When all parameters are complete the folder is removed by the data management department. It is the responsibility of the data management group to make sure that all the data is present and deliverable requirements are complete. This may include chain of custody forms, special instructions, and case narratives. The data is then compiled and sent to the report production group for word processing.

9.0 DATA QUALITY ASSESSMENT

Data quality is assessed based on five main characteristics:

- Precision
- Accuracy
- Completeness
- Representativeness
- Comparability

Each of these characteristics have been previously defined in section 2.2 of this document.

Laboratory Quality Assurance Objectives

Precision:

The objective of the network laboratories concerning precision is to equal or exceed the precision demonstrated in the published analytical method on similar samples. Relative Percent Difference (RPD) is used as the measure of precision sample duplicates. The formula utilized to calculate RPD is as follows:

Relative Percent Difference (RPD)

$$\text{RPD} = \frac{\text{(Sample Result - Duplicate Result)}}{\text{Mean of Sample and Duplicate Results}} \times 100$$

Note: RPD is expressed as the absolute value obtained from the above formula.

Accuracy:

The objective of the network laboratories concerning accuracy is to equal or exceed the accuracy demonstrated in the published analytical method on similar samples. Accuracy is determined on matrix spikes and/or blank spikes and is calculated as follows:

$$\text{Percent Recovery} = \frac{\text{(Observed-Sample) Concentration}}{\text{Spiked Concentration}} \times 100$$

Completeness:

IEA's objective for completeness is to be able to provide analytical data for 100 % of samples received intact and have sufficient sample volume for conducting re-analysis if initial analysis does not meet QC acceptance criteria.

Representativeness:

Representativeness of the analytical data is primarily a function of the sampling procedures and techniques employed in the field. As such, the sampling plan must be designed to provide representative samples to the laboratory. Once received at the laboratory, samples are homogenized in an effort to yield representative data on the sample submitted for analysis.

Comparability:

IEA's objective for comparability is that all data be fully comparable with data from other network laboratories. This is accomplished through use of the following practices:

- Demonstrate traceability of standards to NIST or EPA sources
- Use of standard and approved methodologies
- Standardized units of measure
- Standardized QC acceptance criteria
- Participation in interlaboratory studies to demonstrate laboratory performance

9.1 Content of Analytical Reports

Laboratory customers have a wide variety of analytical needs. In order to meet these varied requirements, the laboratory offer several levels of data reporting options ranging from very simple format to an extreme level of documentation. Table 9.1.1 presents the contents of various levels of reports offered by the laboratory. Custom reporting beyond those listed is usually available but may require additional cost. The information provided in Table 9.1.1 is a summary only. In some cases, individual methods may not include the indicated items. For example, in metals graphite furnace analysis an ICP interference check would not be included since it is inappropriate for that method.

Table 9.1.1 Report Content Options

	Data Reporting Options			
Wet Chemistry	Level 1	Level 2	Level 3	Level 4 (CLP)
Case narrative	Yes	Yes		Yes
Sample Results	Tabular	Tabular		Form I
Method Blank	Yes	Yes		Yes
External Chain of Custody	Yes	Yes		Yes
Internal Chain of Custody	Yes	Yes		Yes
Duplicate	-	Yes		Yes
Matrix Spike	-	Yes		Yes
Initial Calibration Verification (ICV)	-	-		Yes
Continuing Calibration Verification (CCV)	-	-		Yes
Laboratory Control Sample (LCS)	-	-		Yes
EPA Forms 1-14	-	-		Yes
Metals	Level 1	Level 2	Level 3	Level 4 (CLP)
Case Narrative	Yes	Yes		Yes
Sample Results	Tabular	Tabular		Form I
Method Blank	Yes	Yes		Yes
External Chain of Custody	Yes	Yes		Yes
Internal Chain of Custody	Yes	Yes		Yes
Duplicate	-	Yes		Yes
Matrix Spike	-	Yes		Yes
Initial Calibration Verification (ICV)	-	-		Yes
Continuing Calibration Verification (CCV)	-	-		Yes
Laboratory Control Sample (LCS)	-	-		Yes
ICP Interference Check	-	-		Yes
ICP Linear Range	-	-		Yes
ICP Post Spike	-	-		Yes
EPA Forms 1-14	-	-		Yes
Organics	Level 1	Level 2	Level 3	Level 4 (CLP)
Case Narrative	Yes	Yes		Yes
Sample Results	Tabular	TAbular		Form I
Method Blank	Yes	Yes		Yes
External Chain of Custody	Yes	Yes		Yes
Internal Chain of Custody	Yes	Yes		Yes
Matrix Spike	-	Yes		Yes
Matrix Spike Duplicate	-	Yes		Yes
Laboratory Control Sample (LCS)	-	-		as needed
Surrogate Recovery Information	-	Yes		Yes
Tuning Data (GC/MS only)	-	-		Yes
Initial Calibration Information	-	-		Yes
Continuing Calibration Information	-	-		Yes
Run Sequence Logs	-	-		EPA only
Sample Preparation Logs	-	-		Yes
Chromatograms and Mass Spectra	-	-		Yes
EPA Forms 1-8	-	-		Yes

10.0 CORRECTIVE ACTION

10.1 Introduction

The Corrective action form (CAF), presented in Section 7 of the Appendix, provides a routine written communication vehicle to describe most types of problems which may occur throughout the laboratory or as a result of a client inquiry. Problems described in SDG narratives should be supported by a CAF.

Corrective actions can be initiated at several operational levels; however they must always involve the QA Manager. Corrective actions are reviewed, documented and distributed to the appropriate personnel through the QA department. Responses are returned to QA for review and redistributed in a specified time frame.

Examples of three types of corrective actions which may be initiated are as follows:

Sample problems

Individual samples or matrix problems may cause documented corrective actions such as re-extraction, reanalysis, cleanups or dilutions.

QC problems

Corrective action may occur on entire batches of samples when QC criteria cannot be achieved.

Systematic problems

Specific project issues and procedural issues may require corrective actions. These are handled by laboratory management and the QA department.

The QA Manager will monitor and log the progress of CAF's and will report in the QA Progress Report the status of major corrective actions taken in the past month. It is the QA Manager's responsibility to see that laboratory problems are documented and solved in a timely manner. This system is outlined in the SOP for Corrective Action Reports - QAS00501.CT.

10.2 System Audit

A system audit is an inspection and review of the entire data generation and support system of a laboratory. Activities related to the established requirements in the quality assurance program are reviewed for compliance. A typical system audit includes an evaluation of the following:

- Assessment of degree of compliance with the quality assurance program
- Continuing compliance with corrective actions identified in a previous audit of the facility
- Calibration procedures and documentation
- Sample handling procedures including chain-of-custody
- Experience of laboratory personnel
- Existence and routine use of standard operating procedures
- Analytical data review and validation procedures
- Data storage and recordkeeping

A system audit is performed by the on-site quality assurance manager at each facility annually. In addition to the above, a system audit is also conducted at the corporate level at each laboratory annually. The audits are staggered so that each facility is audited semi-annually, either by the local QA manager or corporate.

As previously indicated, all system audits are conducted utilizing a comprehensive standardized checklist (IEA Doc.# QAS00300.NET). Copies of the system audits conducted by the QA managers are submitted to the appropriate laboratory director/manager and president for review.

The auditor will identify any deficiencies in the audit report which is to be generated within a week of the actual audit. The laboratory director/manager is required to respond, in writing, no later than 30 days from issuance of the audit report. The response must address each of the items contained in the audit. If corrective action cannot be taken immediately, the anticipated date of compliance must be presented. If the auditor identifies issues which are significant (in their opinion), a follow-up audit can be conducted prior to the regularly scheduled audit.

A summary of the audit report findings is included in the quality assurance status report provided to management by the corporate quality assurance director.

10.3 Performance Audits

A performance audit is a quantitative check on the accuracy and/or precision of analytical data.

IEA network laboratories participate in a number of contracts and certification programs (see Table 5.4.1). Many of the certification programs employ rigorous performance evaluations which take the form of proficiency samples submitted to the laboratories on a regular basis. The following represents typical examples of routine proficiency programs.

All network laboratories are active participants in EPA Water Pollution (WP) and Water Supply (WS) proficiency programs which issue performance check samples on a semi-annual frequency.

IEA-CT participates in a number of contracts and certification programs. Many of these programs employ performance evaluations which take the form of proficiency samples submitted to the laboratory on a regular basis.

Bi-annually, the laboratory participates in the USEPA Water Supply (WS) and Water Pollution (WP) proficiency programs. IEA-CT also participates in the NYSDOH proficiency testing program for Potable Water, Hazardous Waste and CLP. The lab currently analyzes quarterly organic PE samples from EPA for the CLP program.

On a semi-annual basis, the QA Manager will submit QC samples supplied from an external source to the laboratory. The purpose of this is to check the accuracy of results, assess data quality, documentation and completeness of data reporting. The QA Manager shall submit an data review report to the laboratory. A written response must be submitted to QA within two weeks addressing the unacceptable findings Corrective actions shall be put in place and monitored.

A copy of all analytical results associated with any proficiency samples is submitted to the operations director and president by each laboratory. The corporate office reviews this information and will utilize it in performing the regularly scheduled system audits at each lab. If results indicate a significant problem may exist, the network QA director will investigate accordingly.

In addition to participating in the above performance evaluation programs, the corporate office conducts additional performance evaluation studies.

Periodically, performance evaluation samples are submitted to each laboratory for parameters which are not addressed in other performance evaluation programs (ie. TCLP testing). In this type of testing the laboratory is aware the samples are performance check samples but the "true" concentrations are unknown. The results are submitted to corporate QA for evaluation and a report is issued on the findings. Corrective actions are taken if required, as a result of these test findings.

10.4 Independent Audits

IEA network laboratories are routinely audited by state and federal agencies for compliance with government regulations. In addition, several industrial clients conduct systems and performance audits of the facilities prior to project plan approval.

10.5 Subcontracted Services

IEA network laboratories occasionally choose to send selected analyses to a subcontract laboratory outside of the IEA organization. The most common reason for utilization of a subcontract facility is that the procedure is not routinely performed by an IEA network laboratory and the subcontractor has greater experience in day-to-day execution of the method. In such cases, although an IEA lab could in all likelihood conduct the analysis, it is more cost effective for both IEA and the client to utilize a subcontract lab as necessary. All subcontract laboratories utilized by IEA on a continuing basis require approval of the QA department prior to use. The QA manager is responsible for defining the analytical requirements to be met by the subcontract lab. For instance, the QA manager and the subcontracting lab must agree on the specific quality control to be performed with the samples submitted for analysis. Acceptance limits for items such as method blanks and matrix spiking must be determined.

IEA's clients are notified whenever another IEA laboratory or a subcontract laboratory is to be utilized for any portion of the analytical requirements. Although all analytical data appears in the IEA report, all data produced by another IEA laboratory or a subcontract laboratory is identified. In specific cases, states (ie. New Jersey) may have specialized requirements concerning the reporting of subcontracted analyses. In such cases, the laboratory will comply with the stated requirements. Subcontractors are not utilized when specifically restricted in a client's quality assurance project plan.

APPENDIX, Section 1

PROFESSIONAL PROFILES
OF
KEY PERSONNEL

The following professional profiles are presented alphabetically and represent the key quality assurance and laboratory management personnel for the network organization. Additional professional profiles are available for review during a site visit to any of our laboratory facilities.

PROFESSIONAL PROFILE
Michael V. Bonomo

TITLE: Vice-President and Director of Operations-IEA Connecticut

ACADEMIC ACCOMPLISHMENTS:

Fordham University - Bronx, New York
B.S. Biology

Pace University - White Plains, New York
M.B.A Marketing

MAJOR AREA OF EXPERTISE:

Environmental Regulations
(RCRA, CERCLA, CWA, SDWA, ECRA)

Sampling and Analysis Plan Design

Data Management

SUMMARY OF EXPERIENCE:

Mr. Bonomo has over 15 years experience in environmental monitoring programs. He has functioned in numerous roles including director, co-director, sales manager, project manager, field and laboratory scientist, consultant, and seminar instructor. He has assisted many Fortune 500 companies and consultant/engineers in the design and implementation of sampling and analysis project plans. He has been involved in a wide spectrum of environmental programs for groundwater, soil, and sludge testing as well as monitoring various aquatic biota. Mr. Bonomo is also experienced in data management requirements for large analytical projects. He was instrumental in developing and implementing a data collection through data reporting system that was successfully utilized on many projects. He has also served as a seminar instructor for groundwater monitoring sampling and data tracking for a major waste management company.

PROFESSIONAL EXPERIENCE:

1992 to Present — IEA, Inc.
Monroe, CT

Position — Vice-President, Director of Operations

Responsibility

Responsible for overall operations and profitability.

1991 to 1992 — IEA, Inc.
Monroe, CT

Position — Co-Director

Responsibilities

Co-responsibility for the profitability and management. Duties included business development, marketing, financial and budget management, sales management, strategic planning and monitoring operations.

1990 to 1991 IEA, Inc.
Monroe, CT

Position Sales and Marketing Manager

Responsibilities

Responsible for the sales staff, corporate strategic planning, sales management and marketing in the New Jersey, Connecticut, Massachusetts and Vermont laboratories.

1989 to 1990 York Wastewater Consultants (YWC)
Monroe, Connecticut

Position Executive Director

Responsibilities

Assisted in the growth of an unknown Connecticut based company to one that covered all of the Eastern United States. Participated in a 6-month strategic planning process that provided insight into the tools needed to run a successful company. In spite of severe banking problems, a 2-year Federal EPA investigation, and a downturn in the market, saw YWC through successful acquisition by Aquarion.

1987 to 1989 York Wastewater Consultants (YWC)
Monroe, Connecticut

Position Sales and Marketing Manager

Responsibilities

Managed three York Laboratories division of YWC, Inc. Responsible for the Northeast, Mid-Atlantic and Midwest United States. Built sales and marketing program where non had existed before. Helped to assimilate five disjointed businesses into a single working division with resource sharing, cross training, budget management, and team building.

1982 - 1987 ETC

Position National Account Executive

Responsibilities

Developed and managed new business for analytical and data management services. Responsible for marketing to many Fortune 500 chemical, petrochemical, waste, and electronics firms. Efforts included major projects throughout the United States. Worked with clients in regulatory compliance, project design, and data use and interpretation. Developed a client base that was involved in RCRA groundwater monitoring, CERCLA site Remedial Investigation Feasibility Studies, New Jersey ECRA investigations, and Clean Water Act compliance. Involved in one of the first petroleum refinery land treatment demonstrations in the United States. Served as the Chairman of the ETC Technical Product Development Committee.

1980 - 1982 Lawler, Matusky and Skelly Engineers

Position Assistant Project Manager

Responsibilities

Project Manager for environmental monitoring programs related to the electric utility industry. Responsible for proposal writing, program design, management of staff scientists and technicians for projects, budget control, report writing and technical presentations. These projects included water chemistry, fish population studies, lower trophic level monitoring, and mitigation of the impact of power plants on the river environment. Designed and implemented groundwater sampling programs with customized equipment for a major site in New York State.

1978 - 1980 Lawler, Matusky and Skelly Engineers

Position Project Scientist

Responsibilities

Crew Chief for field survey including sampling of biota, water, soil and sludge. Responsible for maintaining field control of samples, including documentation, custody, and proper sampling techniques. Performed laboratory analysis including wet chemistry procedures, fish taxonomy and other biological studies. Responsible for writing Standard Operating Procedures for laboratory operations.

IEA
An Aquarion Company

PROFESSIONAL PROFILE
Jeffrey C. Curran

TITLE: Laboratory Manager

ACADEMIC ACCOMPLISHMENTS:

Southern Connecticut State University - New Haven, Connecticut
B.A. Chemistry, 1975
M.S. Chemistry, 1978

MAJOR AREA OF EXPERTISE:

Quality Control/Quality Assurance
Hazardous Waste Analyses
Classical and Wet Chemistry Analyses
PCB Analysis
Capillary GC/MS Analysis
Industrial Hygiene

Certified Laboratory Director for the States of Connecticut, New York, New Jersey and Massachusetts.

SUMMARY OF EXPERIENCE:

Mr. Curran has extensive experience in analytical chemistry specializing in environmental analysis. He has worked in all areas of the laboratory and has hands-on expertise in general wet chemistry techniques, atomic spectroscopy, gas chromatography, infrared spectroscopy and gas chromatography/mass spectrometry.

PROFESSIONAL EXPERIENCE:

Present

IEA, Inc. - Connecticut

Position Laboratory Manager

Responsibilities

For the past 15 years Mr. Curran has directed and participated in a variety of projects. Some highlights are listed below:

Hazardous Waste Site, East Windsor, CT

At a major Connecticut Hazardous Waste site Mr. Curran participated in the sampling analysis of buried drums of hazardous waste during a state-supervised cleanup project.

Ethylene Oxide Emissions Testing, Sherburn, New York

At a major EtO user in Upstate New York, Mr. Curran directed an on-site testing program for measuring EtO emissions using gas chromatography. Mr. Curran also worked on a testing program in conjunction with the NYSDEC for testing pollutant control equipment for EtO sterilizers.

Canadian Tariff Board Hearings

Mr. Curran provided expert witness testimony at a Canadian Tariff Board Hearing concerning chemical composition of foam packaging material.

Worker Exposure Study, Lynchburg, Virginia

Mr. Curran directed an on-site industrial hygiene study to monitor employee exposure to various solvents and chemicals. Mr. Curran was also part of the team which analyzed the various samples collected using gas chromatography, atomic spectroscopy, and UV-VIS spectroscopy in accordance with NIOSH protocols.

Food Processing Plant, Rochester, New York

Mr. Curran conducted an investigation to determine the cause of stainless steel tubing failures for a national food process company. The results of this study were used in determining alternatives to the current materials used in the process.

Hazardous Breakdown Product Study

Mr. Curran designed a system to identify and measure potentially hazardous breakdown products resulting from the pyrolysis of plastic materials for an international aircraft manufacturer. Results of this study were used to identify what materials were responsible for and how to alleviate the problem.

PROFESSIONAL AFFILIATIONS:

Member of the American Chemical Society

PROFESSIONAL PROFILE
Marsha Culik

TITLE: QA Manager

ACADEMIC ACCOMPLISHMENTS:

S.U.N.Y. at Alfred - Alfred, New York
A.A.S. Medical, 1976
Laboratory Technology

MAJOR AREA OF EXPERTISE:

Extensive development and "hands on" experience with Gas Chromatography, Atomic Absorption Spectrophotometry, Auto Analyzer, and some computer data stations.

SUMMARY OF EXPERIENCE:

Ms. Culik has over 12 years experience in the environmental laboratory field. Experience ranges from analysis of drinking water with a Grade 3 Water Treatment Plant Operator to gas chromatography chemist with environmental samples. Ms. Culik has experience as supervisor of the Gas Chromatography department.

PROFESSIONAL EXPERIENCE:

1/91 to Present

IEA, Inc. - Connecticut

Position QA Manager

Responsibilities

Quality Assurance Manager, responsible for monitoring the continuing compliance with the Corporate QA Program and to be a liaison between Corporate QA and laboratory staff.

Additional responsibilities include maintaining certification programs, coordination of external and internal audits, coordinate all inquiries relative to quality issues and follow-up on corrective actions as necessary, maintain files of all QA related documentation include review and approval of all SOP's.

1986 to 1991

Position GC Group Leader

Responsibilities

Supervisor of GC Group, responsible for analysis of environmental samples for pesticides/PCB's according to EPA/NYSDEC CLP Protocols, SW846 Methods and EPA "600" Series Methods. Additional responsibilities include analysis of samples via purge & trap/GC according to various protocols.

Other duties include analysis of air samples, charcoal absorbent tubes and other miscellaneous samples for any parameters requiring gas chromatography analysis. She is also responsible for supervision of the group including sample tracking, data review, etc.

1984 to 1986

Position Chemist

Responsibilities

Experience in sample prep and GC analyses of Pesticides/PCB's in water, oil and soil samples.

1981 to 1984

Position Laboratory Analyst - American Waterworks Service Company

Responsibilities

Experience performing complete laboratory analysis or raw, potable, and waste water including all miscellaneous include Volatile Organics, Trihalomethanes and Aromatics using Purge and Trap techniques; Pesticides and Herbicides by GLC; Transition and Heavy Metals by Flame and Graphite Furnace Atomic Absorption; and Nutrients by Automated and other various wet chemistry procedures. Assisted Lab Director in the development of many methods used in these analyses. Responsible for collection and interpretation of all quality control data.

1978 to 1981

Position Lab Technician - Suffolk County Water Authority

Responsibilities

Laboratory experience in the analysis of potable water for a large water utility. Cooperative studies done in conjunction with state and local health agencies concerning water and wastewater quality. Also monitoring the chemical quality of water and seawater programs for the U.S.G.S. Primary responsibilities were for the analysis of Halogenated and Aromatic organic compounds by Purge and Trap Gas Chromatography. Other areas of experience include the analyses of nutrients by Technicon Auto Analyzer, metals by Flame and Graphite Furnace Atomic Absorption, and microbiological testing using Millipore System.

1976-1978

Position Lab Technician - Hooker Chemicals & Plastics

Responsibilities

Responsible for the analysis of vinyl chloride monomer in PVC Compounds, Resins and Food Packageability studies utilizing Gas Chromatography. Responsible for monitoring the air quality of the plant environment.

SPECIALIZED TRAINING:

1984 Certified Grade 3 Water Treatment Plant Operator

1977 ASCP Registered MLT

Environmental Laboratory Management
Two day seminar on Environmental Laboratory Management
John H. Taylor, Analytical Technology.

Performance Management Workshop
One day seminar
Cynthia Barnet, Human Resources Consultant

Interview Skills Workshop
One day seminar
Cynthia Barnet, Human Resources Consultant

Leadership Development Workshop
Four day workshop
William Frackler, Ingoldsby, Inc.

Mass Spectral Data Interpretation
One day seminar
Dr. Frank Rutecek, Cornell University

Introduction to Analytical Separations
Four day seminar
Dr. Dhea Habboush, Sacred Heart University

ASQC Course
Auditing of Quality Systems

ASQC Course
Introduction to SPC

PROFESSIONAL PROFILE
Lawrence H. Decker

TITLE: GC/MS Manager

ACADEMIC ACCOMPLISHMENTS:

Franklin Pierce College - Rindge, New Hampshire
B.A. Biology 1982

MAJOR AREA OF EXPERTISE:

Final Data Review
Coordination of sample analysis for the GC/MS group
Organics analysis by GC/MS

SUMMARY OF EXPERIENCE:

Lawrence Decker has eight years of GC/MS experience. He has been responsible for operations of the GC/MS group for five years. Presently functioning as the Volatile Group Leader.

PROFESSIONAL EXPERIENCE:

5/92 to Present

IEA, Inc. - Connecticut

Position GC/MS Manager

Responsibilities

Responsible for the volatile group operations. Duties include: Scheduling workforce, ordering supplies, final data package review, employee reviews, overseeing sample analysis and sample prioritizing, adhering to forecasted budget, dealing with client requests, training employees, updating sample/job status with client service and laboratory directors. Tracking workflow through group.

10/91 to 5/92

Position GC/MS Section Leader

Responsibilities

Responsibilities included: Sample analysis for both semi-volatile and volatile samples, tracking and scheduling sample analysis, troubleshooting instrumentation, final data package preparation and review. Unknown compound determination (TIC's). Assisting Group Leader with selected tasks. Responsible for tracking and prioritizing sample analysis, reviewing both initial sample batches and final reports, troubleshooting instruments and monitoring of GC/MS operations.

4/86 to 9/90

Position GC/MS Operator

Responsibilities

Running samples, calibrating instruments, tracking samples, screening, total solids standard preparation, paperwork. Familiarity with EPA/NYSDEC CLP, SW846 and EPA "6--" Series VOA and BNA methods and routine analysis of aqueous and soil samples for VOA and BOA target and non-target (TIC) compounds. Experience in the data review process which involves monitoring surrogate recoveries, internal standard areas, target compounds concentration ranges and matrix spike/matrix spike duplicate performance parameters.

SPECIALIZED TRAINING:

Mass Spectroscopy Data Interpretation
One day Seminar
Dr. Frank Turecek (Cornell University)

Course description included close examination of mass spectra pertaining to identification of molecular ion, stability structure relationship, characteristic ion group effects, fragmentation and identifiable isotope clusters. Further concepts discussed include the nitrogen rule, the picket fence (alkane) series, and common fragment ions.

RTE-VI Procedures File Workshop
Four day seminar
GC/MS HP Aquarius Software Training
Mark Harwick (HP Instructor)

Course description included detailed examination of GC/MS Hardware, theory and function of mass spectroscopy, data acquisition and interpretation. Course emphasized software manipulation to enhance the overall quality and quantity of accurate and legible data.

Hewlett-Packard User I Course
Five day seminar
Hewlett-Packard, Paramus, New Jersey

Course description included a general overview of the HP computer system, mass spectrometer theory, instrument tuning and utility programs.

Introduction to Analytical Separations

Introduction to Chemical Analysis

Terms associated with chemical analysis; a review of the important considerations in analytical chemistry; sensitivity and detection limit; evaluation of results.

Analytical Separation

Solvent extraction; emulsions, completeness of extraction; extraction of organic compounds; pH effect; extraction with metal chelator.

Chromatography (General Principles)

Chromatographic behavior of solutes; column efficiency and resolution.

Gas Chromatography

Gas chromatograph; gas chromatographic columns; liquid phases and column selection; detectors for gas chromatography; optimization of experimental conditions; interfacing gas chromatography with mass spectrometry.

PROFESSIONAL PROFILE
John Bennett, Jr.

TITLE: GC/MS Semi-Volatiles Supervisor

ACADEMIC ACCOMPLISHMENTS:

Southern Connecticut State University - New Haven, CT
B.S. Biology 1978 (Chemistry Minor)

MAJOR AREA OF EXPERTISE:

Classical Chemistry
Atomic Spectroscopy
Organic Extractions
Gas Chromatography
Microbiology

SUMMARY OF EXPERIENCE:

An extensive background in all phases of laboratory operations. Was responsible for designing, specifying, and hiring staff for a state of the art environmental laboratory. Had day to day responsibility for all phases of operation of the lab. Responsible for writing and conducting performance reviews for staff. Implemented stringent QA/QC program in the lab following USEPA CLP protocols. Had direct responsibility for inorganics section of the laboratory. Functioned as a resource person and problem solver for staff.

Wide ranging experience in the analysis of environmental and hazardous waste samples using EPA, APHA, and ASTM methodologies. Experienced in the analysis of contaminants from stationary sources. Has performed industrial hygiene surveys fore a variety of contaminants, and is familiar with the NIOSH procedures for their analysis. Instrumental expertise is ICP spectroscopy, as well as flame and furnace atomic absorption spectroscopy. In addition, has extensive experience with all basic laboratory apparatus and gas chromatography.

A broad background in microbiology including the identification and enumeration of microorganisms from a wide variety of sources. Familiar with USP and APHA procedures of analysis. Performed studies on the effects of point source contamination of water supplies and has performed characterization of problem microorganisms in sewage treatment plants. Developed a novel procedure for determining the microbial kill effectiveness of ethylene oxide sterilization cycles..

PROFESSIONAL EXPERIENCE:

1988 to Present

IEA, Inc. - Connecticut

Position GC/MS Semi-volatiles Supervisor

Responsibilities

Responsible for daily operations of organics extractions group. Interacted with other departments in the laboratory concerning the status of client samples. Responsible for the supervision of six staff members. Responsible for the quality of work produced by group as well as meeting turnaround goals.

1987 to 1989

Position Laboratory Director - Chemrox, Inc.

Responsibilities

State of Connecticut Certified Laboratory Director for Chemrox Laboratory Services. Had overall responsibility for the operation of the laboratory, as well as the development of the business. Supervised 10 staff members. Interacted with other departments in the company, as well as outside clients on technical aspects of laboratory analyses. Participated in seminars to educate various groups about environmental issues.

1985 to 1987

Position Senior Chemist

Responsibilities

Responsible for ethylene oxide associated analyses. Performed pilot scale testing on a variety of medical devices to determine optimal de-gassing conditions. Aided in the design and construction of a pilot ethylene oxide. Was a member of the AAMI committee that developed reference test methods for ethylene oxide residues in medical services.

1980 to 1985

Position Senior Microbiologist/Associate Chemist - YWC, Inc.

Responsibilities

Responsible for performing non-routine microbiological analyses as well as providing technical guidance to technicians performing routine work. Instituted strict quality control procedures on all reagents, media and organisms. Was responsible for routine and non-routine chemical analyses on environmental samples. Was heavily involved in atomic spectroscopy analysis. Also performed evaluations on consumer products ranging from air cleaners to home water purification units.

1978 to 1980

Position Senior Chemist - Nutmeg Chemical Company

Responsibilities

Promoted to Assistant Director of Laboratory. Supervised staff in absence of Director. Served as liaison between director and staff. Performed non-routine water and oil analysis, quality control companies products as well as routine water, oil and deposit analysis. Also performed microbiological analysis of water samples.

1978 to 1979

Position Laboratory Technician

Responsibilities

Responsibilities included routine water and oil analyses and quality control of products.

SPECIALIZED TRAINING:

Basic Atomic Spectroscopy
Perkin Elmer
Norwalk, Connecticut 1979

ICP Spectroscopy
Spectra Inc.
Pompton Lakes, New Jersey 1988

Graphite Furnace Atomic Absorption Spectroscopy
Spectra Inc.
Pompton Lanes, New Jersey 1988

Interpretation of Low Resolution Mass Spectra
YWC
Whippany, New Jersey 1989

PROFESSIONAL PROFILE
Daniel W. Helfrich

TITLE: Inorganics Manager

ACADEMIC ACCOMPLISHMENTS:

Quinnipiac College
Sacred Heart University
M.S. Chemistry
M.B.A.
B.A. Biology
B.S. Biology, 1985

MAJOR AREA OF EXPERTISE

Four years running ICP on environmental samples.
Two years running Furnace analysis.
Four years sample prep in environmental area.
Three years CLP Data Review.
OSHA trained and certified.
Familiar with EPA & NYSDEC protocols and SW846 Methods relating to inorganic metals analysis.

SUMMARY OF EXPERIENCE:

Mr. Helfrich has over 4 years experience in environmental analysis. He has functioned in numerous analytical roles including: Sample prep, Furnace analysis, ICP analysis and hazardous waste coordinator. Experienced in data review, and familiar with EPA and NYSDEC protocols. OSHA trained and experienced.

PROFESSIONAL EXPERIENCE:

1992 to Present

IEA, Inc. - Connecticut

Position Group Leader

Responsibilities

Manage daily flow of work, set priorities.
Monitor productivity of group.
CLP data review ensuring QA/QC protocols are followed.
Manage the collection and removal of all hazardous waste generated by IEA-CT.

1989 to 1992

Position Senior Chemist - IEA,Inc. CT

Responsibilities

ICP & Furnace Operator, manage flow of work, CLP data review ensuring QA/QC protocols are followed.

1987 to 1989

Position Lab Manager - PGP Industries

Responsibilities

ICP Operator and Health & Safety Manager

1984 to 1987

Position Senior Chemist - Handy & Harmon

Responsibilities

ICP Operator

SPECIALIZED TRAINING:

OSHA Seminar - 40 hour training + 28 hour update

Clean Harbours - Hazardous Waste Seminar

PROFESSIONAL PROFILE
Kimberly A. Maturo

TITLE: GC/Semi-VOA Group Leader

ACADEMIC ACCOMPLISHMENTS:

Southern Connecticut State University - New Haven, Connecticut
B.S. Biology, 1985

SUMMARY OF EXPERIENCE:

Ms. Maturo has over 7 years experience in the environmental field. She started in the organic extractions department as a lab technician and worked her way up to supervisor. From there, she transferred to the Gas Chromatography Department in order to expand her knowledge by learning more about the analysis of environmental samples. She is now Group Leader of the GC Department and is experienced in Pesticide and PCB residue analysis.

PROFESSIONAL EXPERIENCE:

3/91 to Present

IEA, Inc. - Connecticut

Position GC Group Leader

Responsibilities

Supervisor of GC Group, responsible for analysis of environmental samples for pesticides/PCB's according to EPA/NYSDEC CLP Protocols, SW846 Methods and EPA "600" Series Methods. Additional responsibilities include analysis of samples via purge & trap/GC according to various protocols.

Other duties include analysis of air samples, charcoal absorbent tubes and other miscellaneous samples for any parameters requiring gas chromatography analysis. She is also responsible for supervision of the group including sample tracking, data review, etc.

10/88 to 3/91

Position GC- Senior Lab Technician

Responsibilities

Ms. Maturo's primary duties are the operation of the gas chromatographs for a variety of analyses. She has experience in pesticide/PCB determinations as well as other miscellaneous analytes such as alcohols, herbicides and solvents in general.

Ms. Maturo's other duties include computer data entry, sample tracking and monitoring QC samples for the group.

10/85 to 10/87

Position Extractions Group

Responsibilities

Over this time period Ms. Maturo was a member of the extractions group and supervised the operations and staff for the last year. Her duties were primarily extraction of environmental samples for semi-volatile organics, pesticides/PCB's and herbicides. She also was responsible for screening of organic extracts via gas chromatography.

PROFESSIONAL PROFILE
Bruno D'Ostilio

TITLE: Systems Manager - IEA-CT

ACADEMIC ACCOMPLISHMENTS:

Western Connecticut State University - Danbury, CT
Computer Science and Business Program
September 1978 , 1989 - Present

MAJOR AREA OF EXPERTISE:

Various types of computer hardware.
Unix and DOS operating systems.
Networks.
Programming.

SUMMARY OF EXPERIENCE:

Mr. D'Ostilio has over 10 years experience in the computer industry. He has a broad knowledge of computers ranging from mainframes to P.C.'s. He has extensive knowledge of UNIX, XWINDOWS, TCP/IP, DOS and various types of hardware.

PROFESSIONAL EXPERIENCE:

10/92 to Present

IEA, Inc. - Connecticut

Position Systems Manager-IEA-CT

Responsibilities

Systems Manager-IEA-CT responsible for all systems development and maintenance at CT laboratory. Including LIMS, ADAM and instrument systems support. He will also be responsible for the development and implementation of a new LIMS System scheduled for 1994.

Position Systems Manager

Responsibilities

Mr. D'Ostilio was responsible for the reintegration, rescaling, checking standards. Mr. D'Ostilio has over 10 years computer related experience on systems ranging from mainframes to personal computers. He is responsible for all systems hardware and software for our CLP 390 system. This system includes a HP9000 workstation with a UNIX Operating System, Envision application software, Ingres RDMS, XWindows and a network of X Terminals and P.C.'s using Advanlink and TCP/IP. His is also responsible for ensuring diskette deliverables meet the requirements specified by the EPA.

10/86 to 10/92

Position Senior Customer Engineer - Concurrent Computer Corp., Wallingford, CT

Responsibilities

Install, service and maintain Concurrent mini and microcomputers, as well as many other types and manufacturers of disk drives, tape drives, printers, modems, multiplexers, networks and personal computers. Also responsible for the installation, troubleshooting and upgrading of systems software which involves shell and C programming. System software includes UNIX SYSTEM V, XWINDOWS, MOTIF, TCP/IP, LABWORKBENCH, DOS and many other packages.

1984 to 1986

Position Customer Engineer - Memorex Corporation, Darien, CT

Responsibilities

Install, service and maintain magnetic tapes drives, disk drives, display stations and printers within local Connecticut & New York territories.

SPECIALIZED TRAINING:

IBM compatible mainframe peripherals, include:

High performance disk drives, tape drives, Impact & Laser printers.
Concurrent computer corp. mini computer hardware.
UNIX Systems Manager.
UNIX based Workstation Hardware.
Novell networks.
RDMS.

PROFESSIONAL PROFILE
Stephanie N. Plunkett

TITLE: Client Services Manager

ACADEMIC ACCOMPLISHMENTS:

BA - Biology, 1986
Hartwich College, Oneonta, NY
Four year recipient - Hartwick College Merit Scholarship

PROFESSIONAL EXPERIENCE:

1/93 to Present

IEA, Inc. - Connecticut

Position Client Services Manager

Responsibilities

Responsible for client service representatives/project managers functions. Aid in solving client problems and questions. Discuss technical issues and manage clients through sampling programs. Assist Account Executives on sales calls and project kick-off meetings.

7/91 to 9/91

IEA, Inc. - Monroe, CT

Position Inside Sales/Project Manager

Responsibilities

While continuing to perform project management services for an established list of laboratory clients, I also assumed marketing and sales responsibilities. Duties include surveying various trade journals, The Federal Register, etc. identifying regulatory trends and predicting future business opportunities. Follow-up includes determining which industries would most likely be impacted by pending legislation and the development of a marketing strategy. Strategies implemented include telemarketing campaigns, mass mailings, and a seminar series. Also responsible for surveying existing clients periodically to assess IEA's strengths and weaknesses. The results of these surveys are compiled, graphically displayed and distributed to all employees.

10/88 to 3/90 IEA, Inc., Monroe, CT

Client Services/Project Manager

Operational responsibilities in environmental investigations, including scheduling and workload projection, technical supervision, sample tracking, contract compliance, data review, and report preparation and interpretation. Interface with clients on project design, including sampling and analytical program requirements, responsible for coordinating project specific quality control/methodology compliance requirements.

1987/1988 Massachusetts General Hospital
Boston, MA

Technologist

Cardiac Unit/Department of Molecular Research. Utilized knowledge of genetics and biology in the screening of DNA libraries with variously prepared probes, plasmid construction, and single and double stranded Sangar dideoxy chain termination sequencing. Duties also include maintaining laboratory supplies and the training of new personnel.

Related Course Work

Chemistry, Organic Chemistry, Environmental History, Ecology

Date: 03/24/95

APPENDIX, Section 2

IEA CHAIN-OF-CUSTODY FORM

IEA
An Aquarion Company

…onroe …ke
Mo…e, CT …
203-261-4458

…HAI… OF …TO… RE… …RD

…GE ____ OF ____ NO. ____

IEA JOB #:

CLIENT:

PROJECT ID:

IEA PROJECT MGR:

RUSH ☐ YES ☐ NO DUE DATE

TESTS								GENERAL REMARKS
BOTTLE TYPE AND PRESERVATIVE								

…OTTLE …ET #	CLIENT SAMPLE ID	DATE / TIME SAMPLED	MATRIX	LAB ID	QC Y / N	FIELD FILTERED - CIRCLE Y or N								SAMPLE REMARKS
						Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	

MATRIX CODES

A - AIR	S - SOIL
AQ - AQUEOUS	SL - SLUDGE
C - COMPLEX	W - WIPE
D - DRUM WASTE	O - OTHER
OI - OIL	FB - FIELD BLANK
	TB - TRIP BLANK

BOTTLES PREPPED BY DATE / TIME

SIGNATURE

SAMPLES COLLECTED BY DATE / TIME

SIGNATURE

BOTTLES REC'D BY DATE / TIME

SIGNATURE

RECEIVED IN LAB BY DATE / TIME

SIGNATURE

REMARKS ON SAMPLE RECEIPT

☐ BOTTLES INTACT ☐ CUSTODY SEALS
☐ PRESERVED ☐ SEALS INTACT
☐ CHILLED ☐ SEE REMARKS

LABORATORY COPY

APPENDIX, Section 3

IEA NETWORK SAMPLE PRESERVATION AND HOLDING TIME REQUIREMENTS

Metals in Water

Parameter[1]	Technique	Method	Holding Time	Container	Preservation
Aluminum	flame	202.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	202.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7020	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Antimony	flame	204.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	204.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7040	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7041	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Arsenic	furnace	206.2	6 Months	500 ml P,G	HNO3 to pH<2
	AA, hydride	206.3	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	AA, hydride	7061	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7060	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Barium	flame	208.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	208.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7080	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7081	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Beryllium	flame	210.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	210.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7090	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7091	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Boron	colorimetric	212.3	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2

Metals in Water-Continued...

Parameter[3]	Technique	Method	Holding Time	Container	Preservation
Cadmium	flame	213.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	213.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7130	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7131	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Calcium	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	215.1	6 Months	500 ml P,G	HNO3 to pH<2
	titrimetric	215.2	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7140	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Chromium	flame	218.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	218.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7190	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7191	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Chromium Hexavalent	Coprecipitation	7195	24 Hours	500 ml P,G	Cool, 4 C.
	colorimetric	7196	24 Hours	500 ml P,G	Cool, 4 C.
	flame	7197	24 Hours	500 ml P,G	Cool, 4 C.
	DPP	7198	24 Hours	500 ml P,G	Cool, 4 C.
Cobalt	flame	219.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	219.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7200	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7201	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2

Metals in Water-Continued...

Parameter [1]	Technique	Method	Holding Time	Container	Preservation
Copper	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7210	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7211	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Iron	flame	236.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	236.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7380	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7381	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Lead	flame	239.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	239.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7420	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7421	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Magnesium	flame	242.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	239.2	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7450	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7421	6 Months	500 ml P,G	HNO3 to pH<2
Manganese	flame	243.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	243.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7460	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7461	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Mercury	cold vapor-manual	245.1	28 Days	500 ml P,G	HNO3 to pH<2
	cold vapor-automated	245.2	28 Days	500 ml P,G	HNO3 to pH<2
	cold vapor-manual	7470	28 Days	500 ml P,G	HNO3 to pH<2

Metals in Water-Continued...

Parameter [5]	Technique	Method	Holding Time	Container	Preservation
Molybdenum	flame	246.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	246.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7480	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7481	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Nickel	flame	249.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	249.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7520	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7521	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Potassium	flame	258.1	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7610	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Selenium	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	270.2	6 Months	500 ml P,G	HNO3 to pH<2
	AA, hydride	270.3	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7740	6 Months	500 ml P,G	HNO3 to pH<2
	AA, hydride	7741	6 Months	500 ml P,G	HNO3 to pH<2
Silica	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
Silver	flame	272.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	272.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7760	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7761	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2

Metals in Water-Continued...

Parameter [3]	Technique	Method	Holding Time	Container	Preservation
Sodium	flame	273.1	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7770	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Thallium	flame	279.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	279.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7840	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7841	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Tin	flame	282.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	282.2	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7870	6 Months	500 ml P,G	HNO3 to pH<2
Titanium	flame	283.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	283.2	6 Months	500 ml P,G	HNO3 to pH<2
Vanadium	flame	286.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	286.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7910	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7911	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2
Zinc	flame	289.1	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	289.2	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	200.7	6 Months	500 ml P,G	HNO3 to pH<2
	flame	7950	6 Months	500 ml P,G	HNO3 to pH<2
	furnace	7951	6 Months	500 ml P,G	HNO3 to pH<2
	ICP	6010	6 Months	500 ml P,G	HNO3 to pH<2

Wet Chemistries in Water

Parameter [5]	Technique	Method	Holding Time	Container	Preservation
Acidity	titrimetric	305.1	14 Days	100 ml P,G	Cool 4 C.
Alkalinity	titrimetric	310.1	14 Days	100 ml P,G	Cool 4 C.
Biochemical Oxygen Demand (BOD)	5 days, 20 C.	405.1	48 Hours	1000 ml P,G	Cool 4 C.
Bromide	titrimetric	320.1	28 Days	100 ml P,G	none required
Chemical Oxygen Demand (COD)	titrimetric, mid-level	410.1	28 Days	50 ml P,G	Cool 4 C, H2SO4 to pH <2
	titrimetric, low-level	410.2	28 Days	50 ml P,G	Cool 4 C, H2SO4 to pH <2
	titrimetric, high-level	410.3	28 Days	50 ml P,G	Cool 4 C, H2SO4 to pH <2
	automated-colorimetric	410.4	28 Days	50 ml P,G	Cool 4 C, H2SO4 to pH <2
Chloride	colorimetric	325.2	28 Days	50 ml P,G	none required
	colorimetric	9250	28 Days	50 ml P,G	none required
	titrimetric	9252	28 Days	50 ml P,G	none required
	colorimetric	9257	28 Days	50 ml P,G	none required
Cyanide	amenable to chlorine	335.1	14 Days [2]	500 ml P,G	Cool 4 C, NaOH to pH>12 Ascorbic Acid [1]
	spectrophotometric	335.2	14 Days [2]	500 ml P,G	Cool 4 C, NaOH to pH>12 Ascorbic Acid [1]
	Total, UV	335.3	14 Days [2]	500 ml P,G	Cool 4 C, NaOH to pH>12 Ascorbic Acid [1]
	colorimetric	9012	14 Days [2]	500 ml P,G	Cool 4 C, NaOH to pH>12 Ascorbic Acid [1]
Fluoride	distillation	340.1	28 Days	500 ml P,G	none required
	ion selective electrode	340.2	28 Days	500 ml P,G	none required
	colorimetric	340.3	28 Days	500 ml P,G	none required
Hardness, Total	colorimetric	130.1	6 Months	100 ml P,G	HNO3 to pH<2
	titrimetric	130.2	6 Months	100 ml P,G	HNO3 to pH<2
Iodide	titrimetric	345.1	24 Days	100 ml P,G	Cool 4 C.
Methylene Blue Active Substances	colorimetric	425.1	48 Hours	500 ml P,G	Cool 4 C.
Nitrogen Ammonia	colorimetric,phenate	350.1	28 Days	500 ml P,G	Cool 4 C, H2SO4 to pH <2
	distillation	350.2	28 Days	500 ml P,G	Cool 4 C, H2SO4 to pH <2
	ion selective electrode	350.3	28 Days	500 ml P,G	Cool 4 C, H2SO4 to pH <2

Wet Chemistries in Water-Continued...

Parameter[3]	Technique	Method	Holding Time	Container	Preservation
Nitrogen-TKN	colorimetric,phenate	351.1	28 Days	500 ml P,G	Cool 4 C, H2SO4 to pH <2
	block digestor	351.2	28 Days	500 ml P,G	Cool 4 C, H2SO4 to pH <2
	colorimetric	351.3	28 Days	500 ml P,G	Cool 4 C, H2SO4 to pH <2
	ion selective electrode	351.4	28 Days	500 ml P,G	Cool 4 C, H2SO4 to pH <2
Nitrate	colorimetric, brucine	352.1	48 Hours	100 ml P,G	Cool 4 C.
	colorimetric, brucine	9200	48 Hours	100 ml P,G	Cool 4 C.
Nitrate-Nitrite	colorimetric, hydrazine	353.1	28 Days	100 ml P,G	Cool 4 C, H2SO4 to pH <2
	cadmium reduction, auto	353.2	28 Days	100 ml P,G	Cool 4 C, H2SO4 to pH <2
	cadmium reduction, manual	353.3	28 Days	100 ml P,G	Cool 4 C, H2SO4 to pH <2
Nitrite	spectrophotometric	354.1	48 Hours	100 ml P,G	Cool 4 C.
Oil & Grease, Total	gravimetric	413.1	28 Days	1000 ml G only	Cool 4 C, HCL or H2SO4 to pH <2
	IR	413.2	28 Days	1000 ml G only	Cool 4 C, HCL or H2SO4 to pH <2
	gravimetric	9070	28 Days	1000 ml G only	Cool 4 C, HCL or H2SO4 to pH <2
	gravimetric-sludge	9071	28 Days	1000 ml G only	Cool 4 C, HCL or H2SO4 to pH <2
Petroleum Hydrocarbons	IR	418.1	14 Days	1000 ml G only	Cool 4 C, HCL to pH <2
pH	electrode	150.1	in-field	50 ml P,G	not applicable
	electrode	9040	in-field	50 ml P,G	not applicable
	test paper	9041	in-field	50 ml P,G	not applicable
Phenolics, T-Recoverable	spectrophotometric	420.1	28 Days	500 ml G only	Cool 4 C, H2SO4 to pH <2
	colorimetric	420.2	28 Days	500 ml G only	Cool 4 C, H2SO4 to pH <2
	4AAP, Manual, Distillation	9065	28 Days	500 ml G only	Cool 4 C, H2SO4 to pH <2
	4AAP, Auto, Distillation	9066	28 Days	500 ml G only	Cool 4 C, H2SO4 to pH <2
	MBTH, Distillation	9067	28 Days	500 ml G only	Cool 4 C, H2SO4 to pH <2
Phosphorus, Ortho	colorimetric, auto	365.1	48 Hours	50 ml P,G	Filter immediately, Cool 4 C
	colorimetric, single	365.2	48 Hours	50 ml P,G	Filter immediately, Cool 4 C
	colorimetric-dual	365.3	48 Hours	50 ml P,G	Filter immediately, Cool 4 C
	total, auto, block digester	365.4	48 Hours	50 ml P,G	Filter immediately, Cool 4 C

Wet Chemistries in Water-Continued...

Parameter [3]	Technique	Method	Holding Time	Container	Preservation
Phosphorus, Total	colorimetric, auto	365.1	28 Days	50 ml P,G	Cool 4 C, H2SO4 to pH <2
	colorimetric, single	365.2	48 Hours	50 ml P,G	Cool 4 C, H2SO4 to pH <2
	colorimetric-dual	365.3	48 Hours	50 ml P,G	Cool 4 C, H2SO4 to pH <2
	total, auto, block digester	365.4	48 Hours	50 ml P,G	Cool 4 C, H2SO4 to pH <2
Residue (Solids)	filterable (TDS)	160.1	7 Days	100 ml P,G	Cool 4 C.
	non-filterable (TSS)	160.2	7 Days	100 ml P,G	Cool 4 C.
	total (TS)	160.3	7 Days	100 ml P,G	Cool 4 C.
	volatile	160.4	7 Days	100 ml P,G	Cool 4 C.
	settleable	160.5	48 Hours	100 ml P,G	Cool 4 C.
Specific Conductance	meter	120.1	28 Days	100 ml P,G	Cool 4 C.
	meter	9050	28 Days	100 ml P,G	Cool 4 C.
Sulfate	ion chromatography	300.0	28 Days	50 ml P,G	Cool 4 C.
	colorimetric	375.1	28 Days	50 ml P,G	Cool 4 C.
	gravimetric	375.3	28 Days	50 ml P,G	Cool 4 C.
	turbidimetric	375.4	28 Days	50 ml P,G	Cool 4 C.
	colorimetric	9035	28 Days	50 ml P,G	Cool 4 C.
	colorimetric	9036	28 Days	50 ml P,G	Cool 4 C.
	turbidimetric	9038	28 Days	50 ml P,G	Cool 4 C.
Sulfide	titrimetric	376.1	7 Days	500 ml P,G	Cool 4 C, ZnAc/NaOH to pH>9
	colorimetric	376.2	7 Days	500 ml P,G	Cool 4 C, ZnAc/NaOH to pH>9
	colorimetric	9030	7 Days	500 ml P,G	Cool 4 C, ZnAc/NaOH to pH>9
Total Organic Carbon (TOC)	combustion or oxidation	415.1	28 Days	50 ml P,G	Cool 4 C, HCL or H2SO4 to pH <2
	combustion or oxidation	9060	28 Days	50 ml P,G	Cool 4 C, HCL or H2SO4 to pH <2
Total Organic Halides (TOX)	titrimetric	9020	28 Days	1000 ml G only [4] No Headspace	Cool 4 C, H2SO4 to pH <2 [5] Sodium Sulfite
Turbidity	nephelometric	180.1	48 Hours	100 ml P,G	Cool 4 C

Parameters by Gas Chromatography in Water

Parameter [5]	Technique	Method	Holding Time	Container	Preservation
Halogenated Volatile Organics	gas chromatography	601	14 Days	3x40 ml vials	Cool 4 C.,Thiosulfate [6]
	gas chromatography	8010	14 Days	3x40 ml vials	Cool 4 C.,Thiosulfate [6]
Non-Halogenated Volatile Organics	gas chromatography	8015	14 Days	3x40 ml vials	Cool 4 C., HCL to pH<2, Thiosulfate [6]
Purgeable Aromatics	gas chromatography	602	7/14 Days [7]	3x40 ml vials	Cool 4 C., HCL to pH<2, Thiosulfate [6]
	gas chromatography	8020	7/14 Days [7]	3x40 ml vials	Cool 4 C., HCL to pH<2, Thiosulfate [6]
Acrolein & Acrylonitrile	gas chromatography	603	14 Days	3x40 ml vials	Cool 4 C., HCL to pH 5, Thiosulfate [6]
	gas chromatography	8030	14 Days	3x40 ml vials	Cool 4 C., HCL to pH 5, Thiosulfate [6]
Phenols	gas chromatography	604	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	gas chromatography	8040	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
Phthalate Esters	gas chromatography	606	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	gas chromatography	8060	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
Nitrosamines	gas chromatography	607	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
Organochlorine Pesticides and PCB's	gas chromatography	608	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	gas chromatography	8080	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
Polynuclear Aromatic Hydrocarbons (PNA's)	gas chromatography/LC	610	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	gas chromatography	8100	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	HPLC	8310	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]

Parameters by Gas Chromatography in Water-Continued...

Parameter [3]	Technique	Method	Holding Time	Container	Preservation
Haloethers	gas chromatography	611	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
Chlorinated Hydrocarbons	gas chromatography	612	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	gas chromatography	8120	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
Organophosphorus Pesticides	gas chromatography	8140	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
Chlorinated Herbicides	gas chromatography	8150	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]

Parameters by GC/MS in Water

Parameter [3]	Technique	Method	Holding Time	Container	Preservation
Purgeables	GC/MS-624 list	624	7/14 Days [7]	3x40 ml vials	Cool 4 C., HCL to pH<2, Thiosulfate [6]
	Priority Pollutant list	624	7/14 Days [7]	3x40 ml vials	Cool 4 C., HCL to pH<2, Thiosulfate [6]
	Hazardous Substance list	624	7/14 Days [7]	3x40 ml vials	Cool 4 C., HCL to pH<2, Thiosulfate [6]
	Target Compound list (TCL)	624	7/14 Days [7]	3x40 ml vials	Cool 4 C., HCL to pH<2, Thiosulfate [6]
	Appendix IX list	624	7/14 Days [7]	3x40 ml vials	Cool 4 C., HCL to pH<2, Thiosulfate [6]
	Priority Pollutant list	8240	7/14 Days [7]	3x40 ml vials	Cool 4 C., HCL to pH<2, Thiosulfate [6]
	Hazardous Substance list	8240	7/14 Days [7]	3x40 ml vials	Cool 4 C., HCL to pH<2, Thiosulfate [6]
	Target Compound list (TCL)	8240	7/14 Days [7]	3x40 ml vials	Cool 4 C., HCL to pH<2, Thiosulfate [6]
	Appendix IX list	8240	7/14 Days [7]	3x40 ml vials	Cool 4 C., HCL to pH<2, Thiosulfate [6]

Parameters by GC/MS in Water

Parameter [5]	Technique	Method	Holding Time	Container	Preservation
Base-Neutral & Acid Extractables	625 list	625	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	Priority Pollutant list	625	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	Hazardous Substance list	625	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	Target Compound list (TCL)	625	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	Appendix IX list	625	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	Priority Pollutant list	8250	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	Hazardous Substance list	8250	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	Target Compound list (TCL)	8250	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	Appendix IX list	8250	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	Priority Pollutant list	8270	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	Hazardous Substance list	8270	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	Target Compound list (TCL)	8270	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]
	Appendix IX list	8270	ext.-7 Days anal.-40 Days	1 L, Amber G	Cool 4 C.,Thiosulfate [6]

Metals in Soil

Parameter [3]	Technique	Method	Holding Time	Container	Preservation
Aluminum	flame	7020	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Antimony	flame	7040	6 Months	100 g P,G	Cool 4 C.
	furnace	7041	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Arsenic	ICP	6010	6 Months	100 g P,G	Cool 4 C.
	furnace	7060	6 Months	100 g P,G	Cool 4 C.
	AA, hydride	7061	6 Months	100 g P,G	Cool 4 C.
Barium	flame	7080	6 Months	100 g P,G	Cool 4 C.
	furnace	7081	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Beryllium	flame	7090	6 Months	100 g P,G	Cool 4 C.
	furnace	7091	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Boron	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Cadmium	flame	7130	6 Months	100 g P,G	Cool 4 C.
	furnace	7131	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Calcium	flame	7140	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Chromium	flame	7190	6 Months	100 g P,G	Cool 4 C.
	furnace	7191	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.

Metals in Soil-Continued...					
Parameter [3]	Technique	Method	Holding Time	Container	Preservation
Cobalt	flame	7200	6 Months	100 g P,G	Cool 4 C.
	furnace	7201	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Copper	flame	7210	6 Months	100 g P,G	Cool 4 C.
	furnace	7211	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Iron	flame	7380	6 Months	100 g P,G	Cool 4 C.
	furnace	7381	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Lead	flame	7420	6 Months	100 g P,G	Cool 4 C.
	furnace	7421	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Magnesium	flame	7450	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Manganese	flame	7460	6 Months	100 g P,G	Cool 4 C.
	furnace	7461	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Mercury	cold vapor-manual	7470	28 Days	100 g P,G	Cool 4 C.
	cold vapor-manual	7471	28 Days	100 g P,G	Cool 4 C.
Molybdenum	flame	7480	6 Months	100 g P,G	Cool 4 C.
	furnace	7481	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Nickel	flame	7520	6 Months	100 g P,G	Cool 4 C.
	furnace	7521	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Potassium	flame	7610	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Selenium	ICP	6010	6 Months	100 g P,G	Cool 4 C.
	furnace	7740	6 Months	100 g P,G	Cool 4 C.
	AA, hydride	7741	6 Months	100 g P,G	Cool 4 C.

Metals in Soil-Continued...

Parameter [3]	Technique	Method	Holding Time	Container	Preservation
Silver	flame	7760	6 Months	100 g P,G	Cool 4 C.
	furnace	7761	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Sodium	flame	7770	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Thallium	flame	7840	6 Months	100 g P,G	Cool 4 C.
	furnace	7841	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Tin	flame	7870	6 Months	100 g P,G	Cool 4 C.
Vanadium	flame	7910	6 Months	100 g P,G	Cool 4 C.
	furnace	7911	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.
Zinc	flame	7950	6 Months	100 g P,G	Cool 4 C.
	furnace	7951	6 Months	100 g P,G	Cool 4 C.
	ICP	6010	6 Months	100 g P,G	Cool 4 C.

Wet Chemistries in Soil

Parameter [3]	Technique	Method	Holding Time	Container	Preservation
Cyanide	spectrophotometric	9010	14 Days	100 g P,G	Cool 4 C.
	colorimetric	9012	14 Days	100 g P,G	Cool 4 C.
Sulfate	colorimetric	9035	28 Days	100 g P,G	Cool 4 C.
	colorimetric	9036	28 Days	100 g P,G	Cool 4 C.
	turbidimetric	9038	28 Days	100 g P,G	Cool 4 C.
Sulfide	colorimetric	9030	-	100 g P,G	Cool 4 C

Parameters by Gas Chromatography in Soil

Parameter [3]	Technique	Method	Holding Time	Container	Preservation
Halogenated Volatile Organics	gas chromatography	8010	14 Days	3x40 ml vials[8]	Cool 4 C.
Non-Halogenated Volatile Organics	gas chromatography	8015	14 Days	3x40 ml vials[8]	Cool 4 C.
Purgeable Aromatics	gas chromatography	8020	14 Days	3x40 ml vials[8]	Cool 4 C.
Acrolein & Acrylonitrile	gas chromatography	8030	14 Days	3x40 ml vials[8]	Cool 4 C.
Phenols	gas chromatography	8040	ext.-14 Days anal.-40 Days	100 g ,G	Cool 4 C.
Phthalate Esters	gas chromatography	8060	ext.-14 Days anal.-40 Days	100 g ,G	Cool 4 C.
Nitrosamines	gas chromatography	8070	ext.-14 Days anal.-40 Days	100 g ,G	Cool 4 C.
Organochlorine Pesticides and PCB's	gas chromatography	8080	ext.-14 Days anal.-40 Days	100 g ,G	Cool 4 C.
Polynuclear Aromatic Hydrocarbons (PNA's)	gas chromatography	8100	ext.-14 Days anal.-40 Days	100 g ,G	Cool 4 C.
	HPLC	8310	ext.-14 Days anal.-40 Days	100 g ,G	Cool 4 C.
Chlorinated Hydrocarbons	gas chromatography	8120	ext.-14 Days anal.-40 Days	100 g ,G	Cool 4 C.
Organophosphorus Pesticides	gas chromatography	8140	ext.-14 Days anal.-40 Days	100 g ,G	Cool 4 C.
Chlorinated Herbicides	gas chromatography	8150	ext.-14 Days anal.-40 Days	100 g ,G	Cool 4 C.

Parameters by GC/MS in Soil

Parameter [3]	Technique	Method	Holding Time	Container	Preservation
Volatile organics	packed column	8240	14 Days	3x40 ml vials[8]	Cool 4 C.
	capillary column	8260	14 Days	3x40 ml vials[8]	Cool 4 C.
Base-Neutral & Acid Extractables	semi-vol packed	8250	ext.-14 Days anal.-40 Days	100 g ,G	Cool 4 C.
	semi-vol capillary	8270	ext.-14 Days anal.-40 Days	100 g ,G	Cool 4 C.

Footnotes

[1] If residual chlorine is present in the sample, 0.6 g of ascorbic acid is utilized. Ascorbic acid is only used if residual chlorine is present.

[2] Maximum holding time is 24 hours when sulfide is present. Optionally, all samples may be tested with lead acetate paper before pH adjustments 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.

[3] The following information is based upon EPA requirements as outlined in Table II, Part 136, Title 40 of the Code of Federal Regulations, July 1991. This reference should be consulted if further clarification is desired. Various state agencies have differing requirements for both holding times and preservation from those listed above. In such cases, the local requirements supercede the EPA information.

[4] All samples should be collected in bottles with teflon septa and be protected from light. If this is not possible, use 250 ml bottles fitted with teflon lined caps. Samples should contain no headspace.

[5] If samples contain residual chlorine, it must be removed in the field by adding sulfite to the sample bottle (5 mg sodium sulfite crystals per liter of sample).

[6] If samples contain residual chlorine, 0.008% sodium thiosulfate must be added at the time of sampling and should only be used if residual chlorine is present.

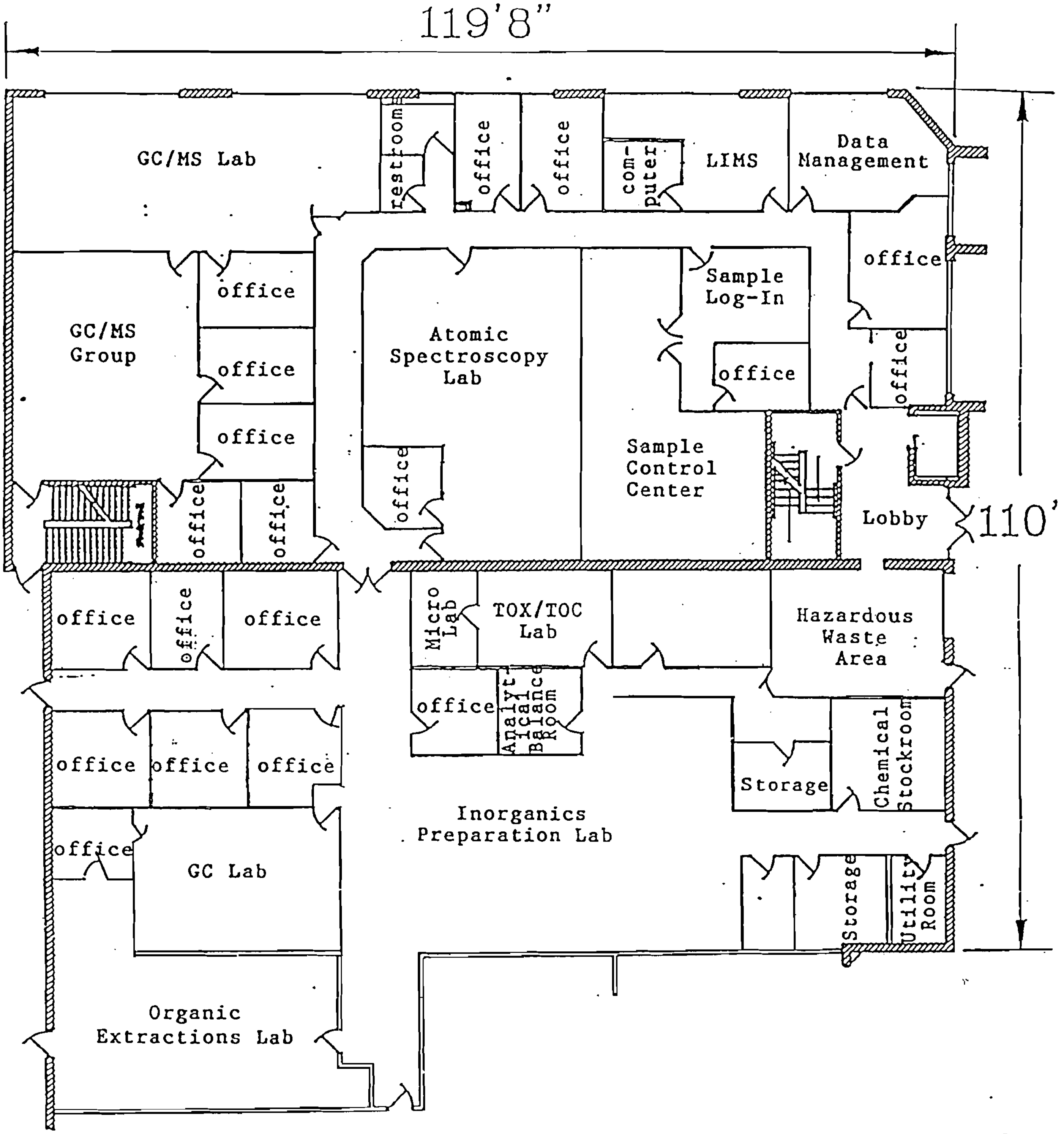
[7] If samples do not receive pH adjustment, the holding time is 7 days. With pH adjustment, the holding time is 14 days.

[8] Alternatively, wide mouth glass jars designed for volatile samples may be utilized with teflon lined caps.

APPENDIX, Section 4

LABORATORY FLOOR PLAN

Fig. 3.0



IEA, INC.-CONNECTICUT
200 MONROE TURNPIKE MONROE, CONNECTICUT 06468
FLOOR PLAN 5/91

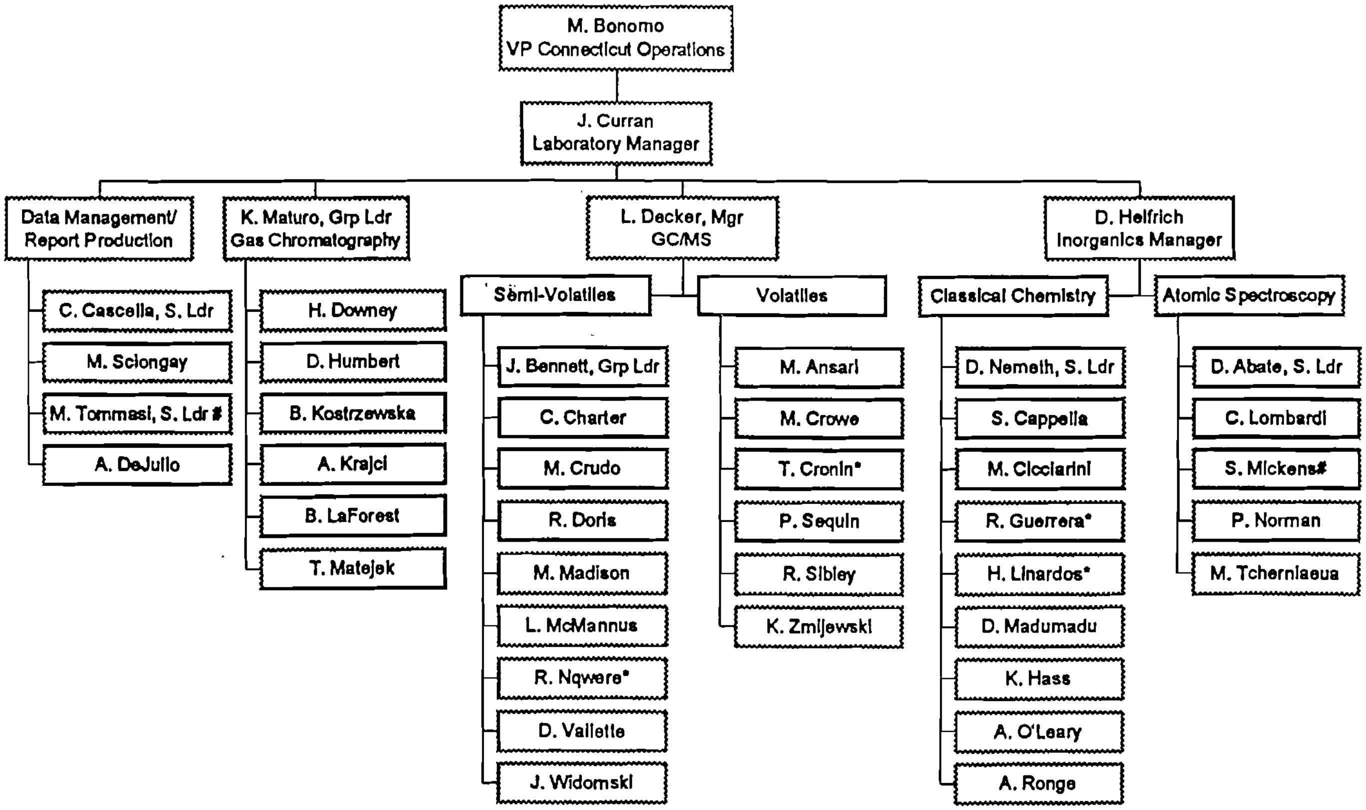
Date: 03/24/95

APPENDIX, Section 5

ORGANIZATIONAL CHART

IEA, Inc. - CT
An Aquarion Company

Doc #QAC00104.CT
Date: 01/23/96

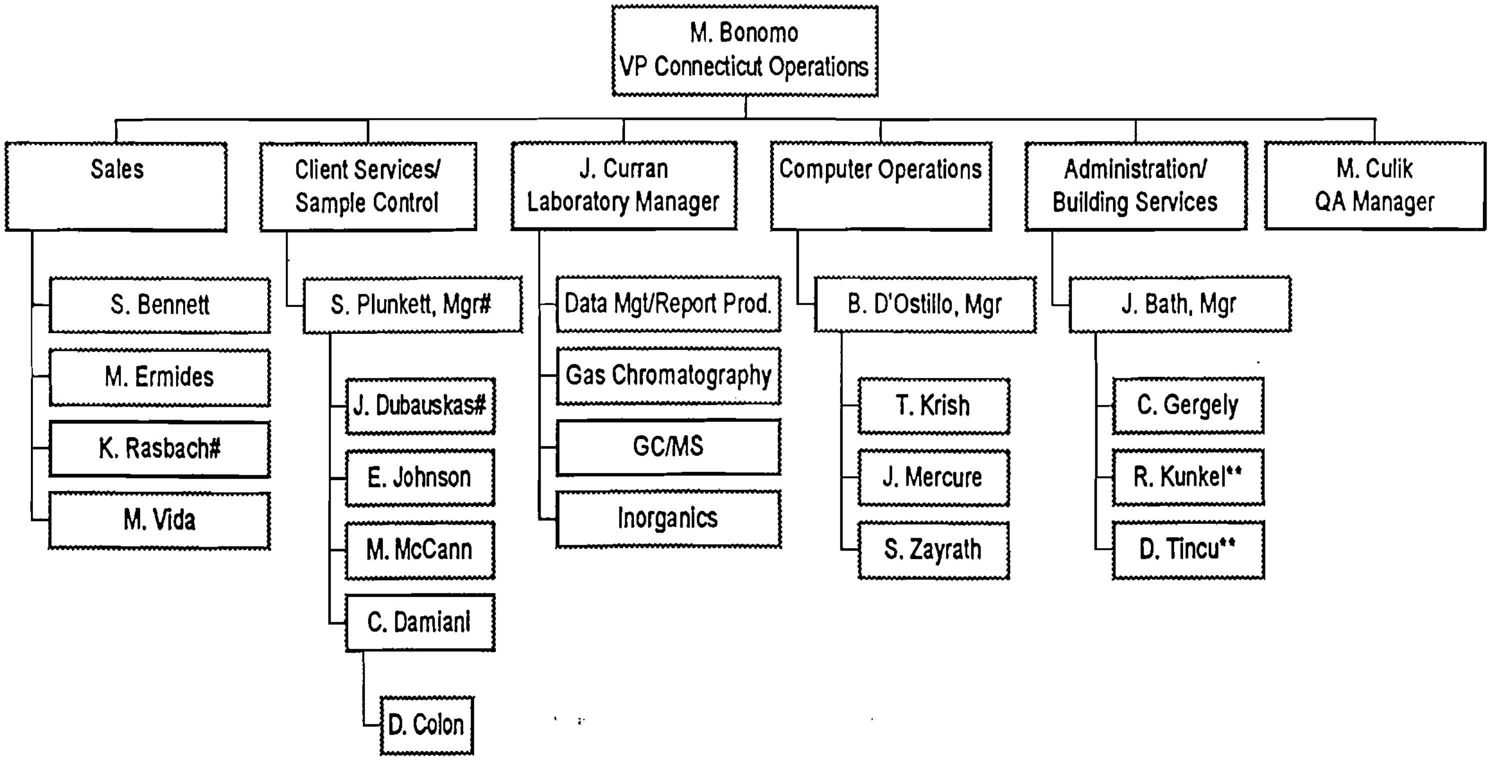


*Part Time/Temp
**25% charged to AMS
#30 hour work week

IEA, Inc. - CT

An Aquarion Company

Doc #QAC00104.CT
Date: 01/23/96



*Part Time/Temp
**25% charged to AMS
#30 hour work week

Date: 03/24/95

APPENDIX, Section 6

CORRECTIVE ACTION FORM

IEA
An Aquarion Company

CORRECTIVE ACTION FORM

A. Originator Information

Client Inquiry____

Client:______________________
Date/time:______________________
Client/Lab Contact: ______________
Job/Case:______________________
Sample Number(s):______________
Date/Time Response Due:__________

Detailed Description of Potential Problem:______________________________________

B. Quality Assurance Information

Corrective Action ID# __________

Recommended Corrective Action:______________________________________

Groups Involved:

__Sample Control
__Gas Chromatography
__Client Service
__ Wet Chemistry
__ Mass Spectrometry
__ Sample Preparation
__ Metals
__ Report Generation

C. Final Resolution

Describe What Happened and Long Term Corrective Action Taken:______________________________

Supervisor Signature: __________ Date______ Date/Time Client Notified:__________

D. Quality Assurance Final Approval (QA Manager use only)

Corrective Action Approved: __________
Date Finalized: __________
Was a problem identified? Yes / No

Date: 03/24/95

APPENDIX, Section 7

EXAMPLE LISTING OF LABORATORY STANDARD OPERATING PROCEDURES (SOPs)

SAMPLE CONTROL

Standard Operating Procedure	Code	Date Generated
SOP for Bottle Order Preparation	SMS00100.CT	02/15/95
SOP for Sample Processing and Sample Arrival	SMS00402.CT	05/15/92
SOP for Log-in of CLP Samples	SMS00502.CT	05/15/92
SOP for Storing Water and Soil Samples	SMS00602.CT	05/12/92
SOP for Generating Labels/Labeling Containers	SMS00700.CT	05/15/92
SOP for Documenting Sample Removal from Laboratory	SMS00802.CT	05/15/92
SOP for Securing the Laboratory and Samples	SMS00903.CT	05/15/92
SOP for Temperature Control Requirements	SMS01001.CT	05/15/92
SOP for Compositing Samples	SMS01100.CT	06/16/94
SOP for Sample Receipt (NJDEPE)	SMS01200.CT	01/24/95
SOP for Operating and Maintaining Fume Hoods	SFS00202.CT	05/15/92
SOP for Hazardous Waste Disposal	SFS00100.CT	05/06/92
SOP for Emergency Procedures	SFS00300.CT	06/21/94
SOP for Hazardous Waste Minimization Plan	SFS00500.CT	07/25/94
SOP for Tracking and Collection of Mixed Waste	RAS00100.CT	02/06/94
SOP for Radioactivity Swpie Tests	RAS00200.CT	08/17/94
SOP for Radiation Screening	RAS00300.CT	08/15/94
SOP for Management/Disposal of Mixed Waste	RAS00400.CT	08/24/94

DATA MANAGEMENT/HANDLING

Standard Operating Procedure	Code	Date Generated
SOP for Preparation/ Review of Laboratory Reports	RPS00300.CT	02/16/94
SOP for Documentation Policy/Procedures	DM:090191:2	09/01/91
SOP for Data Reduction, Mgt, and Handling - CLP	RPS00200.CT	05/05/92
SOP for Sample Tracking	QAS00200.CT	01/13/92
SOP for Data validation/Self Inspection - CLP	QAS00100.CT	05/06/92
SOP for Data Validation/Self Inspection - OLM02.1	QAS00600.CT	01/17/94
SOP for Data Validation	QAS00700.CT	dft

EXTRACTIONS

Standard Operating Procedure	Code	Date Generated
SOP for CLP Aqueous BNA Preparation	SPS00303.CT	08/20/91
SOP for CLP Aqueous Pesticide/PCB Preparation	SPS00403.CT	08/19/91
SOP for CLP Soil BNA Preparation	SPS00102.CT	08/23/91
SOP for CLP Soil Pesticide/PCB Preparation	SPS00202.CT	08/26/91
SOP for CLP Extractions Standard Prep	SPS00702.CT	05/07/92
SOP for CLP BNA extract Screening	SPS00803.CT	05/12/92
SOP for CLP GPC BNA Extracts	SPS00502.CT	08/29/91
SOP for CLP GPC Pesticide/PCB Extracts	SPS00602.CT	04/02/92
SOP for Cleaning Glassware	SPS00901.CT	05/13/92
SOP for Hydrocarbon Sample Prep	SPS01000.CT	dft
SOP for Aqueous Herbicides Method 509B	SPS01100.CT	dft
SOP for Prepararion of Chlorinated Herbicides - 8150	SPS02800.CT	dft
SOP for Aqueous BNA Methods 3510/3520	SPS01300.CT	09/10/93
SOP for Aqueous Pest/PCB Methods 3510/3520	SPS01200.CT	09/15/93
SOP for Soil BNA Method 3550	SPS01400.CT	12/10/93
SOP for Soil Pest/PCB Method 3550	SPS01600.CT	01/21/94
SOP for Aqueous OP Pesticides Methods 3510/3520	SPS01700.CT	06/15/94
SOP for SW846 GPC of BNA extracts	SPS01800.CT	12/17/94
SOP for GPC of Pesticide/PCB extracts method 3640	SPS01900.CT	03/04/94
SOP for Soil OP Pesticides Method 3550	SPS02700.CT	03/07/94
SOP for Waste dilution - BNA	SPS03000.CT	03/08/94
SOP for Waste dilution - Pesticides/PCB	SPS03100.CT	03/04/94
SOP for Pesticide/PCB extraction method 608	SPS03200.CT	08/24/94
SOPs for extractions CLP OLM02.1	SPS02000.CT- SPS02600.CT	dft
SOP for Extraction Standard Prep	SPS01500.CT	dft

EXTRACTIONS - cont.

Standard Operating Procedure	Code	Date Generated
SOP for Prep Soil/Sediment samples for CLP P/P OLM03.1	SPS03300.CT	11/11/94
SOP for GPC of Pesticide extracts OLM03.1	SPS03400.CT	11/11/94
SOP for Prep Soil/Sed samples for CLP BNA's OLM03.1	SPS03500.CT	11/11/94
SOP for GPC of Semivolatile extracts OLM03.1	SPS03600.CT	11/11/94
SOP for Prep of Aqueous samples for CLP BNA's OLM03.1	SPS03700.CT	11/11/94
SOP for Prep of Aqueous samples for CLP P/P OLM03.1	SPS03800.CT	11/11/94
SOP for Prep of Low Level PCB Analysis 3510A	SPS03900.CT	11/29/94
SOP for Alumina Column C/U Method 3611A	SPS02900.CT	Dft
SOP for Prep Aqueous SV OLC10/92	SPS04000.CT	Dft
SOP for Prep of Semivolatiles in Tissue samples	SPS04200.CT	10/21/95
SOP for Prep of Pesticides/PCBs in Tissue samples	SPS04300.CT	10/21/95

GC/MS

Standard Operating Procedures	Code	Date Generated
SOP for CLP Volatiles (GC/MS)	MSS00601.CT	09/04/91
SOP for Semi-volatile CLP OLM01.8	MSS01001.CT	09/10/91
SOP for Volatile Std Prep CLP	MSS00100.CT	05/05/92
SOP for Semi-volatile Std Prep CLP	MSS00200.CT	05/05/92
SOP for Cleaning AS vials	MSS01200.CT	02/15/93
SOP for Analysis of BNA Method 8270A	MSS00700.CT	05/23/94
SOP for Analysis of Volatiles Method 8240A	MSS00400.CT	04/30/93
SOP for Volatile Standard Prep	MSV:120588:1	12/05/88
SOP for BNA standard Prep	MSSV:112686:2	11/26/86
SOP for GC/MS Semi-volatiles CLP OLM02.1	MSS00800.CT	01/14/94
SOP for GC/MS Volatiles CLP OLM02.1	MSS00900.CT	01/14/94
SOP for Volatile Std Prep CLP OLM02.1	MSS01300.CT	01/14/94
SOP for Semi-volatile Std Prep CLP OLM02.1	MSS01400.CT	01/14/94
SOP for GC/MS Volatiles in Air	MSS00300.CT	dft
SOP for GC/MS Volatile in Air - Summa Canister	MSS01100.CT	dft
SOP for GC/MS Volatile 524.2 Rev. 3	MSS01500.CT	dft
SOP for GC/MS Semivolatiles OLM03.1	MSS01600.CT	11/12/94
SOP for GC/MS Semivolatile Standard Prep OLM03.1	MSS01700.CT	11/12/94
SOP for GC/MS Volatiles OLM03.1	MSS01800.CT	11/12/94
SOP for GC/MS Volatile Standard Prep OLM03.1	MSS01900.CT	11/12/94
SOP for GC/MS Analysis Method 625	MSS02000.CT	07/13/94
SOP for GC/MS Analysis Method 624	MSS02100.CT	02/27/95
SOP for GC/MS Semivolatile OLC10/92	MSS02200.CT	Dft

GAS CHROMATOGRAPHY

Standard Operating Procedures	Code	Date Generated
SOP for GC CLP OLM01.8	GCS00200.CT	09/11/91
SOP for Standard Prep CLP- Pesticides	GCS00100.CT	05/05/92
SOP for Sulfur Removal	GCS00300.CT	04/30/93
SOP for Pest/PCB Method 8080A	GCS00600.CT	02/15/94
SOP for Analysis of OP Pesticides Method 8141	GCS00500.CT	02/28/94
SOP for HP3350A LAS System	GCS00400.CT	06/08/93
SOP for Misc. Volatiles Method 8015 (DAI)	GCS00700.CT	02/14/94
SOP for Herbicide analysis Method 8150	GCS00800.CT	02/14/94
SOP for Analysis of Hydrocarbon Fingerprinting	GCS01300.CT	08/02/94
SOP for GC/ECD Pesticides/PCB CLP OLM02.1	GCS00900.CT	01/14/94
SOP for Pesticide/PCB Standard Prep OLM02.1	GCS01000.CT	01/14/94
SOP for Pesticides/PCB Method 608	GCS01100.CT	02/15/94
SOP for Sulfur Removal - CLP OLM01.8	GCS01200.CT	06/10/94
SOP for GC/ECD Pesticides/PCB analysis OLM03.1	GCS01400.CT	11/11/94
SOP for Pesticide/PCB Standard Prep OLM03.1	GCS01500.CT	11/11/94
SOP for Low Level Pesticide/PCB analysis - 8080	GCS01600.CT	11/29/94

METALS

Standard Operating Procedures	Code	Date Generated
SOP for SW846 Method 3005	MES00800.CT	04/21/93
SOP for SW846 Method 3010	MES00900.CT	04/21/93
SOP for SW846 Method 3020A	MES00701.CT	04/21/93
SOP for SW846 Method 3050	MES01001.CT	04/21/93
SOP for CLP SOW Digestion (S)	MES01100.CT	04/21/93
SOP for CLP SOW Digestion (W)	MES01200.CT	04/21/93
SOP for Method 200.7 with TJA 61 Operation	MES00600.CT	04/16/93
SOP for GFAAS 200 series methods	MES00501.CT	04/16/93
SOP for Tracking Metals and Cyanide Samples	IN:050189:1	05/01/89
SOP for Standards Preparations	AS:092988:1	09/29/88
SOP for Determination of Mercury in Water ILM03.0	MES01300.CT	06/10/94
SOP for Determination of Mercury in Soils ILM03.0	MES01400.CT	06/10/94
SOP for Determination of Mercury in Water - 7470	MES01500.CT	09/12/94
SOP for Determination of Mercury in Soils - 7471	MES01600.CT	09/12/94
SOP for Method 6010A with TJA 61	MES00400.CT	09/12/94
SOP for GFAAS SW846 series methods	MES00300.CT	09/12/94
SOP for Microwave Digestion Method 3015 (W)	MES01700.CT	04/20/95
SOP for Microwave Digestion Method 3051 (S)	MES01800.CT	04/20/95
SOP for Digestion of AS/SE (GFAA)	MES01900.CT	10/02/95

COMPUTER SYSTEMS

Standard Operating Procedures	Code	Date Generated
SOP for PCB EPA CLP Forms and Disk File	SYS00100.CT	05/25/89
SOP for LIMS Data Entry	SYS00201.CT	02/23/89
SOP for LIMS Data Entry Errors	SYS00301.CT	05/12/92
SOP for LIMS Data Base Security and Backup	SYS00400.CT	08/24/91
SOP for Testing, Modifying and Implementing Changes to Existing Computer Systems	SYS00502.CT	08/25/91
SOP for System Maintenance Operations and Response Time	SYS00600.CT	08/26/91
SOP for Lotus Diskette Deliverable	SYS00700.CT	02/25/92
SOP for Volatile Data Filter Program	SSY00800.CT	03/25/92
SOP for Metals Data Filter Program	SYS00900.CT	03/26/92
SOP for Classical Chemistry Results Program	SYS01000.CT	03/24/92
SOP for LIMS to PC File Transfer	SYS01100.CT	03/27/92
SOP for Classical Chemistry Completion Date Entry Program	SYS01200.CT	03/31/92
SOP for Hamilton Standard Diskette Deliverable	SYS01300.CT	04/01/92
SOP for Envision Software - Organic Deliverables	SYS01400.CT	03/27/92
SOP for Acres Diskette Deliverable	SYS01501.CT	12/01/92
SOP for Control Charts	SYS01600.CT	dft
SOP for CH2MHILL Diskette Deliverable	SYS01701.CT	02/23/93
SOP for AAS File Filter Program	SYS01800.CT	dft

QUALITY ASSURANCE

Standard Operating Procedures	Code	Date Generated
SOP for Document Control	QAS00301.CT	05/08/92
SOP for Corrective Action Reports	QAS00501.CT	07/08/91
SOP for Internal Quality Assurance	QAS00400.CT	07/18/92

SALES/MARKETING

Standard Operating Procedures	Code	Date Generated
SOP for Taking Client Orders	MKS00100.CT	02/21/94
SOP for LIMS Log-in	MKS00200.CT	02/21/94
SOP for Preparation for Price Quotations	MKS00300.CT	02/14/94
SOP for Telephone Logs	MKS00400.CT	06/22/94

CLASSICAL CHEMISTRY

Standard Operating Procedures	Code	Date Generated
Analysis of Tannins and Ligins in Environmental Samples	WC:042091:0	04/20/91
Analysis of Acidity (Method 305.2)	WC:033191:0	03/31/91
Analysis of Acidity (Method 305.1)	CVS00800.CT	03/24/94
Bromide (Method 405)	WC040791:0	04/07/91
Analysis of Hydrocarbons (418.1)	WC:041891:0	04/18/91
Analysis of Oil & Grease (Gravimetric)- 413.1	CVS01000.CT	03/29/94
Analysis of Salinity in Water	WC:070891:0	07/08/91
Analysis of Temperature in Water	WC:070591:0	07/05/91
Analysis of Grain Size	WC:071591:0	07/15/91
Measurement of Conductivity	WC:082190:0	08/21/90
Analysis of Dissolved Oxygen in Water	WC:071691:0	07/16/91
Analysis of Phosphorus in Water	WC:053191:0	05/31/91
Analysis of Alkalinity in Water - 310.1	CVS00700.CT	02/22/94
Analysis of Ammonia (method 350.1) in Water	WC:070791:0	07/07/92
Analysis of MBAS in Water	CVS00600.CT	03/31/94
Measurement of pH	CVS00900.CT	03/31/94
Analysis of Sulfide (9030)	CVS01700.CT	Dft
Analysis of Biochemical Oxygen Demand	CVS00500.CT	02/22/94
Analysis of COD (Method 410.4)	CVS01201.CT	08/17/94
Analysis of Hexavalent Chromium in cromite ore samples	WC:911205:0	12/05/91
Analysis of Samples for Total Cyanide CLP Protocol	CVS01100.CT	07/01/87
Analysis of Fluroide in Water (Method 340.2)	WC:051590.0	05/15/90
Total Organic Halides Analysis in Water Samples	WC:051490:0	05/14/90
Analysis of Total Organic Carbon in Water	WC:021390:1	02/13/90

CLASSICAL CHEMISTRY (cont.)

Standard Operating Procedures	Code	Date Generated
Analysis of Hexavalent Chromium Colorimetric	WC:090192:0	09/01/92
Analysis of Hexavalent Chromium Alkaline digestion of Soil Samples	WC:083192:0	08/31/92
Analysis of TOC Soil Samples	WC:102692:0	10/26/92
Analysis of TKN in Environmental Samples	WC:081090:0	08/10/90
Analysis of Hardness in Water	WC:081390:1	08/13/90
Analysis of Chloride (325.2) in Water	WC:081190:2	08/11/90
Analysis of Chloride (325.3) in Water	WC:040991:0	04/09/91
Analysis of Ammonia-Nitrogen in Environmental Samples	WC:021690:0	02/16/90
Standard Operating Procedure for Reactivity	CVS01900.CT	09/29/94
Standard Operating Procedure for Corrosivity	WC:011069:0	01/10/69
Standard Operating Procedure for Ignitability	WC:011889:0	01/18/89
Manual Spectrophotometric Method for Hexavalent Chromium	WC:110889:4	11/08/89
Analysis of Total Suspended Solids in Water	CVS00200.CT	08/21/93
Analysis of Sulfate in Water (Method 375.3)	CVS01300.CT	03/04/89
Analysis of Sulfate in Water (Method 375.4)	CVS01400.CT	Dft
EPTOX Leachate Procedure in Environmental Samples	WC:081090:0	08/10/90
Analysis of Total Dissolved Solids in Water	CVS00100.CT	08/16/93
Analysis of Nitrate and Nitrite for Water Samples (Method 353.2)	CVS02500.CT	05/03/90
Gravimetric Determination of Lube Oils in Solids	WC:062889:0	06/28/89
Total Recoverable Phenols Automated 4-AAP Method	WC:111389:0	11/13/89
Analysis of Environmental Samples for T- Phenols	WC:080186:1	08/01/86
Analysis of Samples for Chloride (SM407A)	WC:031189:0	03/11/89
Analysis of Environmental Samples for Formaldehyde	WC:072489:0	07/24/89
SOP for Total Cyanide - Method 335.4	CVS02000.CT	10/04/94
SOP for Amenable Cyanide - Method 335.1	CVS02100.CT	10/04/94
SOP for Toxicity Characteristic Leaching Procedure - 1311	CVS01500.CT	09/28/94

CLASSICAL CHEMISTRY (cont.)

Standard Operating Procedures	Code	Date Generated
Measurement of Turbidity in Water Samples	WC:082190:0	08/21/90
Shake Extraction of Solids for Wet Chemistry Analysis	WC:041391:0	04/13/91
COD (410.1)	WC:082290:1	08/22/90
SOP for WC Data Reporting/Validation	CVS00400.CT	08/29/93
SOP for Total Solids	CVS00300.CT	08/21/93
SOP for Flashpoint - Method 1010	CVS01600.CT	09/28/94
SOP for Waste Extraction Test (WET) Procedure	CVS01800.CT	09/28/94
SOP for Cation/Anion Balance	CVS02800.CT	3/20/95
SOP for CEC Method 9081	CVS02900.CT	3/20/95
SOP for Soil Homogenization	CVS03000.CT	3/20/95

APPENDIX, Section 8

LISTING OF ANALYTICAL METHODS AND ASSOCIATED DETECTION LIMITS

COMPONENT	LCS/QC CHECK % RECOVERY	MATRIX SPIKE % RECOVERY LIMIT	RELATIVE % DIFFERENCE (RPD)	MDL ug/L	PQL ug/L
Method 8080 Organochlorine Pesticides in Water					
alpha-BHC	37-134	-	-	.005	0.05
beta-BHC	17-147	-	-	.017	0.05
delta-BHC	19-140	-	-	.004	0.05
gamma-BHC (Lindane)	32-127	56-123	20	.004	0.05
Heptachlor	34-111	40-131	20	.012	0.05
Aldrin	42-122	40-120	20	.008	0.05
Heptachlor epoxide	37-142	-	-	.005	0.05
Endosulfan I	45-153	-	-	.005	0.05
Dieldrin	36-146	52-126	20	.006	0.1
4,4'-DDE	30-145	-	-	.008	0.1
Endrin	30-147	56-121	20	.005	0.1
Endosulfan II	D-202	-	-	.015	0.1
4,4' DDD	31-141	-	-	.010	0.1
Endosulfan sulfate	26-144	-	-	.022	0.1
4,4'-DDT	25-160	38-127	20	.011	0.1
Methoxychlor	50 - 168	-	-	.019	0.5
Toxaphene	-	-	-	2.0	0.5
Aroclor 1016	-	-	-	.008	1.0
Aroclor 1221	-	-	-	.014	2.0
Aroclor 1232	-	-	-	.031	1.0
Aroclor 1242	33-128	-	-	.029	1.0
Aroclor 1248	-	-	-	.022	1.0
Aroclor 1254	-	-	-	.060	1.0
Aroclor 1260	41-116	15-175	20	.025	1.0
Chlordane (technical)	-	-	-	.0.158	0.2
Endrin aldehyde	44-154	-	-	.010	0.1
Endrin ketone	30-150	-	-	.006	0.1
Method 8150 Chlorinated Herbicides in Water					
2,4-D	50-176	10-200	20	0.173	0.50
Silvex (2,4,5-TP)	10-134	10-197	20	0.015	0.50
2,4,5-T	10-146	-	-	0.018	0.50

COMPONENT	LCS/QC CHECK % RECOVERY	MATRIX SPIKE % RECOVERY LIMIT	RELATIVE % DIFFERENCE (RPD)	MDL ug/Kg	PQL ug/Kg
Method 8080 Organochlorine Pesticides in Soil					
alpha-BHC	37-134	-	-	0.195	1.7
beta-BHC	17-147	-	-	0.396	1.7
delta-BHC	19-140	-	-	0.094	1.7
gamma-BHC (Lindane)	32-127	46-127	20	0.196	1.7
Heptachlor	34-111	35-130	20	0.466	1.7
Aldrin	42-122	40-120	20	0.146	1.7
Heptachlor epoxide	37-142	-	-	0.142	1.7
Endosulfan I	45-153	-	-	0.270	1.7
Dieldrin	36-146	31-134	20	0.176	3.3
4,4'-DDE	30-145	-	-	0.188	3.3
Endrin	30-147	42-139	20	0.205	3.3
Endosulfan II	D-202	-	-	2.03	3.3
4,4' DDD	31-141	-	-	2.30	3.3
Endosulfan sulfate	26-144	-	-	0.224	3.3
4,4'-DDT	25-160	23-134	20	1.580	3.3
Methoxychlor	50 - 168	-	-	0.511	17
Toxaphene	-	-	-	3.86	17
Aroclor 1016	-	-	-	1.28	33
Aroclor 1221	-	-	-	3.69	67
Aroclor 1232	-	-	-	2.54	33
Aroclor 1242	33-128	-	-	1.19	33
Aroclor 1248	-	-	-	4.79	33
Aroclor 1254	-	-	-	2.62	33
Aroclor 1260	41-116	10-175	20	1.05	33
Chlordane (technical)	-	-	-	ns	6.7
Endrin aldehyde	44-154	-	-	0.81	3.3
Endrin ketone	30-150	-	-	0.247	3.3
Method 8150 Chlorinated Herbicides in Soil					
2,4-D	50-176	10-200	20	9.25	20
Silvex (2,4,5-TP)	10-134	10-197	20	13.0	20
2,4,5-T	10-146	-	-	1.11	5.0

Metals

COMPONENT	SAMPLE MATRIX	ANALYTICAL METHOD	PRECISION %RSD	ACCURACY % RECOVERY	UNITS	PQL
Aluminum	Water	200.7	0-20	90-110	ug/l	200
	Water	6010	0-20	90-110	ug/L	200
	Soil	6010	0-20	90-110	mg/Kg	40
Antimony	Water	200.7	0-20	90-110	ug/L	60
	Water	6010	0-20	90-110	ug/L	60
	Soil	6010	0-20	90-110	mg/Kg	12
	Water	204.2	0-20	80-120	ug/L	
	Soil	7412	0-20	80-120	mg/Kg	
Arsenic	Water	200.7	0-20	90-110	ug/L	10
	Water	6010	0-20	90-110	ug/L	10
	Water	206.2	0-20	80-120	ug/L	10
	Water	7060	0-20	80-120	ug/L	10
	Soil	7060	0-20	80-120	mg/Kg	2.0
	Soil	6010	0-20	90-110	mg/Kg	2.0
Barium	Water	200.7	0-20	90-110	ug/l	200
	Water	6010	0-20	90-110	ug/L	200
	Soil	6010	0-20	90-110	mg/Kg	40
Beryllium	Water	200.7	0-20	90-110	ug/l	5.0
	Water	6010	0-20	90-110	ug/L	5.0
	Soil	6010	0-20	90-110	mg/Kg	1.0
Cadmium	Water	200.7	0-20	90-110	ug/l	5.0
	Water	6010	0-20	90-110	ug/L	5.0
	Soil	6010	0-20	90-110	mg/Kg	1.0
Calcium	Water	200.7	0-20	90-110	ug/l	5000
	Water	6010	0-20	90-110	ug/L	5000
	Soil	6010	0-20	90-110	mg/Kg	1000
Cobalt	Water	200.7	0-20	90-110	ug/l	50
	Water	6010	0-20	90-110	ug/L	50
	Soil	6010	0-20	90-110	mg/Kg	10
Chromium	Water	200.7	0-20	90-110	ug/l	10
	Water	6010	0-20	90-110	ug/L	10
	Soil	6010	0-20	90-110	mg/Kg	2.0

Metals

COMPONENT	SAMPLE MATRIX	ANALYTICAL METHOD	PRECISION %RSD	ACCURACY % RECOVERY	UNITS	PQL
Copper	Water	200.7	0-20	90-110	ug/l	25
	Water	6010	0-20	90-110	ug/L	25
	Soil	6010	0-20	90-110	mg/Kg	5.0
Iron	Water	200.7	0-20	90-110	ug/l	100
	Water	6010	0-20	90-110	ug/L	100
	Soil	6010	0-20	90-110	mg/Kg	20
Lead	Water	200.7	0-20	90-110	ug/L	3.0
	Water	239.2	0-20	80-120	ug/L	3.0
	Water	7421	0-20	80-120	ug/l	3.0
	Water	6010	0-20	90-110	ug/L	3.0
	Soil	6010	0-20	90-110	mg/Kg	0.6
	Soil	7421	0-20	90-110	mg/Kg	0.6
Magnesium	Water	200.7	0-20	90-110	ug/l	5000
	Water	6010	0-20	90-110	ug/L	5000
	Soil	6010	0-20	90-110	mg/Kg	1000
Manganese	Water	200.7	0-20	90-110	ug/L	15
	Water	6010	0-20	90-110	ug/L	15
	Soil	6010	0-20	90-110	mg/Kg	3.0
Molybdenum	Water	200.7	0-20	90-110	ug/l	20
	Water	6010	0-20	90-110	ug/L	20
	Soil	6010	0-20	90-110	mg/Kg	4.0
Mercury	Water	245.1	0-20	80-120	ug/L	0.2
	Water	7470	0-20	80-120	ug/L	0.2
	Soil	7471	0-20	80-102	mg/Kg	0.1
Nickel	Water	200.7	0-20	90-110	ug/L	40
	Water	6010	0-20	90-110	ug/L	40
	Soil	6010	0-20	90-110	mg/Kg	8.0
Potassium	Water	200.7	0-20	90-110	ug/L	5000
	Water	6010	0-20	90-110	ug/L	5000
	Soil	6010	0-20	90-110	mg/Kg	1000
Selenium	Water	200.7	0-20	90-110	ug/L	5.0
	Water	270.2	0-20	80-120	ug/L	5.0
	Water	6010	0-20	90-110	ug/L	5.0

Metals

COMPONENT	SAMPLE MATRIX	ANALYTICAL METHOD	PRECISION %RSD	ACCURACY % RECOVERY	UNITS	PQL
	Water	7740	0-20	80-120	ug/L	5.0
	Soil	7740	0-20	80-120	mg/Kg	1.0
	Soil	6010	0-20	90-110	mg/Kg	1.0
Silver	Water	200.7	0-20	90-110	ug/L	10
	Water	6010	0-20	90-110	ug/L	10
	Soil	6010	0-20	90-110	mg/Kg	2.0
Sodium	Water	200.7	0-20	90-110	ug/L	5000
	Water	6010	0-20	90-110	ug/L	5000
	Soil	6010	0-20	90-110	mg/Kg	1000
Thallium	Water	200.7	0-20	90-110	ug/L	10
	Water	6010	0-20	90-110	ug/L	10
	Water	279.2	0-20	80-120	ug/L	10
	Water	7841	0-20	80-120	ug/L	10
	Soil	7841	0-20	80-120	mg/Kg	2.0
	Soil	6010	0-20	90-110	mg/Kg	2.0
Tin	Water	200.7	0-20	90-110	ug/L	50
	Water	6010	0-20	90-110	ug/L	50
	Soil	6010	0-20	90-110	mg/Kg	10
Titanium	Water	200.7	0-20	90-110	ug/L	20
	Water	6010	0-20	90-110	ug/L	20
	Soil	6010	0-20	90-110	mg/Kg	4.0
Zinc	Water	200.7	0-20	90-110	ug/L	20
	Water	6010	0-20	90-110	ug/L	20
	Soil	6010	0-20	90-110	mg/Kg	4.0
Vanadium	Water	200.7	0-20	90-110	ug/L	50
	Water	6010	0-20	90-110	ug/L	50
	Soil	6010	0-20	90-110	mg/Kg	10

(1) Acceptance limits are those indicated in the published method data.

Wet Chemistry

COMPONENT	SAMPLE MATRIX	ANALYTICAL METHOD	PRECISION %RSD	ACCURACY % RECOVERY	UNITS	PQL
Acidity	Water	305.1	0-20	NA	mg/L	1.0
Alkalinity	Water	310.1	0-20	NA	mg/L	2.0
Ammonia-N	Water	350.3	0-20	75-125	mg/L	0.04
Bicarbonate	Water	406C	0-20	NA	mg/L	1.0
Biochemical Oxygen Demand (BOD)	Water	405.1	0-20	75-125	mg/L	2.0
Bromide	Water	320.1	0-20	75-125	mg/L	2.0
Bromide	Water	405	0-20	75-125	mg/L	0.50
Chloride	Water	325.2	0-20	75-125	mg/L	3.0
Chlorine Demand	Water	3-364	0-20	NA	mg/L	1.0
Chlorine Residual	Water	330.4	0-20	NA	mg/L	0.1
Chemical Oxygen Demand (COD)	Water	410.4	0-20	75-125	mg/L	10.0
Color	Water	110.2	0-20	NA	Pt-Co	5.0
Conducitivity	Water	120.1	0-20	NA	umho/cm	NA
Chromium (VI)	Water	7196	0-20	75-125	mg/L	0.01
Cyanide-Total	Water	335.4	0-20	75-125	ug/L	10.0
Cyanide-Total	Water	9012	0-20	75-125	ug/L	10.0
Cyanide-Amenable	Water	335.1	0-20	75-125	ug/L	10.0
Cyanide-CLP	Water	ILM04	0-20	75-125	ug/L	10.0
Dissolved Oxygen	Water	360.1	0-20	NA	mg/L	0.1
Flashpoint	Water	1010	0-20	75-125	-	-
Fluoride	Water	340.2	0-20	75-125	mg/L	0.10
Grain Size	Water	D442-63	0-20	NA	-	-
Hardness	Water	130.2	0-20	75-125	mg/L	1.0
Hydrocarbons (Grav.)	Water	503E	0-20	75-125	mg/L	1.0
Hrdrocarbons (IR)	Water	418.1	0-20	75-125	mg/L	1.0
MBAS	Water	425.1	0-20	75-125	mg/L	0.04
Nitrate-Nitrite-N	Water	353.2	0-20	75-125	mg/L	0.10
Nitrate-N	Water	353.2	0-20	75-125	mg/L	0.005
Odor	Water	140.1	0-20	NA	NA	-
Oil & Grease (Grav.)	Water	413.1	0-20	75-125	mg/L	1.0
Oil &Grease (IR)	Water	413.2	0-20	75-125	mg/L	1.0

Wet Chemistry

COMPONENT	SAMPLE MATRIX	ANALYTICAL METHOD	PRECISION %RSD	ACCURACY % RECOVERY	UNITS	PQL
Paint Filter Test	Water	9095	0-20	75-125	NA	-
pH	Water	150.1	0-20	NA	NA	-
pH	Water	9040	0-20	NA	NA	-
Phenols	Water	420.2	0-20	75-125	mg/L	0.005
Phenols	Water	9066	0-20	75-125	mg/L	0.005
Phosphorus	Water	365.2	0-20	75-125	mg/L	0.10
Phosphate (Ortho)	Water	365.2	0-20	75-125	mg/L	0.10
Settable solids	Water	160.5	0-20	NA	mL/L	1.0
Silica	Water	370.1	0-20	75-125	mg/L	1.0
Specific Gravity	Water	3-61	0-20	75-125	NA	-
Sulfate	Water	375.3	0-20	75-125	mg/L	10.0
Sulfate	Water	375.4	0-20	75-125	mg/L	10.0
Sulfide	Water	376.1	0-20	75-125	mg/L	1.0
Sulfide	Water	9030	0-20	75-125	mg/L	1.0
Sulfite	Water	377.1	0-20	-	mg/L	1.0
Sludge Volume Index	Water	213C	0-20	-	ml/mg	1.0
Total Kjeldahl Nirogen	Water	351.2	0-20	75-125	mg/L	1.0
Total Kjeldahl Nitrogen	Water	351.1	0-20	75-125	mg/L	1.0
Total Soilds	Water	160.3	0-20	N/A	mg/L	1.0
Total Dissolved Solids	Water	160.1	0-20	N/A	mg/L	5.0
Total Suspended Solids	Water	160.2	0-20	N/A	mg/L	5.0
Total Volatile Solids	Water	160.4	0-20	N/A	mg/L	1.0
Total Organic Carbon	Water	415.2	0-20	75-125	mg/L	0.5
Total Organic Halides	Water	9020	0-20	75-125	ug/L	10.0
Turbidity	Water	180.1	0-20	-	NTU	0.10
Cyanide	Soil	ILM04	0-20	75-125	mg/Kg	0.5
Total Organic Carbon	Soil	9060M	0-20	75-125	mg/Kg	100
Corrosivity Char.	Soil	9045	-	-	-	-
Ignitability Char.	Soil	BRT	-	-	-	-
TCLP	W/S	1311	-	-	-	-
SPLP	W/S	1312	-	-		

* Acceptance limits are those indicated in the published method data.

Date: 03/24/95

COMPONENT	ACCURACY % RECOVERY	MATRIX SPIKE % RECOVERY	MDL ug/L	PQL ug/L
Method 608 Organochlorine Pesticides in Water				
alpha-BHC	37-134	26-126	.005	.005
beta-BHC	17-147	54-140	.017	.017
delta-BHC	19-140	3-113	.004	.004
gamma-BHC (Lindane)	32-127	47-123	.004	.004
Heptachlor	34-111	26-119	.012	.012
Aldrin	42-122	53-104	.008	.008
Heptachlor epoxide	37-142	59-125	.005	.005
Endosulfan I	45-153	69-138	.005	.005
Dieldrin	36-146	50-136	.006	.006
4,4'-DDE	30-145	73-104	.008	.008
Endrin	30-147	52-154	.005	.005
Endosulfan II	D-202	18-124	.015	.015
4,4' DDD	31-141	10-163	.010	.010
Endosulfan sulfate	26-144	59-152	.022	.022
4,4'-DDT	25-160	51-140	.011	.011
Methoxychlor	62-181	62-181	.019	.019
Toxaphene	41-126	-	2.0	2.0
Aroclor 1016	50-114	-	.008	.008
Aroclor 1221	15-178	-	.014	.014
Aroclor 1232	10-215	-	.031	.031
Aroclor 1242	39-150	-	.029	.029
Aroclor 1248	38-158	-	.022	.022
Aroclor 1254	29-131	-	.060	.060
Aroclor 1260	8-127	-	.025	.025
Chlordane (technical)	45-119	-	0.158	0.158
Endrin aldehyde	30-164	30-164	.010	.010
Endrin ketone	30-150	30-150	.006	.006

GC/MS Volatile Organics

Method 8240 Purgeables in Soil

	QC CHECK/LCS % RECOVERY LIMIT	MATRIX SPIKE % RECOVERY LIMIT	RELATIVE % DIFFERENCE (RPD) LIMIT	MDL (ug/Kg)	PQL (ug/Kg)
Acetone	14-187	-	-	4.3	10
Benzene	70-145	66-142	21	0.5	5
Bromodichloromethane	70-125	-	-	0.4	5
Bromoform	45-169	-	-	1.0	5
Bromomethane	13-145	-	-	2.9	10
2-Butanone	D-251	-	-	3.5	10
Carbon disulfide	D-475	-	-	1.0	5
Carbon tetrachloride	70-140	-	-	0.6	5
Chlorobenzene	90-135	60-133	21	0.8	5
Dibromochloromethane	70-130	-	-	0.4	5
Chloroethane	14-230	-	-	1.6	10
2-Chloroethylvinyl ether	D-305	-	-	0.9	10
Chloroform	80-135	-	-	1.0	5
Chloromethane	D-273	-	-	2.1	10
1,1-Dichloroethane	75-135	59-172	22	0.8	5
1,2-Dichloroethane	65-135	-	-	1.0	5
1,1-Dichloroethene	70-125	-	-	1.4	5
1,2-Dichloroethene (total)	68-132	-	-	1.4	5
1,2-Dichloropropane	75-145	-	-	0.7	5
cis-1,3-Dichloropropene	70-113	-	-	0.5	5
trans-1,3-Dichloropropene	70-113	-	-	0.8	5
Ethylbenzene	75-130	-	-	0.6	5
2-Hexanone	28-170	-	-	1.4	10
Methylene chloride	50-160	-	-	4.1	5
4-Methyl-2-pentanone	60-170	-	-	1.0	10
Styrene	80-120	-	-	0.7	5
1,1,2,2-Tetrachloroethane	65-130	-	-	0.8	5
Tetrachloroethene	64-148	-	-	1.1	5
Toluene	31-130	50-139	21	0.9	5
1,1,1-Trichloroethane	80-120	-	-	0.6	5

GC/MS Volatile Organics					
	QC CHECK/LCS % RECOVERY LIMIT	MATRIX SPIKE % RECOVERY LIMIT	RELATIVE % DIFFERENCE (RPD) LIMIT	MDL (ug/Kg)	PQL (ug/Kg)
1,1,2-Trichloroethane	85-130	-	-	1.0	5
Trichloroethene	70-135	62-137	24	1.0	5
Vinyl acetate	8-118	-	-	1.3	10
Vinyl chloride	1-240	-	-	1.1	10
Xylenes (total)	55-172	-	-	2.6	5

GC/MS Extractable Organics

Method 8270 Extractables in Water

	QC CHECK/LCS % RECOVERY LIMIT	MATRIX SPIKE % RECOVERY LIMIT	RELATIVE % DIFFERENCE (RPD) LIMIT	MDL (ug/l)	PQL (ug/l)
Acenaphthene	47-145	46-118	31	2.5	10
Acenaphthylene	33-145	-	-	2.3	10
Anthracene	27-133	-	-	1.6	10
Benzoic acid	D-473	-	-	ns	50
Benzo(a)anthracene	33-143	-	-	1.7	10
Benzo(b)fluoranthene	24-139	-	-	1.6	10
Benzo(k)fluoranthene	11-162	-	-	3.3	10
Benzo(g,h,i)perylene	D-219	-	-	6.4	10
Benzo(a)pyrene	17-163	-	-	1.8	10
Benzyl alcohol	D-130	-	-	1.5	10
bis(2-Chloroethoxy)methane	33-184	-	-	2.9	10
bis(2-Chloroethyl)ether	12-138	-	-	1.7	10
bis(2-Chloroisopropyl)ether	36-166	-	-	5.4	10
bis(2-Ethylhexyl)phthalate	8-138	-	-	2.9	10
4-Bromophenyl phenyl ether	53-127	-	-	1.1	10
Benzyl butyl phthalate	D-132	-	-	2.1	10
4-Chloroaniline	1-78	-	-	3.2	10
2-Chloronaphthalene	60-118	-	-	2.4	10
4-Chloro-3-methylphenol	44-294	23-97	42	1.6	10
2-Chlorophenol	46-268	27-123	40	0.8	10
4-Chlorophenyl phenyl ether	25-138	-	-	2.5	10
Chrysene	17-168	-	-	2.5	10
Dibenzo(a,h)anthracene	D-227	-	-	4.1	10
Dibenzofuran	D-170	-	-	2.4	10
Di-n-butylphthalate	1-118	-	-	1.9	10
1,3-Dichlorobenzene	D-172	-	-	1.9	10
1,4-Dichlorobenzene	20-124	36-97	28	2.4	10
1,2-Dichlorobenzene	32-129	-	-	2.3	10
3,3'-Dichlorobenzidine	D-52	-	-	2.8	10
2,4-Dichlorophenol	78-270	-	-	2.1	10
Diethyl phthalate	D-114	-	-	2.1	10

GC/MS Extractable Organics

	QC CHECK/LCS % RECOVERY LIMIT	MATRIX SPIKE % RECOVERY LIMIT	RELATIVE % DIFFERENCE (RPD) LIMIT	MDL (ug/l)	PQL (ug/l)
2,4-Dimethylphenol	64-238	-	-	1.3	10
Dimethyl phthalate	D-112	-	-	1.8	10
4,6-Dinitro-2-methylphenol	D-362	-	-	2.3	25
2,4-Dinitrophenol	D-382	-	-	1.7	25
2,4-Dinitrotoluene	39-139	24-96	38	2.2	10
2,6-Dinitrotoluene	50-138	-	-	2.8	10?
Di-n-octylphthalate	4-146	-	-	1.0	10
Fluoranthene	26-137	-	-	1.4	10
Fluorene	59-121	-	-	3.0	10
Hexachlorobenzene	D-132	-	-	0.8	10
Hexachlorobutadiene	24-116	-	-	3.0	10
Hexachlorocyclopentadiene	D-59	-	-	1.1	10
Hexachloroethane	40-113	-	-	1.5	10
Indeno(1,2,3-cd)pyrene	D-171	-	-	5.4	10
Isophorone	21-196	-	-	2.6	10
2-Methylnaphthalene	D-127	-	-	2.7	10
2-Methylphenol (o-cresol)	40-189	-	-	1.4	10
4-Methylphenol (p-cresol)	28-198	-	-	7.3	10
Naphthalene	21-133	-	-	2.6	10
2-Nitroaniline	D-127	-	-	2.0	25
3-Nitroaniline	D-91	-	-	20.6	25
4-Nitroaniline	D-108	-	-	2.5	20
Nitrobenzene	35-180	-	-	2.5	10
2-Nitrophenol	58-364	-	-	1.5	10
4-Nitrophenol	D-264	10-80	50	0.6	25
N-Nitroso-di-n-propylamine	D-230	41-116	38	3.3	10
N-Nitrosodiphenylamine	D-114	-	-	1.2	10
Pentachlorophenol	28-352	9-103	50	22.6	25
Phenanthrene	54-120	-	-	1.4	10
Phenol	10-224	12-110	42	0.9	10
Pyrene	52-113	26-127	31	2.4	10
1,2,4-Trichlorobenzene	44-142	39-98	28	2.7	10

GC/MS Extractable Organics					
	QC CHECK/LCS % RECOVERY LIMIT	MATRIX SPIKE % RECOVERY LIMIT	RELATIVE % DIFFERENCE (RPD) LIMIT	MDL (ug/l)	PQL (ug/l)
2,4,5-Trichlorophenol	82-354	-	-	1.4	25
2,4,6-Trichlorophenol	74-288	-	-	1.4	25

GC/MS Extractable Organics

	QC CHECK/LCS % RECOVERY LIMIT	MATRIX SPIKE % RECOVERY LIMIT	RELATIVE % DIFFERENCE (RPD) LIMIT	MDL (ug/Kg)	PQL (ug/Kg)
Method 8270 Extractables in Soil					
Acenaphthene	47-145	31-137	19	12.6	330
Acenaphthylene	33-145	-	-	12.8	330
Anthracene	27-133	-	-	13.0	330
Benzoic acid	D-473	-	-	100	1600
Benzo(a)anthracene	33-143	-	-	14.6	330
Benzo(b)fluoranthene	24-139	-	-	23.0	330
Benzo(k)fluoranthene	11-162	-	-	16.5	330
Benzo(g,h,i)perylene	D-219	-	-	17.8	330
Benzo(a)pyrene	17-163	-	-	16.2	330
Benzyl alcohol	D-130	-	-	13.4	330
bis(2-Chloroethoxy)methane	33-184	-	-	11.7	330
bis(2-Chloroethyl)ether	12-138	-	-	17.0	330
bis(2-Chloroisopropyl)ether	36-166	-	-	15.2	330
bis(2-Ethylhexyl)phthalate	8-138	-	-	20.8	330
4-Bromophenyl phenyl ether	53-127	-	-	12.9	330
Benzyl butyl phthalate	D-132	-	-	11.4	330
4-Chloroaniline	1-78	-	-	47.8	330
2-Chloronaphthalene	60-118	-	-	14.3	330
4-Chloro-3-methylphenol	44-294	26-103	33	14.5	330
2-Chlorophenol	46-268	25-102	50	12.0	330
4-Chlorophenyl phenyl ether	25-138	-	-	14.6	330
Chrysene	17-168	-	-	15.1	330
Dibenzo(a,h)anthracene	D-227	-	-	18.5	330
Dibenzofuran	D-170	-	-	16.7	330
Di-n-butylphthalate	1-118	-	-	16.8	330
1,3-Dichlorobenzene	D-172	-	-	14.0	330
1,4-Dichlorobenzene	20-124	28-104	27	16.7	330
1,2-Dichlorobenzene	32-129	-	-	13.4	330
3,3'-Dichlorobenzidine	D-52	-	-	10.4	660
2,4-Dichlorophenol	78-270	-	-	10.2	330
Diethyl phthalate	D-114	-	-	17.1	330

GC/MS Volatile Organics					
	LFB % RECOVERY LIMIT	LAB MATRIX SPIKE % RECOVERY LIMIT	RELATIVE % DIFFERENCE (RPD) LIMIT	MDL (ug/l)	PQL (ug/l)
Method 524.2 Low Level Purgeables in Water					
Benzene	80-120	80-120	13	0.31	1.0
Bromobenzene	80-120	80-120	13	0.34	1.0
Bromochloromethane	80-120	80-120	13	0.43	1.0
Bromodichloromethane	80-120	80-120	13	0.40	1.0
Bromoform	80-120	80-120	13	0.43	1.0
Bromomethane	80-120	80-120	13	0.27	1.0
n-Butylbenzene	80-120	80-120	13	0.33	1.0
sec-Butylbenzene	80-120	80-120	13	0.30	1.0
tert-Butylbenzene	80-120	80-120	13	0.28	1.0
Carbon tetrachloride	80-120	80-120	13	0.28	1.0
Chlorobenzene	80-120	80-120	13	0.32	1.0
Chloroethane	80-120	80-120	13	0.28	1.0
Chloroform	80-120	80-120	13	0.48	1.0
Chloromethane	80-120	80-120	13	0.37	1.0
2-Chlorotoluene	80-120	80-120	13	0.33	1.0
4-Chlorotoluene	80-120	80-120	13	0.34	1.0
Dibromochloromethane	80-120	80-120	13	0.45	1.0
1,2-Dibromo-3-chloropropane	80-120	80-120	13	0.46	1.0
1,2-Dibromoethane	80-120	80-120	13	0.46	1.0
Dibromomethane	80-120	80-120	13	0.43	1.0
1,2-Dichlorobenzene	80-120	80-120	13	0.36	1.0
1,3-Dichlorobenzene	80-120	80-120	13	0.35	1.0
1,4-Dichlorobenzene	80-120	80-120	13	0.37	1.0
Dichlorodifluoromethane	80-120	80-120	13	0.29	1.0
1,1-Dichloroethane	80-120	80-120	13	0.33	1.0
1,2-Dichloroethane	80-120	80-120	13	0.42	1.0
1,1-Dichloroethene	80-120	80-120	13	0.31	1.0
cis-1,2-Dichloroethene	80-120	80-120	13	0.33	1.0
trans-1,2-Dichloroethene	80-120	80-120	13	0.31	1.0

GC/MS Volatile Organics

	LFB % RECOVERY LIMIT	LAB MATRIX SPIKE % RECOVERY LIMIT	RELATIVE % DIFFERENCE (RPD) LIMIT	MDL (ug/l)	PQL (ug/l)
1,2-Dichloropropane	80-120	80-120	13	0.38	1.0
1,3-Dichloropropane	80-120	80-120	13	0.48	1.0
2,2-Dichloropropane	80-120	80-120	13	0.27	1.0
1,1-Dichloropropene	80-120	80-120	13	0.32	1.0
Ethylbenzene	80-120	80-120	13	0.30	1.0
Hexachlorobutadiene	80-120	80-120	13	0.47	1.0
Isopropylbenzene	80-120	80-120	13	0.28	1.0
p-Isopropyltoluene	80-120	80-120	13	0.29	1.0
Methylene chloride	80-120	80-120	13	0.38	1.0
Naphthalene	80-120	80-120	13	0.50	1.0
n-Propylbenzene	80-120	80-120	13	0.28	1.0
Styrene	80-120	80-120	13	0.31	1.0
1,1,1,2-Tetrachloroethane	80-120	80-120	13	0.36	1.0
1,1,2,2-Tetrachloroethane	80-120	80-120	13	0.40	1.0
Tetrachloroethene	80-120	80-120	13	0.29	1.0
Toluene	80-120	80-120	13	0.30	1.0
1,2,3-Trichlorobenzene	80-120	80-120	13	0.38	1.0
1,2,4-Trichlorobenzene	80-120	80-120	13	0.50	1.0
1,1,1-Trichloroethane	80-120	80-120	13	0.34	1.0
1,1,2-Trichloroethane	80-120	80-120	13	0.45	1.0
Trichloroethene	80-120	80-120	13	0.38	1.0
Trichlorofluoromethane	80-120	80-120	13	0.31	1.0
1,2,3-Trichloropropane	80-120	80-120	13	0.38	1.0
1,2,4-Trimethylbenzene	80-120	80-120	13	0.31	1.0
1,3,5-Trimethylbenzene	80-120	80-120	13	0.30	1.0
Vinyl chloride	80-120	80-120	13	0.35	1.0
o-Xylene	80-120	80-120	13	0.31	1.0
m/p-xylene	80-120	80-120	13	0.56	1.0

GC/MS Volatile Organics

	QC CHECK/LCS % RECOVERY LIMIT	MATRIX SPIKE % RECOVERY LIMIT	MDL (ug/l)	PQL (ug/l)
Method 624 Purgeables in Water				
Benzene	37-151	78-122	1.2	5
Bromodichloromethane	35-155	82-117	1.1	5
Bromoform	45-169	61-136	1.0	5
Bromomethane	d-242	67-122	1.5	10
Carbon tetrachloride	70-140	76-127	1.1	5
Chlorobenzene	37-160	78-117	1.0	5
Chloroethane	14-230	79-118	2.2	10
2-Chloroethylvinyl ether	D-305	10-305	2.0	5
Chloroform	51-138	83-114	1.5	5
Chloromethane	D-273	35-152	1.2	10
Dibromochloromethane	53-149	78-122	1.2	5
1,2-Dichlorobenzene	18-190	18-190	1.0	5
1,3-Dichlorobenzene	59-156	59-156	0.4	5
1,4-Dichlorobenzene	18-190	60-145	0.8	5
1,1-Dichloroethane	59-155	81-181	1.2	5
1,2-Dichloroethane	49-155	80-123	1.2	5
1,1-Dichloroethene	D-234	79-121	1.2	5
1,2-Dichloroethene (total)	54-156	85-113	1.6	5
1,2-Dichloropropane	D-210	77-124	1.4	5
cis-1,3-Dichloropropene	D-227	75-110	1.4	5
trans-1,3-Dichloropropene	17-183	73-132	1.1	5
Ethylbenzene	37-162	83-112	1.4	5
Methylene chloride	D-221	83-115	4.1	5
1,1,2,2-Tetrachloroethane	46-157	69-138	1.3	5
Tetrachloroethene	64-148	76-121	0.8	5
Toluene	47-150	77-117	1.0	5
1,1,1-Trichloroethane	52-162	72-130	1.2	5
1,1,2-Trichloroethane	52-150	71-126	1.1	5

Date: 03/24/95

GC/MS Volatile Organics				
	QC CHECK/LCS % RECOVERY LIMIT	MATRIX SPIKE % RECOVERY LIMIT	MDL (ug/l)	PQL (ug/l)
Trichloroethene	71-157	82-116	0.8	5
Trichlorofluoromethane	17-181	17-181	1.3	5
Vinyl Chloride	D-251	65-127	1.3	10

GC/MS Volatile Organics

	QC CHECK/LCS % RECOVERY LIMIT	MATRIX SPIKE % RECOVERY LIMIT	RELATIVE % DIFFERENCE (RPD) LIMIT	MDL (ug/L)	PQL (ug/l)
Method 8240 Purgeables in Water					
Acetone	28-374	-	-	9.9	10
Benzene	14.2-25.8	76-127	11	0.4	5
Bromodichloromethane	13.1-26.9	-	-	1.2	5
Bromoform	14.2-25.8	-	-	1.2	5
Bromomethane	D-37.2	-	-	1.0	10
2-Butanone	D-502	-	-	2.2	10
Carbon disulfide	D-95	-	-	1.2	5
Carbon tetrachloride	14.6-25.4	-	-	0.9	5
Chlorobenzene	13.2-26.8	75-130	13	0.7	5
Dibromochloromethane	13.5-26.5	-	-	0.8	5
Chloroethane	7.6-32.4	-	-	1.0	10
2-Chloroethylvinyl ether	D-44.8	-	-	0.9	10
Chloroform	13.5-26.5	-	-	1.8	5
Chloromethane	D-40.8	-	-	1.1	10
1,1-Dichloroethane	14.5-25.2	61-145	14	0.9	5
1,2-Dichloroethane	13.6-26.4	-	-	0.9	5
1,1-Dichloroethene	10.1-29.9	-	-	1.2	5
1,2-Dichloroethene (total)	13.9-26.1	-	-	0.9	5
1,2-Dichloropropane	6.8-33.2	-	-	0.8	5
cis-1,3-Dichloropropene	1.8-13.3	-	-	0.6	5
trans-1,3-Dichloropropene	9.9-48	-	-	0.5	5
Ethylbenzene	11.8-28.2	-	-	0.4	5
2-Hexanone	11-68	-	-	1.4	10
Methylene chloride	12.1-27.9	-	-	1.5	5
4-Methyl-2-pentanone	24-68	-	-	1.0	10
Styrene	16-24	-	-	0.6	5
1,1,2,2-Tetrachloroethane	12.1-27.9	-	-	1.1	5
Tetrachloroethene	14.7-25.3	-	-	1.7	5
Toluene	14.9-25.1	76-125	13	0.5	5
1,1,1-Trichloroethane	13-25	-	-	0.9	5

Date: 03/24/95

GC/MS Volatile Organics

	QC CHECK/LCS % RECOVERY LIMIT	MATRIX SPIKE % RECOVERY LIMIT	RELATIVE % DIFFERENCE (RPD) LIMIT	MDL (ug/L)	PQL (ug/l)
1,1,2-Trichloroethane	12.8-27.2	-	-	0.7	5
Trichloroethene	13.3-26.9	71-120	14	0.8	5
Vinyl acetate	3.2-47	-	-	2.1	10
Vinyl chloride	0.8-39.2	-	-	1.1	10
Xylenes (total)	33-103	-	-	1.3	5

IEA
An Aquarion Company

IEA - CT LABORATORY
QUALIFICATIONS AND EXPERIENCE STATEMENT

200 Monroe Turnpike
Monroe, CT 06468
Phone (203) 261-4458
Fax (203) 268-5346

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Table of Contents

I. INTRODUCTION

IEA is full service environmental laboratory serving both the public and private sectors with facilities in Whippany, NJ, Monroe, CT, Schaumburg, IL, Sunrise, N. Billerica, MA, and 2 in Research Triangle Park, NC, including a Radiological facility.

IEA performs analyses following EPA protocols and produces deliverable packages to comply with the current regulatory requirements of CERCLA, RCRA, NPDES, Safe Drinking Water Act, Clean Air Act and State ECRA type programs. Our services start with a technical Marketing/Sales force that can tailor a proposal to your project needs, and includes dedicated project managers, documented bottle preparation, sample pick-up, and expert data interpretation, in addition to the actual analyses and data report.

The following pages contain a closer look at IEA's capabilities and credentials.

II. LABORATORY CAPABILITIES

There are a number of environmental regulations that require analytical testing. Each of these has specific objectives and most have established test methodologies. IEA has developed testing capabilities to conform with the requirements of these regulations. In order to implement this type of program, we have also developed a technically oriented Client Service and Account Executive Staff. These individuals understand the differences in the protocols and deliverables and can clearly communicate the requirements to our laboratory staff.

Some of the regulatory programs where IEA is typically involved, are discussed below:

A. Hazardous Waste Assessments

1. CERCLA (Superfund)

Superfund site investigations, whether sponsored by Federal, State, or Principally Responsible Parties (PRP's) utilize the analytical guidelines established by the USEPA Contract Laboratory Program (CLP). Typical analytical requirements performed at Superfund sites include:

- Full Target Compound List (TCL's formerly known as the Hazardous Substance List-HSL's) air, soil and water.
- Tentatively Identified Compounds (TIC's) performed by GC/MS library search with analyst review.
- Site specific compounds, often times requiring some level of method development.
- Air analysis for volatile constituents potentially migrating from the site.

IEA has extensive experience providing these services to the New York State Department of Environmental Conservation, Connecticut Department of Transportation, New York City Department of Sanitation, as well as numerous confidential industrial clients.

2. RCRA

The Resource Conservation and Recovery Act has a number of requirements for analytical testing. These requirements generally fall into two categories: analysis of waste to determine if the material is hazardous; and analysis of environmental samples (soils, water, air) to determine if hazardous constituents are present.

Analysis of waste material usually involves the Toxicity Characteristic Leaching Procedure Tests including:

- Volatiles
- Semivolatiles
- Pesticides
- Herbicides
- Metals

It is also common practice to test this material for:

- Priority Pollutants
- Appendix IX constituents
- Other characteristics required by waste disposal companies

The 1986 RCRA Amendments also list a plan, phasing out certain hazardous materials from land disposal. The RCRA land ban program includes a number of analytical requirements. Some of these are:

- TCLP Solvent list (F001-F005 wastes)
- California List
- Appendix III

Analysis of environmental samples at RCRA facilities generally involves:

- Groundwater monitoring for RCRA indicators, Appendix IX, and specific constituent monitoring
- Soil analysis for Appendix IX or priority pollutants
- Air analysis for off-site migration of volatile organics

The guidelines for analytical testing for RCRA programs is provided in the SW846 Manual (Third Edition). IEA has reviewed the requirements of SW846 and has developed the analytical capabilities to comply with this document. We have carefully reviewed and are able to deliver all of the QA/QC described in SW846. Our understanding of the application and limitations of these methods helps us provide guidance to our clients. We are also able to clearly define, review, and manage our laboratory with the knowledge that we are providing quality data that meets the regulatory requirements.

B. Effluent Monitoring

1. NPDES

The Clean Water Act has certain requirements for effluent monitoring. This includes both the NPDES permit process for direct discharges and the Pretreatment program for effluents to POTW's. The NPDES permit generally involves priority pollutant analysis upon permit renewal (5 year) or on an annual basis, plus monthly reporting of "conventional pollutants". The Pretreatment program is based on industry specific categorical standards and the requirements of the POTW.

The analytical guidelines for these programs are described in 40 CFR Part 136, specifically, Methods 624/625 and 608 for organics and the 200 series for inorganics. The QA/QC requirements are described in these methods.

IEA has been providing effluent monitoring services since 1977. We provide sampling and analytical program design, sample collection and pick-up, and analysis using the appropriate methodologies and QA/QC.

C. Potable Water Analysis

1. Safe Drinking Water Act (SDWA)

The SDWA requires water purveyors test their supply at least once annually. Those supplying larger populations must test more frequently. There are a number of parameter groups that are tested under SDWA including the primary and secondary drinking water standards. These include:

PRIMARY	SECONDARY
INORGANICS	**INORGANICS**
Arsenic, Barium, Cadmium, Silver, Sodium, Chromium Lead, Mercury, Selenium, Fluoride, Nitrate	Chloride, Color, Copper, Iron, Langelier Index, Manganese, Odor, TDS, Sulfate, Surfactants, Zinc
ORGANICS	**ORGANICS**
Vinyl Chloride, Endrin, Lindane Methoxychlor, Toxaphene 2,4-D, 2,3,5-TP (Silvex)	Vinyl Chloride

PRIMARY	SECONDARY
BIOLOGICAL	
Total Coliform	
TRIHALOMETHANES and VOLATILE ORGANICS	
RADIOACTIVITY	
Gross alpha, beta, Radium 226, 228	

The EPA promulgated amendments to the SDWA in 1986. The amendments include a "phase in" program for the analysis of volatile synthetic organic chemicals (SOC's), inorganic chemicals (IOC's), microbiological and radionuclide contaminants. The analytical protocols for the organic constituents are defined in the EPA 500 series methods.

IEA has provided drinking water analysis to many clients. We have also been contracted by the USEPA to perform a Special Analytical Services (SAS) project for the analysis of drinking water detection limit volatile organics. This required the use of capillary column purge and trap GC/MS using Method 524.2.

D. Real Estate Transfers

Many state environmental agencies have promulgated regulations requiring a site assessment prior to the sale of an industrial facility. The extent and complexity of the assessment varies due to different state regulatory requirements as well as site specific conditions. These transfers of property are governed by specific state environmental guidelines such as ECRA (NJ), Superlien (CT), and proposed regulations in Illinois.

IEA has provided laboratory services for numerous property transfers, particularly in New Jersey, under ECRA regulations, and CT under the Superlien Laws. The data generated from these projects have to withstand close scrutiny by state regulators. The data must also be of "courtroom quality" should there be any dispute over the findings.

We have the capability to test for specific chemicals and chemical groups as well as broad based chemical lists such as Priority Pollutants, RCRA characteristics, Target Compound List and Appendix IX. We can provide rush turnaround time service for "hot" transactions as quickly as 24 hours for volatile organics. The most important aspect of this type of testing, however, is the data quality and its usability for the site assessment.

E. Air Testing Capabilities

IEA-CT has been providing air testing services since the 1970's. We specialize in the analysis of volatile organic compounds for ambient air monitoring programs. We are also experienced in the analysis of other organic compounds, as well as inorganics.

Our experience includes several different sampling media such as Tenax tubes, Tedlar bags, SUMA Canisters, impinger solutions, and a variety of adsorptive traps. EPA has not published air testing methodologies of the same detail as water and soil methods. Existing air methods, for example T01 and T02 volatile organics, do not have the rigorous procedures and QA/QC detail. This requires that the laboratory have sufficient working knowledge and experience to provide quality, defensible data.

IEA has performed air testing for several clients, including the USEPA. We were contracted under the EPA's Special Analytical Services (SAS) program to provide trace analysis of volatile organics from SUMA canisters. We have conducted stack gas monitoring at a midwest steel mill, formaldehyde analysis on impinger solutions from a chemical manufacturing facility, soil vent gas testing from landfills in New Jersey, as well as numerous other projects.

As part of our air testing services, we provide consultation on sampling program design, including the selection of the most appropriate sampling media.

We have investigated the adsorptive properties of many different traps and are able to pass this information, as well as our experience, to our customers. We are very proficient in the analysis of Tenax/adsorptive media traps using cryofocus GC/MS techniques. Using this knowledge, and the customers knowledge of site conditions, we can develop the most effective sampling plan.

We believe that our understanding and experience, combined with our familiarity with EPA-CLP QA/QC requirements, makes us uniquely qualified to provide air testing services.

A summary of the IEA-CT analytical capabilities is presented in TABLE II-1

TABLE II - 1

IEA-CT ANALYTICAL CAPABILITIES

I. ORGANICS-GC/MS

Volatile Organics - 524
Volatile Organics - 8240
Volatile Organics - CLP
Volatile Organics - TO1/TO2
Volatile Organics - Appendix IX
Acid & Base/Neutrals - 8270
Acid & Base Neutrals - CLP
Acid & Base/Neutrals - Appendix IX

II. ORGANICS-GC

Organohalide Pesticides & PCBs - 608
Organohalide Pesticides & PCBs - 8080
Organohalide Pesticides & PCBs - CLP
Organophosphate Pesticides - 8140
Organohalide Pesticides & PCBs - Appendix IX
Chlorinated Herbicides - 8150
Chlorinated Herbicides - Appendix IX

III. INORGANIC METALS

ICP Metals
Furnace Metals
CLP Metals

IV. BIOLOGICAL ANALYSES

Total Coliform
Fecal Coliform
Standard Plate Count
Enterococci
Fecal Streptococcus

V. INORGANIC WET CHEMISTRY

Acidity
Alkalinity
Ammonia
Bicarbonate
Biochemical Oxygen Demand (BOD)
Bromide
Chloride
Chlorine Demand
Chlorine Residual
Chemical Oxygen Demand
Color
Conducitivity
Chromium (VI)
Cyanide - Amenable
Cyanide - Total
Cyanide (CLP)
Dissolved Oxygen
Flashpoint
Fluoride
Grain Size
Hydrocarbon analysis
MBAS
Nitrate
Nitrite
Odor
Oil and Grease
Paint Filter Test
pH
Phenols
Phosphate
Phosphorus
Settleable Solids
Silica
Specific Gravity
Sulfate
Sulfide
Sulfite
Sludge Volume Index
Tannins and Lignins
Total Dissolved Solids
Total Kjeldahl Nitrogen
Total Organic Carbon
Total Organic Halides
Total Solids
Total Suspended Solids
Turbidity
Volatile Solids
Corrosivity Characteristics
Ignitability Characteristics
EPTOX
TCLP

III. REPRESENTATIVE ENVIRONMENTAL PROJECTS

United States Environmental Protection Agency - U.S. EPA Contract Laboratory Program contract for organic and inorganic analysis of 60 environmental samples per month for 30 months. Analysis by rigid protocols and QA/QC policies for Target Compound List (TCL) organics by GC/MS and GC/ECD procedures.

United States Environmental Protection Agency - many SAS contracts, including PCB analysis for a major enforcement action and low detection level drinking water analyses by GC/MS.

U.S. Navy, Philadelphia, PA - Analysis of bay samples, river water, groundwater, and surface water for priority pollutants, xylenes, and petroleum hydrocarbons.

Northville Industries - Melville, NY - Analysis of air samples associated with cleanup and vapor monitoring of contaminated groundwater. Adsorptive tubes are analyzed for volatile organics utilizing very strict QA/QC requirements. Approximately 1000 samples are tested annually.

URS Consultants - Buffalo, NY - NYC Landfills, Fountain Avenue and Pennsylvania Avenue Analysis of approximately 700 samples, over a 9 month period, consisting of water, soil, sediment, waste, and air. Parameters included Full TCL/TAL and miscellaneous wet chemistry tests, all in accordance with '91NYSDEC ASP/CLP with Superfund deliverables and customized diskette deliverable.

Wehran Engineering - Middletown, NY - NY State manufacturing facility. Analysis of approximately 600 samples consisting of water and soil for Full TCL/TAL analysis by '91NYSDEC ASP CLP Protocol and Category B deliverables with customized diskette deliverables.

McLaren-Hart - Pittsburgh, PA - American Cyanamid, Willow Island, W.VA. Analysis of approximately 75 water and soil samples for Full TCL/TAL by CLP 3/90 protocols and deliverables.

Fanning, Phillips and Molnar\NY Urban Development Corporation/Donald Trump - Analysis of over 100 soils, sediments, and groundwater samples for volatiles, base/neutrals, petroleum hydrocarbons, and metals.

TABLE II - 1

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I. ORGANICS-GC/MS

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Organohalide Pesticides & PCBs - CLP
Organophosphate Pesticides - 8140
Organohalide Pesticides & PCBs - Appendix IX
Chlorinated Herbicides - 8150
Chlorinated Herbicides - Appendix IX

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Furnace Metals
CLP Metals

IV. BIOLOGICAL ANALYSES

Total Coliform
Fecal Coliform
Standard Plate Count
Enterococci
Fecal Streptococcus

V. INORGANIC WET CHEMISTRY

Acidity
Alkalinity
Ammonia
Bicarbonate
Biochemical Oxygen Demand (BOD)
Bromide
Chloride
Chlorine Demand
Chlorine Residual
Chemical Oxygen Demand
Color
Conducitivity
Chromium (VI)
Cyanide - Amenable
Cyanide - Total
Cyanide (CLP)
Dissolved Oxygen
Flashpoint
Fluoride
Grain Size
Hydrocarbon analysis
MBAS
Nitrate
Nitrite
Odor
Oil and Grease
Paint Filter Test
pH
Phenols
Phosphate
Phosphorus
Settleable Solids
Silica
Specific Gravity
Sulfate
Sulfide
Sulfite
Sludge Volume Index
Tannins and Lignins
Total Dissolved Solids
Total Kjeldahl Nitrogen
Total Organic Carbon
Total Organic Halides
Total Solids
Total Suspended Solids
Turbidity
Volatile Solids
Corrosivity Characteristics
Ignitability Characteristics
EPTOX
TCLP

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Fanning, Phillips and Molnar\NY Urban Development Corporation/Donald Trump - Analysis of over 100 soils, sediments, and groundwater samples for volatiles, base/neutrals, petroleum hydrocarbons, and metals.

CH_2M Hill - Alachua, FL - Analysis of 60 samples for full Appendix IX. Results were provided both electronically (diskette) and in full CLP-like hardcopy.

Fortune 500 Company - New England Locations - Analysis of over 1,000 samples over a two year period for PCB's in soils, sediments, groundwaters, surface waters, concrete cores, and transformer oils.

Various Connecticut, New York, Massachusetts and New Jersey Consulting Engineering Firms - Groundwater and effluent analysis for priority pollutants and conventional indicator parameters.

Numerous Electroplaters in the State of Connecticut - NPDES and SPDES analyses for compliance with Connecticut DEP guidelines. Analyses include heavy metals and volatile priority pollutants.

IV. DATA DELIVERABLES

Just like there are many different analytical protocols for a specific parameter list, there are also different report formats or deliverables. These deliverables may be based on State or Federal requirements or client preference. The USEPA Contract Laboratory Program (CLP) also has a defined set of requirements for reporting.

IEA offers several Report Levels. These include Data Summaries, CLP, NJ Regulatory and Reduced Format, and client specified report packages.

Custom report packages are also available. We recognize that clients have different needs depending on data quality objectives, data validation criteria, and individual preferences. Our data processing system affords us the capabilities to produce this variety of formats.

IEA-CT is especially adept in the production of Full CLP reports. We have over 8 years experience in the USEPA CLP program and consider this level of reporting part of our routine services.

V. CUSTOMER SERVICE/PROJECT MANAGEMENT

One of IEA's strengths is our dedication to customer service. Our Client Service Staff is experienced in laboratory testing and understand technical and logistical issues. These three individuals serve as the point contact for sample coordination with the project team. One Client Service Representative is assigned to each customer, so there is consistency in project management.

The Client Service Representatives coordinate bottle preparation and delivery, order entry, monitor project status, and notify the client of any analytical difficulties. Upon receipt of bottles, they will notify the client as to the condition of bottles, chain-of-custody questions, or any other sample receipt issues.

Technical questions about data packages are also directed to our Client Service staff. They can address most data package issues immediately. If the question requires further assistance, a Corrective Action Report (CAR) is generated documenting the question and the date/time a response is due. This expedites clients inquiries with one phone call.

VI. DATA MANAGEMENT

IEA-CT currently uses a Perkin Elmer Laboratory Information Management System (LIMS). This LIMS is primarily used for order processing and sample tracking. Samples are pre-logged at the time a client calls with an order. All information detailing the project requirements are entered at this time. Upon receipt of actual samples, the original PreLog-In information is checked against the actual samples that arrived. If necessary, edits are made and the project is upgraded to Logged-In status. This system has greatly enhanced the timeliness of Log-In. Group Leaders use LIMS to track sample status, due dates, and holding times.

In addition to PE-LIMS, IEA-CT utilizes an ORACLE data base system, called Seedpack II/III for analytical data processing, report generation, and diskette deliverables. This system utilizes SP II/III development tools to customize the laboratories information management needs. Data, including results and all associated QC, moves from the instruments to the centralized data base, where it is available for final report. Report programs have been written to satisfy customer needs. These include USEPA-CLP, NYSDEC-ASP, Level I Summary Reports, and other customer specific formats. A menu driven diskette program was developed to accommodate a wide variety of electronic deliverable formats. These diskettes, typically used as data summaries, can be delivered by overnight mail. They are transmitted in ASCII or LOTUS format, generally useful for a wide range of applications.

VII. QA/QC SUMMARY

The staff at IEA has an understanding of the requirements of each analytical protocol. Our QA/QC program is based on the EPA methodologies and their specific requirements. These methods are numerous and are constantly changing. We have defined the QC programs and continue to monitor them. This is an assurance to our clients of compliance to regulatory requirements.

The responsibility of the Inorganics and Organics Group Leaders at IEA is to produce analytical data that meets the appropriate and specific regulatory requirement in terms of completeness, precision, accuracy, representativeness, documentation, and comparability of data.

The QA/QC program at IEA is administered by the QA/QC officer. It is the responsibility of the QA/QC officer to monitor and guarantee, to the extent possible, the quality of all measurements to the Director of each IEA Laboratory. The QA/QC officer accomplishes the above objectives by implementing a formal QA/QC program and periodically monitoring laboratory produced analytical data, Corrective Action Reports, and the results of analysis of QC and QA samples.

The QA/QC officer implements the correction of any problems by notifying laboratory management using a QA/QC Deficiency Report. This report specifies deficiencies in analytical procedures, quality control procedures, bench data, and/or standard operating procedures. An implementation due date is also specified.

Our QC program is an integrated approach consisting of:

Good Laboratory Practice -

High standards of excellence by the IEA Chemists and Technicians, in a well maintained analytical laboratory performing duplicate analyses, blanks, standard additions, internal standards, and using the highest quality reagents. Legally defensible chain-of-custody procedures for analysis as well as sampling are used. Standard Operating Procedures are used and are available at the bench for quick reference by the analyst.

An Internal Quality Control Program -

Consisting of sample chain-of-command, laboratory notebook review, quality control sample analysis, technique review, and continued education programs.

External Quality Control Audits -

Done on a quarterly basis by the USEPA-CLP States of Connecticut, New York and New Jersey, which encompass organics, metals, nutrients, and demand series. Also, the QA/QC officer regularly introduces "blind" samples from outside consultants and other laboratory "round-robin" series.

VIII. IEA LABORATORIES ORGANIZATIONAL STRUCTURE

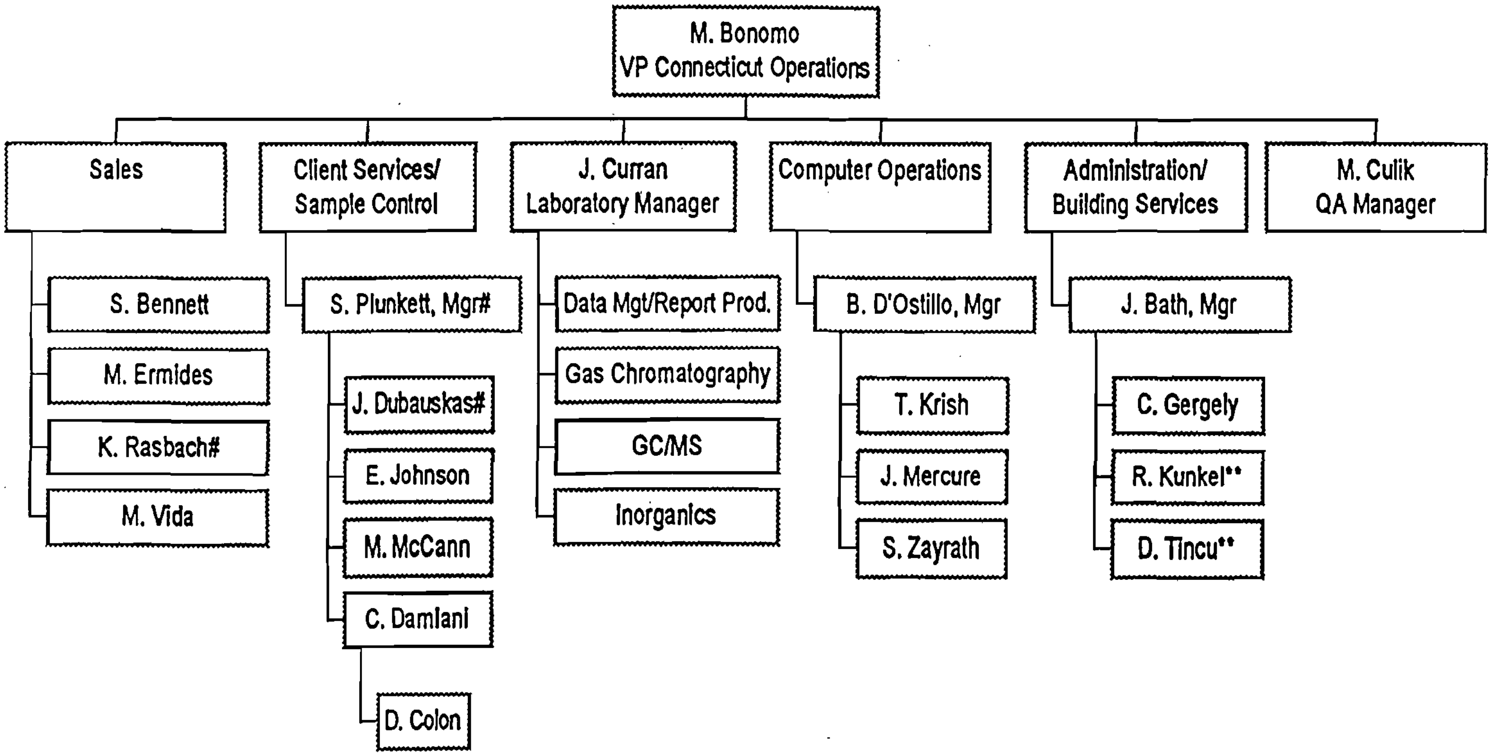
IEA maintains full-time staff of over 320 professionals with approximately 75% experienced in the areas of organic and inorganic sample preparation and analysis. We also have professional profiles for all laboratory managers and group leaders. This information will be made available upon request.

The IEA-CT Organization structure is presented in Table VIII-1.

IEA, Inc. - CT

An Aquarion Company

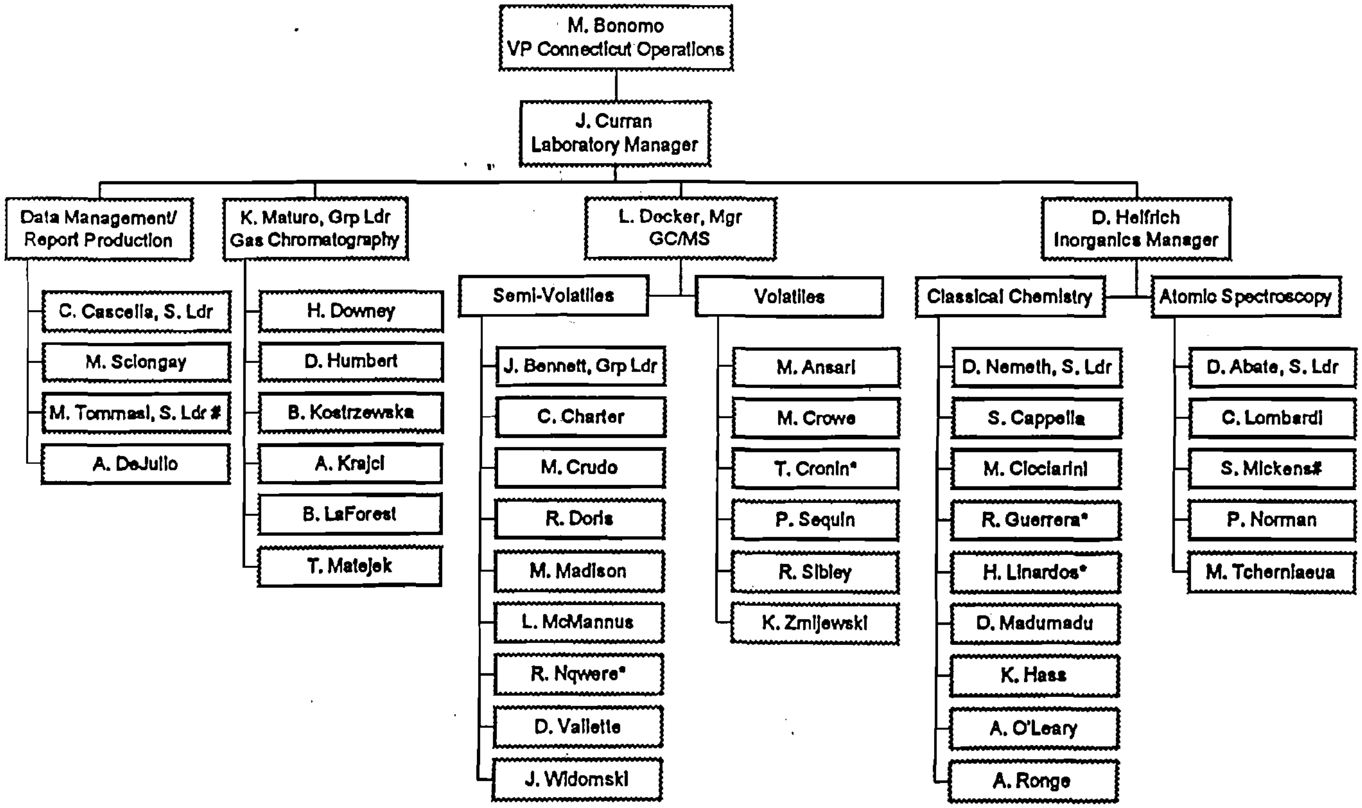
Doc #QAC00104.CT
Date: 01/23/96



*Part Time/Temp
**25% charged to AMS
#30 hour work week

IEA, Inc. - CT
An Aquarion Company

Doc #QAC00104.CT
Date: 01/23/96



*Part Time/Temp
**25% charged to AMS
#30 hour work week

IX. IEA NETWORK SERVICES

IEA, Monroe, CT is part of the IEA network consisting of 7 labs throughout the Eastern United States:

Monroe, CT
Cary, NC (Headquarters) (2 labs including Radiological)
N. Billerica, MA
Whippany, NJ
Schaumburg, IL
Sunrise, FL

The entire network is used to help facilitate client requests. The Account Executive and Client Service staff will make arrangements with other IEA labs for services. Samples are never sent to another IEA lab, without first consulting with the client. Utilizing the network in this manner gives us the resources of a staff of 320 people and one of the largest analytical capabilities in the country. Any work sent to another IEA lab will be managed, tracked, and reported by IEA-CT, so that the customer has the benefit of dealing with one contact.

The following is a list of the additional services offered by IEA:
COURIER - SAMPLE PICK UP and DELIVERY
SAMPLE CONTAINER PREPARATION and TRANSPORT
AIR ANALYSIS
ASBESTOS (PLM, TEM)
ELECTRON MICROSCOPY
RADIOLOGICAL ANALYSIS
MIXED WASTE TESTING

Data Validation

IEA has performed data validation for several consulting and engineering firms that did not have an internal QA/QC department. We have performed validation services on New Jersey ECRA projects (Tier II reports) and Superfund remediation sites (CLP-Tier I reports).

Courier Service

IEA offers sample pick-up for local clients. This service was designed for customer convenience and has a small fee dependent upon the location of sample pick-up.

Sample Containers and Transport

IEA provides new, pre-labelled, pre-preserved bottles for sample collection. Chain-of-custody documentation is initiated at the laboratory and included with the bottles. We can list up to 11 samples on a single form. This means less paperwork in the field and fewer mistakes.

There are two types of bottles that can be provided: Standard and I-Chem glassware (as used by the USEPA for CLP projects). Preservatives specified by the analytical methods are added to bottles before delivery to the client. The bottle labels identify both the parameter and preservative.

Bottles are delivered to the site in sample coolers chilled with blue ice, using Federal Express or the IEA courier service. This generally requires 1-2 weeks advance notice. Different size coolers are used depending on the number of containers. Each bottle is wrapped with protective "bubble wrap" prior to shipment. All coolers are sealed with York Labs custody tape. This is the same procedure used by the USEPA for Superfund site (CLP) projects. Coolers are returned to the laboratory by overnight courier, such as Federal Express, or the IEA courier service.

TABLE X - 1

CERTIFICATIONS

In some instances it may be necessary for environmental data to be reported to a regulatory authority with reference to a certified laboratory. For your convenience, the laboratory identification numbers for the IEA-Connecticut laboratory are provided in the following table. Many states certify laboratories for specific parameters or tests within a category (i.e. method 325.2 for wastewater). The information in the following table indicates the lab is certified in a general category of testing such as drinking water or wastewater analysis. The laboratory should be contacted directly, if parameter-specific certification information is required.

IEA-Connecticut
Certification Summary (as of June 1993)

STATE	RESPONSIBLE AGENCY	CERTIFICATION	LAB NUMBER
Connecticut	Department of Health Services	Drinking Water, Wastewater	PH-0497
Kansas	Department of Health and Environmental Services	Drinking Water, Wastewater/Solid, Hazardous Waste	E-210/E-1185
Massachusetts	Department of Environmental Protection	Potable/Non-Potable Water	CT023
New Hampshire	Department of Environmental Services	Drinking Water, Wastewater	252891
New Jersey	Department of Environmental Protection	Drinking Water, Wastewater	46410
New York	Department of Health	CLP, Drinking Water, Wastewater, Solid/Hazardous Waste	10602
North Carolina	Division of Environmental Management	Wastewater	388
Rhode Island	Department of Health	Chemistry...Non-Potable Water and Wastewater	A43
California	Department of Health Services	Hazardous Waste	1778
US Army Corps of Engineers	Missouri River Division	Organics, Inorganics	

XI. INVENTORY OF LABORATORY EQUIPMENT

Major Analytical Instrument Inventory - Monroe, CT

CLASSICAL CHEMISTRY

Equipment Name	Manufacturer	Model Number	Serial Number
Spectrophotometer, IR	Perkin-Elmer	1310	134423
Spectrophotometer, UV-VIS	Perkin-Elmer	35	34630
Turbidimeter	Hach Company	2100A	851017142
TOC Analyzer	Xertex-Dohrmann	DC-80	HF2029
TOX Analyzer	Xertex-Dohrmann	MC3 A,B	MF2106
Fluorometer	Sequoia-Turner	112-003	D01491
pH/ISE Meter	Orion	SA 720	SR45A
pH/ISE Meter	Beckman	12	0232578
Conductivity Meter	Cole-Parmer Instrument	1484-20	1421
Flash Point Apparatus	Precision Scientific	Pensky-Martin	10 Au-12
Oven	Fisher Scientific	55G	291
Oven	VWR	1320	0701090
Incubator	Blue M Electric	100A	IN1-1362
Bio Refrigerator	Frost Queen	R20/L	00029
Centrifuge	DYNAC	0101	16846
Water Bath	Blue M Electric	MW-1220	MX-2520
D.O. Meter	YSI	51A	0241
Autoclave	Market Forge	STM-E	034200
COD Reactor	HACH	45600	920300006892
Muffle Furnace	Thermolyne	-----	-----
TKN Block Digestor	Scientific Instruments	AD-4020	8915-049
Digital Hot Plate/Stirrer	PMC	730	0298E
Digital Hot Plate/Stirrer	PMC	730	0299E
Semiautomated Analyzer	LACHAT	Quikchem	125-360
BOD Incubator	Precision Scientific	FLC02662	FU199JRW2
BOD Incubator	Precision Scientific	FLC02662	FU178RRWR
Mini Distillation Setup	Andrews Glass Co	110-10-R	A4WO309
Mini Distillation Setup	Andrews Glass Co	110-10-R	A4WO209

NEW YORK STATE DEPARTMENT OF HEALTH

BARBARA A. DEBUONO, M.D., M.P.H. Commissioner

Expires 12:01 AM April 1, 1996
ISSUED April 1, 1995
REVISED February 27, 1996

INTERIM CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

Lab ID No.: 10602

Director: MR. JEFFREY CURRAN
Lab Name: IEA INC
Address : 200 MONROE TURNPIKE
MONROE CT 06468

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES NON POTABLE WATER

All approved subcategories and/or analytes are listed below:

. Hydrocarbon Pesticides :
-DDD
-DDE
-DDT
alpha-BHC
ldrin
-BHC
rdane Total
delta-BHC
Dieldrin
rin aldehyde
rin
osulfan I
Endosulfan II
osulfan sulfate
tachlor
tachlor epoxide
Lindane
Methoxychlor
aphene

- Wastewater Miscellaneous :
  - Bromide
  - Boron, Total
  - Cyanide, Total
  - Color
  - Phenols
  - Oil & Grease Total Recoverable
  - Hydrogen Ion (pH)
  - Specific Conductance
  - Sulfide (as S)
  - Surfactant (MBAS)
  - Organic Carbon, Total
- Wastewater Metals II (ALL)
- Organophosphate Pesticides (ALL)
- Phthalate Esters (ALL)
- Purgeable Halocarbons (ALL)
- Wastewater Metals III :
  - Cobalt, Total
  - Molybdenum, Total
  - Tin, Total
  - Titanium, Total
  - Thallium, Total
- Nutrient :
  - Kjeldahl Nitrogen, Total
  - Nitrate (as N)
  - Orthophosphate (as P)
  - Phosphorus, Total
- Haloethers (ALL)
- Nitroaromatics and Isophorone (ALL)
- Polynuclear Aromatics (ALL)
- Priority Pollutant Phenols (ALL)
- Residue (ALL)
- Mineral :
  - Alkalinity
  - Chloride
  - Fluoride, Total
  - Sulfate (as SO4)
  - Hardness, Total
- Acrolein and Acrylonitrile (ALL)
- Benzidines (ALL)
- Chlorophenoxy Acid Pesticides (ALL)
- Chlorinated Hydrocarbons (ALL)
- Demand (ALL)
- Wastewater Metals I (ALL)
- Nitrosamines (ALL)
- Polychlorinated Biphenyls (ALL)
- Purgeable Aromatics (ALL)
- TCLP Additional Compounds (ALL)

Serial No.: 032214

Wadsworth Center

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DOH-3317 (3/95)

NEW YORK STATE DEPARTMENT OF HEALTH

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Director: MR. JEFFREY CURRAN
Lab Name: IEA INC
Address : 200 MONROE TURNPIKE
MONROE CT 06468

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES/ POTABLE WATER

All approved subcategories and/or analytes are listed below:

king Water Non-Metals :
lkalinity
alcium Hardness
hloride
olor
orrosivity
luoride, Total
itrate (as N)
ydrogen Ion (pH)
olids, Total Dissolved
ulfate (as SO4)

Drinking Water Trihalomethane (ALL)
Volatile Halocarbons (ALL)

Drinking Water Metals I (ALL)

Volatile Aromatics (ALL)

Serial No.: 027221

Wadsworth Center for Laboratories and Research

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ENVIRONMENTAL ANALYSES NON POTABLE WATER

All approved subcategories and/or analytes are listed below:

- r. Hydrocarbon Pesticides :
  - '-DDD
  - '-DDE
  - '-DDT
  - alpha-BHC
  - Aldrin
  - ta-BHC
  - lordane Total
  - delta-BHC
  - Dieldrin
  - drin aldehyde
  - drin
  - dosulfan I
  - Endosulfan II
  - Endosulfan sulfate
  - ptachlor
  - ptachlor epoxide
  - Lindane
  - Methoxychlor
  - xaphene
- Wastewater Miscellaneous :
  - Bromide
  - Boron, Total
  - Cyanide, Total
  - Color
  - Phenols
  - Oil & Grease Total Recoverable
  - Hydrogen Ion (pH)
  - Specific Conductance
  - Sulfide (as S)
  - Surfactant (MBAS)
  - Organic Carbon, Total
- Wastewater Metals II (ALL)
- Organophosphate Pesticides (ALL)
- Phthalate Esters (ALL)
- Purgeable Halocarbons (ALL)
- Wastewater Metals III :
  - Cobalt, Total
  - Molybdenum, Total
  - Tin, Total
  - Titanium, Total
  - Thallium, Total
- Nutrient :
  - Kjeldahl Nitrogen, Total
  - Nitrate (as N)
  - Orthophosphate (as P)
  - Phosphorus, Total
- Haloethers (ALL)
- Nitroaromatics and Isophorone (ALL)
- Polynuclear Aromatics (ALL)
- Priority Pollutant Phenols (ALL)
- Residue (ALL)
- Mineral :
  - Alkalinity
  - Chloride
  - Fluoride, Total
  - Sulfate (as SO4)
  - Hardness, Total
- Acrolein and Acrylonitrile (ALL)
- Benzidines (ALL)
- Chlorophenoxy Acid Pesticides (ALL)
- Chlorinated Hydrocarbons (ALL)
- Demand (ALL)
- Wastewater Metals I (ALL)
- Nitrosoamines (ALL)
- Polychlorinated Biphenyls (ALL)
- Purgeable Aromatics (ALL)
- TCLP Additional Compounds (ALL)

Serial No.: 032214

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Director: MR. JEFFREY CURRAN
Lab Name: IEA INC
Address : 200 MONROE TURNPIKE
MONROE CT 06468

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES/ POTABLE WATER

All approved subcategories and/or analytes are listed below:

king Water Non-Metals :
- Alkalinity
- Calcium Hardness
- Chloride
- Color
- Corrosivity
- Fluoride, Total
- Nitrate (as N)
- Hydrogen Ion (pH)
- Solids, Total Dissolved
- Sulfate (as SO4)

Drinking Water Trihalomethane (ALL)
Volatile Halocarbons (ALL)
Drinking Water Metals I (ALL)
Volatile Aromatics (ALL)

Serial No.: 027221

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NEW YORK STATE DEPARTMENT OF HEALTH

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BARBARA A. DEBUONO, M.D., M.P.H. \Commissioner

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MONROE CT 06468

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES/AIR AND EMISSIONS

All approved subcategories and/or analytes are listed below:

le Aromatics (ALL)   Purgeable Halocarbons (ALL)

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Lab ID No.: 10602

Director: MR. JEFFREY CURRAN
Lab Name: IEA INC
Address : 200 MONROE TURNPIKE
MONROE CT 06468

is hereby APPROVED as an Environmental Laboratory for the category

ENVIRONMENTAL ANALYSES/SOLID AND HAZARDOUS WASTE

All approved subcategories and/or analytes are listed below:

acteristic Testing :
Corrosivity
Ignitability
Reactivity
TCLP
E.P. Toxicity
eable Halocarbons (ALL)

Miscellaneous :
- Cyanide, Total
- Hydrogen Ion (pH)
- Sulfide (as S)

Organophosphate Pesticides (ALL)
Phthalate Esters (ALL)

Acrolein and Acrylonitrile (ALL)
Chlor. Hydrocarbon Pesticides (ALL)
Haloethers (ALL)
Metals II (ALL)
Polynuclear Arom. Hydrocarbon (ALL)
Priority Pollutant Phenols (ALL)

Chlorophenoxy Acid Pesticides (ALL)
Chlorinated Hydrocarbons (ALL)
Metals I (ALL)
Nitroaromatics Isophorone (ALL)
Polychlorinated Biphenyls (ALL)
Purgeable Aromatics (ALL)

Serial No.: 027223

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Lab ID No.: 10602

Director: MR. JEFFREY CURRAN
Lab Name: IEA INC
Address : 200 MONROE TURNPIKE
MONROE CT 06468

is hereby APPROVED as an Environmental Laboratory for the category

CONTRACT LABORATORY PROTOCOL (CLP)

All approved subcategories and/or analytes are listed below:

LP Inorganics
CLP PCB/Pesticides
CLP Semi-Volatile Organics
CLP Volatile Organics

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GC/MS Extractable Organics

	QC CHECK/LCS % RECOVERY LIMIT	MATRIX SPIKE % RECOVERY LIMIT	RELATIVE % DIFFERENCE (RPD) LIMIT	MDL (ug/Kg)	PQL (ug/Kg)
2,4-Dimethylphenol	64-238	-	-	39.5	330
Dimethyl phthalate	D-112	-	-	9.88	330
4,6-Dinitro-2-methylphenol	D-362	-	-	11.9	1600
2,4-Dinitrophenol	D-382	-	-	105	1600
2,4-Dinitrotoluene	39-139	28-89	47	11.6	330
2,6-Dinitrotoluene	50-138	-	-	14.0	330
Di-n-octylphthalate	4-146	-	-	14.8	330
Fluoranthene	26-137	-	-	11.8	330
Fluorene	59-121	-	-	18.2	330
Hexachlorobenzene	D-132	-	-	13.8	330
Hexachlorobutadiene	24-116	-	-	15.4	330
Hexachlorocyclopentadiene	D-59	-	-	12.8	330
Hexachloroethane	40-113	-	-	21.5	330
Indeno(1,2,3-cd)pyrene	D-171	-	-	17.1	330
Isophorone	21-196	-	-	14.9	330
2-Methylnaphthalene	D-127	-	-	14.8	330
2-Methylphenol (o-cresol)	40-189	-	-	11.2	330
4-Methylphenol (p-cresol)	28-198	-	-	17.8	330
Naphthalene	21-133	-	-	13.0	330
2-Nitroaniline	D-127	-	-	49.2	1600
3-Nitroaniline	D-91	-	-	342	1600
4-Nitroaniline	D-108	-	-	138	1600
Nitrobenzene	35-180	-	-	13.5	330
2-Nitrophenol	58-364	-	-	13.5	330
4-Nitrophenol	D-264	10-80	50	128	1600
N-Nitroso-di-n-propylamine	D-230	41-126	38	13.1	330
N-Nitrosodiphenylamine	D-114	-	-	17.1	330
Pentachlorophenol	28-352	17-109	47	76.7	1600
Phenanthrene	54-120	-	-	12.5	330
Phenol	10-224	26-90	35	10.6	330
Pyrene	52-113	35-142	36	18.2	330
1,2,4-Trichlorobenzene	44-142	38-107	23	15.2	330

GC/MS Extractable Organics					
	QC CHECK/LCS % RECOVERY LIMIT	MATRIX SPIKE % RECOVERY LIMIT	RELATIVE % DIFFERENCE (RPD) LIMIT	MDL (ug/Kg)	PQL (ug/Kg)
2,4,5-Trichlorophenol	82-354	-	-	56.1	1600
2,4,6-Trichlorophenol	74-288	-	-	28.9	330

QAPjP
ATTACHMENT B

STANDARD OPERATING PROCEDURES

Standard Operating Procedure
Decontamination Procedures for Field Equipment

All field equipment (bailers, well sounder, gloves, etc.) must be decontaminated before each use, between samples and before it is returned to the equipment room. Decontamination procedures vary for the type of analyses to be performed. The following basic procedures should always be used to decontaminate equipment regardless of the type of analysis:

1) Scrub equipment with soapy water (Liquinox, Alconox, trisodiumphosphate or equivalent).

2) Rinse with tap water, if available.

3) Rinse with deionized water from spray bottle.

For Metals, perform the following additional procedures:

4) Rinse with 10% nitric acid (HNO_3).

5) Final rinse with deionized water.

For base/neutral/acid extractables, PCB's and pesticides perform the following, additional procedures:

4) Rinse with methanol and let dry.

5) Rinse with hexane and let dry.

6) Final rinse with deionized water.

For Volatile Organics and all other analyses, perform the following additional procedures:

4) Rinse with methanol.

5) Final rinse with deionized water

NOTE: When sampling for more than one of the above types of analyses, use the protocol for volatile organics last.
Solvent use should be gauged carefully so that a minimal amount of solvent is left after use.
Allow any remaining solvent to evaporate.

Standard Operating Procedure
Completion of Field Notes

This protocol is designed to ensure that proper techniques are used during the collection and preparation of field notes. Field notes are collected in field notebooks, which are often the only source of "first hand" information regarding activities that were conducted at a site. Field notes may be called into a court of law; therefore, it is imperative that field notes be maintained in a thorough and proper manner.

All field notes should be completed in a water-proof notebook and should not be completed on loose sheets of paper that might get lost or misplaced. All field notes should be completed in permanent ink, rather than pencil and should be neat and orderly. Use of a pencil for collection of field notes is acceptable only in extremely poor weather conditions. All field notes taken during the field activities should be photocopied immediately after completion of the activities and placed in the project file to preserve a permanent record of the activities. In addition, when conducting field activities, the following information should also be collected:

- the date and time of the field activities (both the start and the finish time) including the time that certain "milestones" are achieved;
- weather conditions on the day of the field activities (in some cases it may also be appropriate to include the weather conditions for the previous day, such as when a heavy snow fall has occurred);
- the names and affiliations of all personnel involved in the field activities;
- the purpose of the field activities (e.g., groundwater sampling, site inspection, UST removal);

The field notes should accurately reflect a chronology of the activities that were conducted at the site. The following are examples of information that should be included in the field notes, but might not be applicable in all situations:

- the time that subcontractors, clients, police details, consultants or other persons arrived and left the site;
- a site sketch indicating the approximate location of groundwater observation wells to be sampled, borings to be installed, test pits to be performed, utilities to be located or suspected underground storage tanks, abutters (Note: site sketches should be included even when a site plan has been provided. If a site sketch is not feasible, the site plan that is being used to locate structures should be referenced);
- reference to any other documents that are completed during the course of the site activities that may include additional information not included in the field book, including: Chain of Custody forms; Test Boring Reports; Test Pit Reports; Manifests and calibration log books;
- a site sketch indicating areas where snow cover, vehicles, debris or other obstructions may have limited site inspection, sampling or otherwise prohibited the completion of activities;
- where and when field instruments (e.g., PID, OVA) are being used, all calibration and sampling/screening conditions should be logged;
- any unsafe conditions observed by GEC personnel and presented to on-site personnel or subcontractors;
- observations made during site inspections or field activities including, but not limited to: the locations of stained soils or stressed vegetation; noticeable odors; the presence of nonaqueous-phase liquid.

It is the responsibility of each GEC employee to maintain his/her own field book. All field books are the property of GEC and in the event that the employee terminates employment with GEC the field books are to remain at GEC.

Standard Operating Procedure
Field Sampling Protocols
Quality Assurance/Quality Control

The purpose of the GEC QA/QC program is to generate analytical data that is of known and defensible quality. These procedures apply to all projects in which sampling is involved. QA/QC from one project is not transferable to another.

Decontamination

1) Decontamination should be performed on all reusable field sampling equipment and protective gear. Sampling equipment should be decontaminated before the collection of a sample and after sampling has been completed. Protective gear should be decontaminated after the collection of a sample.

2) It is necessary to use the following decontamination solutions in the field:

   - Non-phosphate detergent plus tap water wash.
   - Distilled/ deionized water rinse.
   - 10% Nitric Acid rinse.*
   - Pesticide grade methanol rinse, when sampling volatiles only.
   - Pesticide grade methanol then hexane rinse.**
   - Distilled/ deionized water rinse. **

   * Only if sample is to be analyzed for metals.
   ** Only if sample is to be analyzed for semi-volatile organics, PCBs or pesticides.

3) Sample bottles and sampling equipment should not be stored near gasoline, solvents, or other potential sources of contamination. If unavoidable bottles and equipment should be sealed in containers or plastic.

4) Heavy equipment, including hand tools, should be cleaned by steam cleaning or manual scrubbing prior and subsequent to use in hazardous waste investigations.

Measures or Quality Control/Quality Assurance

1) Trip Blanks

   - Trip blanks are used in order to detect additional sources of contamination that might affect analytical results. The following are potential sources of additional contamination:

     a. Sample containers,
     b. Contamination during shipment to and from the site,
     c. Ambient air contact with analytical instrumentation at the laboratory during analysis, or
     d. Laboratory reagent used in analytical procedures.

   - One trip blank is required for every set of samples sent to the lab regardless of job size. Generally, the trip blank should be for VOCs. If, however, VOCs are not a parameter of the sampling round, consult the laboratory as to which parameter should have an associated trip blank.

- Trip blanks are to be kept with containers used in the sampling round at all times. More specifically, they should accompany the site specific sampling containers from the time the containers leave the laboratory until they are returned for analysis.

- Obtain containers and trip blanks prepared specifically for each job from the laboratory. Return unused containers to the laboratory upon completion of a project.

2) Field Blanks

- Field blanks are used to indicate potential contamination contracted from ambient air or from sampling equipment. It also serves as a QA/QC for decontamination procedures.

- Collect one set of field blanks for every 20 samples per project. It is not necessary to take a field blank for jobs in which less than 10 samples are collected.

- Procedure

  a. Collect two sets of sample containers to cover all sampling parameters. One set will be full of analyte free water (obtain extra analyte free water to fill two VOA vials). The other set is empty.
  b. Go to the most contaminated area and run the water from the full containers, through the decontaminated sampling equipment and into the associated empty containers.
  c. Send to the lab for analysis.

- Use containers and field blanks prepared specifically for job.

3) Duplicate Samples

- Duplicate samples are collected in order to serve as a laboratory check. Therefore, it is important that the lab does not know which samples are to serve for this purpose.

- Frequency

  a. Obtain one (1) duplicate sample for every 10 samples of each matrix. If less than ten samples are collected of a given matrix, a duplicate must be collected anyway.
  b. If a total of less than 10 samples are collected, collect one (1) duplicate of the majority medium.
  c. If a total of less than five (5) samples are collected, it is not necessary to collect a duplicate sample.

* Note that the frequency as outlined here pertains to the number of samples collected per project, not per location of a given project.

- Procedures

The idea behind the duplicate sample is to collect two samples as close to identical as possible.

a. For water

Alternately fill containers for the same parameter with equal amounts of liquid per bailer. Fill duplicate VOC vials from the same bailer of liquid.

b. For soil

- VOC samples must be taken from the discreet sampling locations.
- For all other samples, mix the applicable soil in a decontaminated stainless steel or polyethylene bowl or tray. Then fill sample containers with the soil mix.
- When confronted with the option of collecting a water sample or a soil sample, choose the water sample.

- Labeling for the laboratory

a. Label the containers normally and give the duplicate samples different reference numbers.
b. Indicate the quantity of duplicates in the "special instructions" or "remarks" portion of the chain of custody and laboratory services sheet, however, do not indicate the reference numbers of the duplicates.
c. Upon receipt of analytical results, contact the laboratory and convey all data pertaining to the duplicates for their QA/QC.

4) Background samples

- Background samples are taken only if it is required for comparison of site conditions to the surrounding environment. This is to be dictated by client needs on a site to site basis.

5) Performance Evaluation Samples

- The project manger should consider the use of the following performance evaluation samples on a periodic basis. Typically, these will be reserved for larger jobs:

a. Laboratory performance evaluation samples

- Collect duplicate samples and send to two different laboratories for comparison. Avoid using soil samples for this procedure.
- Send a sample of known quantity and quality to the laboratory in order to determine laboratory performance. Such samples can be prepared by any laboratory.

b. Gas chromatograph (GC) performance evaluation samples

- Acquire a sample of known quantity and quality from a laboratory. Analyze the sample with the gas chromatograph in order to determine the integrity of GC results.

Field Sampling QA/QC

1) When sampling a well, collect VOA samples first and Oil & Grease samples last.

2) Start sampling at the presumed least contaminated areas, proceeding to the more contaminated areas.

3) Preservatives

- Consult the laboratory in order to determine which sampling parameters require preservatives. The laboratory will provide sampling containers specific for each job.
- It is necessary to fill the sample container when using preserved bottles; preservative is added with this assumption
- If samples are not collected correctly, they will not pass GEC QA/QC.

4) A chain-of-custody must accompany each set of samples from the job site to the laboratory. Be sure to identify the presence of trip blanks on the chain-of-custody sheets.

5) If possible, use the numbering system outlined on the attached sheet for identifying samples.

Ordering Sample Containers

1) Pre-plan sampling strategy to determine the sample parameters, the number of sample points including QA/QC samples, and the matrix of the given sample points.

2) Call laboratory and tell them:

- Sample parameters,
- Number of samples to be collected,
- The number of container sets needed for trip blanks, field blanks, and duplicates, and
- The matrix of each sample to be collected.

3) Sample containers should be ordered specifically for each job. Any sample containers unused at the end of the job should be sent back to the laboratory.

Conclusions

1) Pre-planning is crucial.

2) Keep open communication with the laboratory on all matters.

3) If you make a mistake in sampling collection, accept it, and retake the necessary samples.

Standard Operating Procedure
Observation Well Sampling
Using a Bucket-Type Bailer

This protocol is designed to ensure that proper techniques are used, safety is considered and quality assurance maintained during the performance of observation well sampling. A GEC representative is assigned to oversee and/or perform all observation well sampling for the project. The duties of the representative are to ensure that the scope of work is followed.

Sampling of groundwater observation wells is the primary means by which the chemical characteristics of groundwater can be determined. Therefore, it is imperative that care be taken in the development and subsequent sampling of observation wells. Water standing in the well prior to sampling may be stagnant and may not be representative of true groundwater quality in the aquifer in question

Procedures for performance of groundwater observation well evacuation and sampling are outlined in the following paragraphs:

Well Evacuation:

1) Prior to initiating any work the Health and Safety Plan, developed for the specific site activities, should be reviewed by all field personnel. The indicated measures on the Plan should be enacted prior to initiation of the sampling activities. Any concerns not addressed in the Plan are to be brought immediately to the attention of the Health and Safety Officer. Personnel participating in the sampling will dress with protective equipment appropriate for the anticipated conditions.

2) Decontaminate all equipment to be used in the performance of the activities in accordance with the protocol for decontamination. Decontamination should at least be performed by alternately rinsing all equipment with methanol and distilled water and vigorously scrubbing the equipment with a clean brush.

3) To the extent that contamination may be known at a given site, observation wells should be sampled in an order from "least contaminated" to "most contaminated".

4) Screen the well headspace with a photoionization detector (PID) or other appropriate instrumentation to confirm that concentrations of potential contaminants are within acceptable limits.

5) Test the well for accumulation of non-aqueous phase product (NAPL) using a pre-cleaned interface probe or transparent disposable bailer. If present, collect a sample of the NAPL and place in an appropriate sample container. This sample should be kept away from other samples.

6) Measure and record the depth to NAPL(if present), depth to water, and total depth of the wells. If NAPL is present, sampling for dissolved-phase contaminants should generally not be performed. In addition, if sampling is to be performed, appropriate measures should be taken to assure that any water removed from a contaminated well is disposed appropriately.

7) Calculate the volume of saturated well casing and the volume of water which will be removed to assure sufficient well evacuation. Evacuate well water into a clean, small (< 0.5 gallons), bucket or similar vessel in which precleaned and calibrated conductivity and pH probes have been placed. Attach a precleaned bailer to cable or line for lowering the bailer into the well. Lower the bailer slowly into the well until it contacts the water surface. Allow the bailer to sink and fill with a minimum of surface disturbance. Raise the bailer to the surface . Do not allow the bailer line to

contact the ground. Drain the bailer into the bucket.

8) Purging should continue until between three and five well volumes have been evacuated, pH, temperature, and specific conductivity values do not vary appreciably and until turbidity levels are below 50 NTU.

9) Record final pH, conductivity, temperature and turbidity values if appropriate.

Well Sampling:

1) Sampling of observation wells will be conducted only with clean, decontaminated Teflon, or stainless steel sampling bailers, clean disposable bailers, or peristaltic pumps. Disposable bailers shall not be re-used for any purpose. In addition, disposable gloves are worn for each individual well sampling, and line used to support the bailer is to be discarded between wells.

2) Samples at any given well will be collected in order of decreasing order of sensitivity to volatilization (i.e. VOC, total organic carbon, semi-volatile organics (BNA), ammonia, PCBs, pesticides, oil and grease, phenols, cyanide, sulfate and chloride, nitrate and ammonia, metals and radionuclides).

3) Lower the bailer slowly until it contacts the water surface. Allow the bailer to sink to a point such that the bailer becomes filled with water, but not to the point where the string comes in contact with the water. Note: Under specific sampling conditions this sample collection procedure may vary. Under these conditions specific notation is required regarding any modifications or amendments made to the Protocol.

4) Slowly raise the bailer to the surface and remove the bailer from the well. Care should be taken to ensure that the string and bailer do not come in contact with the ground or other potential contaminant sources.

5) Carefully and slowly transfer the contents of the bailer into appropriately preserved, pre-labeled containers. Check that the sample containers seal properly and that the cap is sealed tightly. Record applicable information in the field logbook and complete all chain-of-custody documents.

6) Discard string, and discard or decontaminate the bailer appropriately.

Standard Operating Procedure
HNU HW-101 Photoionization Detector

The HNu Instruments, Inc. HW-101 is a portable field instrument used to detect and approximate the concentrations of gaseous phase volatile compounds. The HW-101 operates by drawing the gas sample into an ionization chamber and exposing the gas to ultraviolet light, effecting photoionization.[1] The ions are collected on positive and negative electrodes, creating a current proportional to the concentration of ions. The HW-101 will detect molecules with ionization potentials of approximately 10.2 eV (electron volts) or less.[2]

II. Instrument Assembly and Battery Check

After the probe assembly and readout module are removed from the protective case, the end of the probe cable is connected to the 12-pin receptacle on the readout module. The tab on the probe cable and the corresponding notch on the 12-pin receptacle must be aligned for proper assembly. The filter nozzle is then attached to the end of the probe assembly.

The condition of the internal battery is determined prior to each use of the HW-101. Deep discharge damages the internal battery and should be avoided. The control knob on the face of the readout module is turned to the "BATT" position to determine the charge of the internal battery. If the meter needle deflects to within the green arc, battery charge is sufficient. If the meter needle is not within the green arc, the instrument must be recharged prior to use.

III. Calibration

The HW-101 requires calibration on a frequent and regular basis. The instrument should, at a minimum, be calibrated prior to commencing a day of sampling procedures and again at the end of the day to verify instrument response. In addition, the instrument must be calibrated subsequent to cleaning activities, or whenever suspect readings are noted.

Calibration procedures are initiated by rotating the control knob to the "STANDBY" position and observing the meter needle. If the meter does not indicate "0," the zero knob is rotated sufficiently to correct the discrepancy. The tip of the probe assembly is then connected to a cylinder containing a known concentration of isobutylene gas. The cylinder label will indicate a concentration "as benzene," the standard to which the instrument must be calibrated. The valve on the isobutylene cylinder is fully opened and the control knob of the HW-101 is rotated to the "0-200" parts per million detection scale position. After allowing approximately 1 minute for the reading to stabilize, the span knob is then rotated so as to match the instrument reading with the known concentration of the calibration gas, as printed on the cylinder label.

IV. Operation

Operation of the HW-101 requires two steps. First, the proper detection scale must be determined. If there is uncertainty regarding the correct detection scale, begin with the "0-2000" parts per million scale and increase sensitivity as necessary. Readings significantly higher than the upper limit of the scale may result in damage to the meter needle assembly. If meter needle deflection is less than 10% of the total range, the detection scale should be reduced by one step.

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[1] Claff, Roger E. (1991). "An Evaluation of Soil Gas and Geophysical Techniques for Detection of Hydrocarbons", *Health and Environmental Sciences API Publication Number 4509* . American Petroleum Institute, Washington D.C.

[2] HNu Systems, Inc. (1990) HW-101 Operation Manual.

The second step involves placing the tip of the probe assembly within the volume of gas to be sampled and recording the reading. Although specific conditions affect response time, the HW-101 will generally record peak readings 2-3 seconds subsequent to the start of sampling. The peak reading observed for any given volume of gas is recorded as the result.

V. Notes

Detection Limit: Although information provided by HNu, Inc. indicates that the detection limit of the HW-101 is 0.2 parts per million, field experience has shown the practical detection limit to be approximately 1.0 parts per million.

Interferences: The sensitivity of photoionization processes are reduced by the presence of gases not ionized by the lamp. Water vapor or methane gas are two frequently encountered examples of such a gas. The HW-101 operator should be aware of and document the possible presence of such gases when interpreting data generated during photoionization screening.

Standard Operating Procedure
Oil/Water Interface Probe

The Oil/Water interface probe is a portable hand-held, battery operated device for measuring depth to oil and to water. The probe can be used in catch basins and trenches, but is most frequently used in monitoring wells. The unit utilizes a dual sensing probe which has an optical liquid sensor and electrical conductivity probe to distinguish between water and hydrocarbons. The probe, at the base of the measuring tape, is the most important part of the instrument, therefore care should be taken to ensure that the probe is maintained in good condition. The interface probe is accurate to 1/32 of an inch. The unit is approved for use in Class I, Division I, Group D hazardous locations.

- Attach the grounding clip to a suitable earth ground. In most cases, a road box will provide the best ground.
- Turn the unit on by unfolding the crank handle away from the reel housing.
- Verify that the unit is in operation by pressing the test button on the face plate. If the power is on, the alarm will sound. A low battery light will indicate if battery replacement is necessary.
- Pull the protector tube outward from the reel casing to release the probe. To lower the probe, tilt the front of the reel housing forward and press the brake release, located on the front of the handle. The tape will pay out as long as the brake release is depressed. When lowering the probe toward the oil/water interface, care should be taken to ensure that the probe does not come in contact with the sides of the monitoring well or other surfaces which might damage the tape.
- Slowly lower the probe toward the interface such that minimal disturbance occurs when the probe comes in contact with the interface.
- When the probe contacts liquid, an alarm in the reel will sound. An oscillating tone indicates water while a solid tone indicates hydrocarbons. To determine the exact hydrocarbon thickness, the probe should be moved up and down so the alarm goes from no tone to solid tone. Measure the depth to the air/hydrocarbon interface by recording the depth indicated on the tape to the side of the road box or other fixed feature. Next, measure the depth to the hydrocarbon/water interface by lowering the probe slowly to the point at which the solid tone turns to an oscillating tone. The probe should be moved up and down so that the alarm goes from a solid to a oscillating tone. Record the depth by noting the measurement on the tape at the level of the road box.
- Subtracting the first reading from the second, gives the measured thickness of hydrocarbon
- After the measurement has been taken, snap the probe's protector tube shut, so that the wiper rests against the tape. The wiper ensures that no dirt or accumulated oil gets into the reel assembly. Reel the tape to a point at which the tape is visibly wet. Remove the remaining portions of the tape and probe by manually pulling the tape from the well and resting the tape and probe in a plastic bucket or other appropriate container. Decontaminate the tape and probe.
- When all the tape is reeled in, open the tube, reel the probe into the tube and close the tube. Turn the on/off crank to the "off" position and remove the grounding clip from the grounding surface.

Standard Operating Procedure
Digital Conductance, Temperature and pH Probe

The digital conductance, temperature and pH probe is a portable hand-held, battery operated device for measuring characteristics of water and other liquids*. The unit is not designed for use with non-aqueous liquids. The probe can be used in catch basins and trenches for monitoring wells.

The unit should be calibrated in the office prior to use in the field and should only be calibrated by persons familiar with the instrument.

Operating Instructions

- Rinse the inside of sample cup with liquid to be measured. (This is especially important if samples with a wide range of conductivity or pH are to be measured.)
- Fill sample cup. CAUTION: THE MAIN BODY IS NOT WATER-PROOF, THEREFORE DO NOT SUBJECT THE UNIT TO SPLASHING WATER
- Fill sample cup at least 2/3 full. If the sample is hot boiling water, allow to cool to 160°F, or below.
- Slide the right hand function switch to "TEMP" and push the "READ" button. If temperature reading is not stable, empty & refill cup several times to bring cup and sample to the same temperature. Read the temperature on the digital display panel and adjust both temperature compensation knobs accordingly
- If the approximate conductance is known, slide the left hand range selector switch to the proper range.

  Example: If you expect the sample to be around 2000 micromhos, slide the left hand selector switch to x1000.

- Slide the right hand function switch to "COND" and push the "READ" button. Multiply the digital display reading by the factor indicated by the position of the left hand range switch to determine conductance.

  Example: A display reading of 1.00 with the left hand range selector switch indicating x1000 is:
  1.00 x 1000 or 1000 μ/cm

  Note: If a single "1" appears on the left hand side of the digital display, the sample conductance is higher than the selected range. Slide the left hand (range) selector switch in one step intervals until a 3 or 4 digit display appears. Conversely, if a decimal display appears (such as 0.11) move the range selector switch to the left until a 3 or 4 digit number, 1.00 or larger, appears on the display. This puts the unit in a range affording the best accuracy. Caution: A single "1" always means that the conductance is higher than the selected range.

- Slide the right hand function selector switch to "pH".
- Insert the pH cable connector onto the tester. Push on and twist clockwise.
- Remove the tape from the plastic storage cap and Remove the plastic storage cap <u>slowly</u>.
- Place the pH electrode in the sample cup or any non-metallic container holding the remainder of the sample to be measured. If you use the tester's sample cup, you will have to hold the electrode.

Press the "READ" button: pH value will appear on the digital display.

- Always obtain conductivity reading before placing pH probe in sample cup. pH probes tend to carry contamination over into the sample.

* Review specifications and limitations of the probe, outlined in the owner's manual, before using the probe to measure characteristics of anything other than water.

Standard Operating Procedure
Sample Preservation and Chain of Custody

This protocol is designed to ensure that proper techniques are employed in the preservation and chain-of custody of samples collected for laboratory analyses or for screening. This Protocol is intended to be consistent with Massachusetts Publication #WSC-310-91 (Standard References for Monitoring Wells), and 40 CFR 136 (Guidelines Establishing Test Procedures for the Analysis of Pollutants).

The results of screening and/or laboratory analysis of solid, liquid or gaseous media constitute the basis of evaluation of the majority of the disposal sites under investigation. It is therefore imperative that the preservation of the samples be appropriate to the media being analyzed as well as the analysis which is being performed. In addition, the integrity of the sample is dependent upon the premise that a clear chain of responsibility for the sample integrity has been maintained. Without this "Chain-of-Custody", the integrity of the laboratory results may inevitably come into question.

The preservation and Chain-of-Custody (COC) protocols outlined in the following paragraphs are not intended to be all inclusive, and this protocol is written with the understanding that the sampling of certain media or analyses may require specific sample preservation. This protocol is, however, intended to cover the majority of the media and analyses performed as well as the COC procedures employed at the majority of waste disposal sites.

A COC program must be followed during sampling and handling activities from the field through laboratory operations. This program is designed to assure that each sample is accounted for at all times. Field data sheets, COC records, and sample labels must also be completed by the appropriate sampling and laboratory personnel for each sample. The objective of the sample custody identification and control system is to assure, to the extent practical, that:

- all samples are uniquely identified;
- the correct samples are analyzed for the correct parameters and are traceable through their records;
- important sample characteristics are preserved;
- samples are protected from damage or loss;
- any processing of samples (e.g., filtration, preservation) is documented; and
- client confidentially is maintained.

A sample is considered under a COC if it meets all of the following criteria:

- the sample is in your custody,
- the sample is in your view, after being in your possession,
- the sample is in your possession and then you locked it up to prevent tampering, and
- the sample is in a designated, secured area.

The following paragraphs outline GEC's preservation and COC protocol.

1) Prior to initiating any work, the Health and Safety Plan developed for the specific site activities should be reviewed by all field personnel. The indicated measures on the Plan should be enacted prior to initiation of any sampling activities. Any concerns not addressed in the Plan are to be brought immediately to the attention of the Health and Safety Officer. Personnel participating in the excavations will dress with protective equipment appropriate for the anticipated conditions.

2) Sample integrity is assured by use of containers appropriate to both the matrix to be sampled and the analytes of interest. Sample containers must be prepared in the laboratory in a manner consistent with USEPA protocols. Unless the proper sample bottle preparation and sample preservation measures are taken in the field, sample composition can be altered by contamination, degradation, biological transformation, chemical interaction, and other factors during the time between sample collection and analysis. Prior to sampling GEC personnel will ensure that the sample containers obtained from either a laboratory or a commercial supplier have been prepared in accordance with DEP and EPA protocols. Sample containers are to be used once and discarded. Under no circumstance should a soil, water or gaseous media which has been collected for analysis be placed in a previously used sample container unless that container has been recleaned and preserved by a certified laboratory.

   As part of the COC protocol, sample containers should have prepared labels for each sample. The label should include sample identification, date and time of collection, sample parameters to be analyzed, any preservatives used, and the name of the sample collector.

   Upon collection of the sample(s), documentation of chain of custody (i.e. COC form) should be initiated and should include at least the following:

   - date and time of sampling;
   - sampling locations;
   - sample bottle identification;
   - and specific sample acquisition measures.

   The COC and sample description requires:

   - a unique identification of each sample;
   - the name(s), address(es) and telephone number(s) of the sampler(s) and the person(s) shipping the samples and all subsequent transfers of custody;
   - the type and method of analyses requested;
   - the date and time of sample collection and transfer of custody; and the name(s) of those responsible for receiving the samples at the laboratory.

3) In some cases, field filtration of samples may be required. Information regarding the method of filtration should be determined in advance and communicated to the laboratory. Filtering of any sample collected for organic analysis should be avoided. Decanting of a liquid media is a preferred method for the removal of particulate matter. When field filtering is required, an appropriate filter medium must be selected to avoid potential sample contamination during the filtering process.

4) Sample holding times are specified for the initiation of chemical analyses, usually beginning at the time of sample collection but occasionally beginning at the time of sample receipt at the laboratory. This determination must be made prior to sampling to allow proper logistical planning for sample shipments. Holding times also vary with the regulatory basis under sampling take place in order to properly schedule work.

5) Sample containers are most often packed in plastic, insulated "coolers" for shipment. Bottles are to be packed tightly so that only minimal motion of the sample containers is possible. Materials which are considered to be highly hazardous may require special handling and packing for shipment. Ice, or a similar heat transfer fluid, should be placed over the top of the sample containers and should be placed within a water tight plastic bag to assure that the samples are kept as dry as possible. In addition, all applicable paper

work should also be enclosed within a second water-tight bag and included in the cooler. The sample cooler should then be taped shut.

6) Upon receipt of the samples at the laboratory, any laboratory identification numbers should also be included on the COC form. Finally, those responsible for receipt of the samples should be indicated on the COC form as well as the date and time of the sample drop-off.

Standard Operating Procedure
Free-Product Bail-Down Test (Slug Out Test)
Using a Bucket-Type Bailer

This protocol describes the field methods employed for gathering data to determine the mobility and "true thickness" of light non-aqueous phase liquids (LNAPL) by means of the free product bail-down test. By definition, a bail test infers instantaneous reduction in the product/water level in a given observation well and then subsequently gauging the recovery of the product/water level with time recorded. The method of interpreting the product/water level versus time data that arises from bail-down tests depends on a number of variables and is beyond the scope of this operating procedure. It is the purpose of this protocol to provide the field engineer with a standard guide for use in performing the initial data accumulation. It is the responsibility of the project engineer or geologist to determine if the data reduction method is applicable to a subject site and to understand the limitations of this procedure. NOTE: The product bail-down test is not appropriate in observation wells where the static petroleum thickness is less than approximately 0.5 feet.

By the nature of this test, free-phase liquids are being removed from a ground water observation well. It is the responsibility of the field engineer to assure that all liquids removed from the observation well are handled and disposed in an appropriate manner. Further, it is the responsibility of the field engineer to assure that appropriate personnel protective equipment is being worn, in accordance with a site-specific health and safety plan.

In the following discussion of field procedure, the following assumptions are made:

- Monitoring wells will be suitable for the product baildown test.
- Product removal from the well will be accomplished through the use of a bailer.
- Petroleum and groundwater recovery will be measured through the use of an electronic interface probe.

1) The initial procedure in the performance of a bail test is the measurement of the static product level (H_{oil}), water level (H_{water}) and the total depth (TD) of the observation well. With the two measurements the total volume of water in the observation well is defined.

2) The field notebook should be prepared with the formation of a three-column table or preparation of a Baildown Recovery Test worksheet. One column is for recording the recovery time elapsed, the second column is to record the depth to the rising product level, and the third is to record the depth of the rising water level.

3) The evacuation of the static product within the well should be performed with a transparent or semi-transparent bailer so that the thickness of product being removed can be monitored. The goal of the purging is to instantaneously remove all of the product present in the well. Purging is conducted by repeatedly lowering the bailer to the top of the oil surface, *plus* the measured or observed thickness of the petroleum layer, removing the bailer from the well and emptying the bailer contents into an appropriate container. Purging should be performed until the observed thickness of the product in the bailer is less than approximately one inch or the well has been purged dry.

4) Once the last bailer is removed, a stopwatch is started, the interface probe with a

graduated tape is immediately placed into the well and the depth to both the oil water interface and the oil air interface are measured. The field engineer is responsible for recording the depth to the oil/water interface, depth to the oil/air interface, and the time elapsed since the start of the test, in the field notebook. The depth to the oil/water interface, oil/air interface and elapsed time are repeatedly measured and recorded until such time as the oil level has returned to within 5% of its original level. The nature of the product baildown test requires that the frequency of measurement be as high as possible. As such, it is important to record the oil/water level, the oil/air level and the time elapsed as frequently as possible throughout the performance of the test

Standard Operating Procedure
Surface Water Sampling

This protocol is designed to ensure that proper techniques are used, safety is considered and quality assurance maintained during the performance of surface water sampling. A GEC representative is assigned to oversee and/or perform all surface water sampling for the project.

Sampling of surface water is a primary means of determining the chemical characteristics of a surface water body. Surface water bodies typically include streams, rivers, lakes, bays and ponds, but may also include drainage swales, lagoons, (surface water impoundments) or surface waste streams. It is imperative that care be taken and documentation be provided regarding the sampling performed, as well as conditions and special techniques utilized during the performance of the sampling.

Procedures for performance of surface water sampling are outlined in the following paragraphs:

1) Prior to initiating any work, the Health and Safety Plan developed for the specific site activities should be reviewed by all field personnel. The indicated measures on the Plan should be enacted prior to initiation of the boring activities. Any concerns not addressed in the Plan are to be brought immediately to the attention of the Health and Safety Officer. Personnel participating in the sampling will dress with protective equipment appropriate for the anticipated conditions. In addition, sampling of surface water bodies may involve additional concerns, including drowning and hypothermia.

2) Prior to sampling information regarding the location and characteristics of the subject water body should be documented. These characteristics include the estimated width and depth, color, elevation, as well as estimated flow and velocity. If possible, the location of sample collection should be flagged in the field. In order to maintain sample quality and minimize water body turbulence, where a current, or flow, is present in the water body, samples should be collected in an order from the most-downstream location to the most-upstream location. The location of sample collection within the surface water body will be highly dependent upon the intended purpose of the sampling event. Consideration should be made regarding the intended purpose of the sampling and the specific sample location within the surface water body which will yield the desired sample results. Accurate documentation should be included in the field notebook regarding the depth of sample collection, means of sample collection, as well as alterations to the water body which were made to facilitate sample collection. For example, collection of slow moving liquids or leachate may require that a small excavation be performed and that leachate be permitted to flow into the excavation.

3) Decontaminate all equipment to be used in the performance of the activities. Decontamination should be conducted in accordance with the most applicable standard operating procedure.

4) Sampling of surface water bodies is typically performed utilizing one of two techniques. The first involves the direct immersion of the sample container in the surface water body. The second method involves collecting the sample in a temporary sample container and transferring the contents of the container into a sample jar or vial.

   When utilizing a temporary sample container, sampling will be conducted only with clean, decontaminated sampling equipment (i.e. Teflon or stainless steel sampling bailers or with clean disposable bailers). If disposable bailers are used, the bailers shall not be re-used for any purpose. In addition, disposable gloves are worn for each individual sampling event and line used to support the sampling equipment is to be discarded after each sampling event. Care should be taken to ensure that the string and sampling equipment do not come in contact with the ground or other potential contaminant sources.

5) Where applicable, carefully and slowly transfer the contents of the bailer into appropriately preserved, pre-labeled containers. Check that the sample containers seal properly and that the cap is sealed tightly. Record applicable information in the field logbook and complete all chain-of-custody documents.

6) Discard string and discard or decontaminate the bailer appropriately.

Standard Operating Procedure
Survey of Observation Wells and Significant Features

The primary purpose of surveying is to provide a permanent record of the location of significant features and to develop plans, including those of the groundwater surface. All observation wells and water table elevations must be surveyed in the field. Surveying includes the measurement of both location and elevation of groundwater and other important features. Accurate measurements are important in all cases, but are paramount in areas where wells may be difficult to locate in the future, or where the groundwater gradient may be particularly shallow. It is recognized that the survey of observation wells by GEC personnel will not, and should neither be represented or construed to be, as accurate as a survey which would be prepared by a Registered Land Surveyor.

NOTE: A field book, denoting the approximate locations of major features, is important for the purpose of detailing the survey measurements made in the field. In the absence of sophisticated surveying equipment, the horizontal location of wells and other major features is most effectively accomplished through either taping the distance from wells to major features of known location, or by using stadia.

Surveying should be accomplished through the following steps.

1) Choose a benchmark which is, and will remain, stationary for a reasonable period of time (years) and mark the spot with paint. Do not use road or gate boxes as a benchmark. Concrete transformer pads or street light bases generally make good benchmarks.

2) Set up the leveling instrument and the tripod at a location higher than the benchmark and with a direct line of sight to the benchmark, as well as several of the features to be surveyed. Ideally the leveling instrument should be set up in an area where the chances of the instrument being disturbed by pedestrian or vehicular traffic is minimal. Once set-up, the leveling instrument should not be left unattended.

3) The leveling instrument should be accurately leveled by first extending and firmly tightening the stand's legs. The legs should then be maneuvered such that the leveling instrument is roughly level.

4) Once roughly leveled, precise leveling should be accomplished using the leveling features on the survey instrument itself. Accuracy of the leveling instrument should be confirmed by viewing the "leveling bubble" as the survey instrument is rotated in several different azimuth directions.

5) The leveling instrument cross-hairs should be focused such that they form thin and well defined lines when observed through the view finder.

6) Using the rod tripod or a rodman, place the base of the stadia rod on the benchmark and extend the rod vertically. It is often helpful to use a pocket transit (Brunton Compass) and assistance from a distant observer (the person manning the leveling instrument) to ensure that the stadia is vertical.

7) Sight with the instrument to the rod and record the height of the instrument (Height), i.e. footage as viewed at the cross hairs to the nearest 0.01 foot. Note: some leveling instruments are equipped with distance measuring cross hairs. These usually appear as smaller cross hairs equidistant above and below the primary cross hairs. If these secondary cross hairs are present on the instrument being used, the height, as viewed through these secondary cross hairs should also be determined as a means of double checking or confirming primary measurements i.e. the primary measurement should be the mean of the two secondary measurements. Also, record the azimuth of the instrument.

8) Place the base of the rod on a significant feature or on the inner tab of any well roadbox or the

designated point surface on any well and extend the rod vertically. Note: the designated point surface should be permanently with an indelible marker or a dab of paint, if possible.

9) Sight with the instrument to the rod and record the footage in the same manner as listed in Step 7.

10) Repeat Steps 8 and 9 for all of the wells and significant features which can be viewed from one fixed location. Note: for larger sites it may be necessary to "link" several sightings in series in order to collect information for all features.

11) If the true elevation of the benchmark is not known, the benchmark should be assigned an arbitrary elevation of 100.00 feet. All other elevations should be calculated relative to the 100.00 foot benchmark elevation.

12) If several locations are linked the survey should be completed such that several points are measured from multiple locations. The results of the survey should then be calculated and elevation measurements from duplicate sampling points compared. If comparison of duplicate measuring points indicates measurement error the site should be resurveyed.

Standard Operating Procedure
Boring/Well Installation

This protocol is designed to insure that proper techniques are used, safety is considered, and quality assurance maintained during soil boring and well installation.

- DIGSAFE, municipalities and the owner are contacted prior to any soil boring or well installation to minimize chances of damaging underground utilities (DIGSAFE contacts utility companies to mark the location of utilities to the site). The Geologist or Inspector surveys the site visually for markings delineating the location of underground utilities. If warranted, the inspector modifies the drilling program to compensate for field conditions.

- The Geologist or Inspector continuously monitors all drilling activities and is responsible for maintaining independent field notes, well logs and ensuring that proper procedures are followed.

- Drilling equipment is steam cleaned prior to use in any boring and between borings (if necessary), to minimize potential cross contamination. At a minimum the following pieces of equipment are steam cleaned: augers, cutting heads, samplers, drill rods, and forks. The working end of the drill rig is also cleaned and inspected for evidence of hydraulic fluid or diesel fuel leaks.

- Subsurface soil samples are collected at a minimum of five foot intervals in accordance with standard ASTM methods for split spoon sampling. After logging soil characteristics, samples are collected. Two samples are placed in clean jars with an aluminum bladder below the lid for head space screening. Soil sample screening is performed in accordance with the GEC Jar Headspace Screening procedure. Samples with elevated readings (< 10 ppm) soil are quickly transferred into two clean VOA vials with Teflon liners. The vial is half filled and soil particles are removed from the lip of the vial to assure a proper seal with the lid. All samples are labeled in accordance with the GEC standard labeling identification system and handled/stored in compliance with USEPA protocols.

- The split spoon sampler is decontaminated in accordance with GEC's Decontamination Protocol after sample retrieval and it is steam cleaned between borings. The Geologist may increase the frequency of steam cleaning as necessary.

- All cuttings from drilling remain on the subject property. If cuttings are designated as uncontaminated fill, via headspace screening, and the boring is not completed as a monitoring well the cuttings are used as backfill. Any drill cuttings not returned to boreholes will be stockpiled on and covered with heavy plastic (3-5 mil.) to prevent runoff. Stockpiled soils will be sampled and analyzed to determine the proprer disposal.

- Monitoring well screens are set to depths adequate for the required sampling. Monitoring wells are typically constructed with a silica sand filter surrounding and extending a few feet above the screen. The screen extends at least one to two feet above groundwater. The riser extends from the top of the screen to ground level, has a bentonite pellet seal above the screened interval, a cement seal and protective cover at the surface. No glues or solvents are employed in the well construction.

- Soil Logs are to be maintained by the Geologist and should contain the following:

  - Date and Location of boring/well
  - Drilling contractor
  - Job number
  - Depth of sampling
  - Boring number

- Depth to well point.
- Soil description includes; soil colors, grain size from greatest percentage to lowest, rock fragments, obvious fill constituents, staining, and odor if obvious.
- Changes in soil strata and elevation of the water table are also noted.

Standard Operating Procedure
Turbidimeter

The turbidimeter is a portable, battery or AC operated device for measuring the turbidity of water samples. The turbidimeter measures the turbidity, or cloudiness, of water caused by light scattering particles suspended in the water. These suspended particles may also have a significant affect on laboratory results. Therefore, in some cases, knowledge of turbidity is critical to understanding water chemistry and the presence of potential contaminants.

To determine turbidity, the turbidimeter emits a beam of light into the water sample. The light is scattered by particles suspended in the water sample and the scattered light is detected in one of three sensors. By the nature of how the instrument works, it is obvious that maintaining the cleanliness of the turbidimeter and sample containers is critical to obtaining accurate results.

NOTE: The calibration technique outlined below uses "secondary standards". The turbidimeter should also be calibrated in the office using "primary standards" on a regular basis.

Meter Set-up

- Place the turbidimeter on a flat, stable surface away from vibrations and direct sunlight.
- Push the wall plug adaptor plug into the jack on the turbidimeter.
- Plug the wall plug adaptor into an AC outlet.
- Turn the turbidimeter on with the power switch. Allow at least five minutes warm up before doing any measurements. Portable turbidimeters are supplied with batteries. Follow the above procedure when using the wall plug adaptor or skip the first two steps when using battery power.

Cuvette Preparation and Instrument Calibration

- Pour at least 5ml of sample (Approx. 1/2 inch) into the cuvette. Cover with a cuvette cap. Tilt the cuvette to rinse the entire inside surface of the cuvette and cap. Pour the liquid out. Shake out remaining liquid. Repeat at least one more time. Care should be taken not to touch the glass portions of the cuvette. Hold the cuvette by the Teflon cap.
- Sample volume should be kept constant for accurate results. Fill the cuvette to the level of the alignment mark with sample. Place the sample cap securely on the cuvette before cleaning the outside.
- Cleaning the outside of the cuvette is critical. Use a lint free cloth and a cleaner such as alcohol that will evaporate. Avoid touching the area below the mark as fingerprints will distort the turbidity reading. Using a dry tissue alone is not adequate for removing fingerprints and oils and will cause inaccurate readings.
- All cuvettes are aligned and marked at the factory. To eliminate errors due to irregularities in the sample cuvette and standard cuvette glass, it is important to establish the correct alignment of each cuvette in the test well. This will insure consistent and accurate readings.
- Before inserting the secondary (sealed) standards into the test well clean the outside with a soft tissue or cloth and glass cleaner. Hold the cuvette by the cap and avoid touching the glass. When not being used the secondary standards should be stored where they will not be scratched or broken.
- Set the range switch to 0-20.0 NTU.

- Insert the 10 NTU secondary standard into the test well and line up the alignment marks on the cuvette and test well.

- Always clean the secondary standard with alcohol before taking reading.

- Cover the cuvette with the light shield and use the SET/CAL control to set the display to the calibrated NTU value of the 10 NTU secondary standard.

- Remove the 10 NTU standard and change the range switch to 0-2 NTU.

- Insert the 0.5 secondary standard into the test well. Line up the alignment marks of the cuvette and test well.

- Note the calibrated NTU value obtained for the 0.5 NTU secondary standard when it was calibrated to the primary standards.

- Cover the cuvette with the light shield and turn the zero NTU adjust screw until the display reads the calibrated NTU value of the 0.5 NTU secondary standard.

- Remove the 0.5 NTU standard.

- Set the range switch to 0-20.0 NTU.

- Insert the 10 NTU secondary standard, align and cover.

- The SET/CAL adjust may require a slight adjustment. Set the meter to read the NTU value of the sealed standard.

  The turbidimeter is now calibrated to the secondary standards which are calibrated to the primary standards. You can proceed to measure unknown samples.

Use of the Turbidimeter

- Note: Condensation on the cuvette will cause the false readings. If the sample is colder than the area it is being measured in, allow the temperature to equalize.

- Thoroughly shake the sample. Allow the air bubbles to disappear and large sediment to settle prior to pouring the sample into the cuvette.

- Use a clean (inside and out) cuvette which has been aligned and which has no scratches.

- Rinse the cuvette and cuvette cap as follows: Pour at least 5ml of sample of standard into the cuvette. Cover with a cuvette cap. Tilt the cuvette to rinse the entire inside surface of the cuvette and cap. Pour the liquid out. Shake out remaining liquid.

- Repeat the rinse at least one more time.

- Slowly pour the sample (unknown) liquid against the side of the cuvette to avoid forming air bubbles. Fill to the alignment mark.

- Place the cap securely on top of the cuvette.

- After pouring an unknown sample it is recommended, when possible, to immerse the cuvette in an ultrasonic bath for 1 or 2 seconds to cause complete bubble release. Do not do this with standards.

- Clean the outside of the cuvette with a lint free tissue or cloth and glass cleaner (alcohol). Avoid touching the area below the mark as finger prints can greatly distort the turbidity reading. Using a dry tissue alone is not adequate for removing fingerprints and oils and will cause inaccurate readings.

- Set the range switch to 0-200 NTU, insert the sample cuvette, align the cuvette in the test will and cover with the light shield. Switch to the lowest NTU range for which there is a displayable reading and read the NTU value of the sample.

Measurement Guidelines

- Always use the same cuvette for the standard and the sample when calibrating with primary standard as long as it remains scratch free. Remember no two cuvettes have identical characteristics.

- Keep cuvette clean from dust and scratches. Handle cuvette so that no fingerprints can get on the area below the level mark.

- Make sure the cuvette is indexed and it is aligned in the test well before taking any readings.

- Insure that the turbidimeter has been turned on for at least 5 minutes prior to use.

- Before adding a standard or sample into a cuvette, rinse the cuvette switch with 5ml of the current liquid to be tested. This removes the effects of the previous liquid and any dust or foreign matter that may have found its way into the cuvettes while not in use.

- Gently pour the liquid to be tested down the side of the tilted cuvette. This reduces air bubbles that distort readings. When using AEPA-1 standards, if air bubbles are present allow the cuvette to sit for 10 minutes and/or gently tap the side of the cuvette prior to use as it settles out quickly.

- If the sample water to be tested is cold you must allow it to warm up to room temperature before testing. Cool liquid in a warm turbidimeter chamber will cause the cuvette to fog up, which will distort the reading.

Standard Operating Procedure
Observation Well Development

Subsequent to well installation, and prior to sampling or surveying, an observation well must be thoroughly developed. Well development is critical to the success and integrity of later sampling activities and to the life span of the well. Primarily, two techniques are appropriate for the needs of site investigation and groundwater monitoring. Both methods involve reversals, or surges, in flow to prevent clogging of the filter pack which is common where flow is continuous in one direction. Either a decontaminated pump or bailer or both may be used to surge the well and to remove water which may have been in contact with the drilling apparatus. If a pump is used, a source of clean water is necessary to pump down the well. Water should be alternately pumped out of and into the well until water removed is essentially clear, or of constant minimal turbidity. If the well is to be developed with a bailer the following steps will be performed.

1) Gauge the depth to water/product and the depth to the bottom of the well

2) Based on these measurements calculate the volume of water equal to one well volume.

3) Using a precleaned bailer and clean string, repeatedly plunge the filled bailer up and down within the well and periodically remove the water from the well. Water removed from the well should be discarded in a manner consistent with environmentally sound practices.

4) Periodically (approximately once every five bails) dispense the contents of the bailer into a clean one-liter glass container. Using the electronic TLC probe, determine the temperature and conductivity of the water being removed from the well. Once the temperature and conductivity have been determined discard the contents of the jar appropriately.

5) Steps 3 and 4 should be repeated until the following three conditions have been met: 1) three well volumes of water have been removed from the well; 2) temperature and conductivity levels do not vary more than approximately 10% between measurements, and 3) groundwater being removed from the well has a consistent minimal turbidity.

Samuel W. Butcher
Vice President, Operations

Education

Brown University,
M.Sc. Geology, 1988

Skidmore College
B.A. Geology, 1986

Certifications

Certified Ground Water Professional (CGWP), National Ground Water Assn. (AGWSE)

Licensed Site Professional Masachusetts (#9185)

Additional Training

Tufts University -
Post-graduate study - Hydrology

MODFLOW (USGS Modular Flow Model) for Simulation of Ground Water and Advective Transport, NGWA

Visual MODFLOW, NGWA

OSHA Hazardous Waste Site Worker Training (40 Hours)

OSHA Waste Site Supervisor Training (8 Hours)

Professional Affiliations

National Ground Water Assn.

Geological Society of America

Seminars

University of Massachusetts
Contaminated Soil Remediation

American Petroleum Institute
Assessment, Control and Remediation of LNAPL Contaminated Sites

Senior Project Manager / Senior Hydrogeologist

- Samuel Butcher has over seven years of experience in environmental site investigation and assessment. He manages projects involving complex geologic and/or hydrologic conditions. Specializes in subsurface investigations associated with remedial response activities and site investigations. Also manages investigation, assessment and closure of underground and above ground storage tanks.

- Manages projects to determine subsurface soil and bedrock as well as aquifer and contaminant transport characteristics. Also responsible for ground water modeling projects.

- Conducted numerous site assessments at industrial, commercial, and military facilities throughout New England. Studies included geologic and hydrologic assessments, hazardous waste evaluations, underground storage tank removals, installations and management plans as well as geophysical investigations and emergency response activities.

Recent Work

- Initial Site Assessment, plume delineation, potential source identification and Risk Characterization of multi-media, multi-contaminant releases at a former manufacturing facility. Assessment included lithologic and hydrologic characterization of substrata, decommissioning of USTs, characterization of potential off-site sources and closure of facility

- Field testing, via pump tests and slug tests, to determine hydraulic conductivity of several hazardous waste disposal sites. Incorporation of field test results into design of remedial systems and construction of 3-dimensional groundwater models.

- Initial Site Assessment, source identification and Risk Characterization of releases of chlorinated compounds to subsurface soil and ground water. Included extensive characterization and assessment of subsurface soil and hydrology to determine extent of migration and migration pathways of free-phase chlorinated compounds.

- Supervision and oversight of underground storage tank and soil removal of approximately 25 tanks at military facilities in New England. Design of report format which is specifically requested in tank removal "Request for Bids".

PUBLICATIONS

1. Butcher S.W., 1989 "The Nickpoint Concept and Its Implications Regarding Onlap to the Stratigraphic Record" in Cross T.A. Quantitative Dynamic Stratigraphy, Prentice Hall, p. 375-385.

2. Butcher S.W., "Eight questions you should ask before buying a property with USTs" New England Real Estate Journal, November 24, 1989, p.22-24

3. Butcher S.W., 1993, "Recommended Approach for Subsurface Investigation and Model Development - Case History" Northeastern Geology v. 15, No. 2, p. 176-177

Paul T. Bartlett, P.E.
Vice President and Manager of Air Programs

Education

N.C. State University
B.S. Mechanical Engineering, 1966

Boston University
Courses in M.S. Administration Program

Relevant Training/Professional Registration

Registered Professional Engineer, Connecticut

EPA technical course training in air pollution control and combustion

Clark University, COPACE, Worcester, MA- Designed and taught an introductory course in Environmental Engineering

Membership

Air and Waste Management Association

Regulatory Compliance

- Paul Bartlett has over 25 years of technical, project management, and business development experience with multi-media (air, water, and hazardous waste) environmental programs for industry and government.
- Regional Engineer for Central Region Office, Air Quality Division, North Carolina's Dept. of Natural and Economic Resources where he directed a staff of engineers, scientists, and inspectors conducting source registrations, emission audits, permit negotiations, and public relations.
- Presently managing an air emissions compliance project for a coater who is a major source of VOCs and HAPs. Tasks include preparing source registration form and a comprehensive permit application, SARA Title III and MA TURA reporting, and negotiations with MADEP.
- Managed a cogeneration feasibility study to remove a foundry and manufacturing facility from the electrical grid. The study included developing a conceptual permit application that responded to emerging NOX RACT requirements under the Clean Air Act Amendments.
- Design and implementation of multi-media environmental audit and compliance programs for manufacturing/industrial clients throughout the United States, including due diligence audits for Thermo Electron Corporation during acquisitions.
- Site investigations of 30 industries in Connecticut and Oregon to determine O&M practices and resulting air emissions from normal operations and upset conditions.

Environmental Engineering

- He is experienced in the design, installation, startup, and performance/compliance testing of industrial ventilation, air pollution control, and industrial wastewater treatment systems.
- Specialist in separations technology for pollution prevention, process recycling, toxics use and waste minimization, and site remediation applications.
- He was the Vice President of Engineering during the startup phase of a company introducing a Heat Pump Evaporator (HPE) for process recycling and wastewater treatment. No CFCs were used in the refrigeration cycle and processing was under a vacuum to eliminate emissions to the atmosphere.
- Air quality/emissions evaluation and process redesign to reduce HAPs from a mercury processing mill. Modified solids conveyance and enclosure and redesigned induced draft fans for incineration.

- Process engineering assessment to reduce HAPs from a chlorinated dry bleach plant. Work included modifying calciner's end seals and operating temperature of NH3 burner and improving O&M practices.

List of Publications available upon request.

Eileen A. Furlong
Vice President, Waste Site Program

Education

Michigan State University
M.S., Limnology Option,
Department of Fisheries and
Wildlife, 1982

Southeastern Massachusetts University,
B.S., Marine Biology, 1978

Additional Training

Agency for Toxic Substances and Disease Registry
Health Assessment Training
Workshop

Harvard Educational and Resource Center, Hazardous Substance Training Program,
Risk Communication and the
News Media Workshop

Harvard School of Public Health, Harvard Center for Risk Analysis, Analyzing Risk:
Science, Assessment and
Management

General Sciences Corporation,
Soil and Groundwater Modeling
for Risk Assessment and Soil
Clean-up Level Evaluation

EPA Hazardous Waste Site
Worker Training (40 hours)

OSHA Hazardous Waste Site
Supervisor Training Course

Memberships

National Society for Risk
Analysis

Society for Risk Analysis -
New England Chapter

Boston Bar Association,
Environmental Law, Adjunct
Member

- Eileen Furlong is the Senior Toxicologist and V.P. of the Waste Site Program. She has 8 years of experience characterizing human health risks from multi-media contaminants at hazardous waste disposal sites. She has extensive experience conducting health assessments (environmental fate, human exposure, and toxicology) for Superfund sites.

- Manages personnel and directs projects involved in site assessment activities, fate and transport modeling, risk characterizations, and scopes of work, relative to MCP and MGL Chapter 21E.

Previous Work

- Massachusetts Department of Public Health. Conducted health assessments for Superfund sites per a cooperative agreement with the Agency for Toxic Substances and Disease Registry. Technical advisor to the Woburn Environment and Birth Study; represented the DPH at interagency and community meetings pertaining to Superfund sites. Responded to citizen concerns regarding environmental health issues.

- Department of Cancer Pharmacology, Dana-Farber Cancer Institute. Performed pharmacokinetic studies of alkylating agents in humans and animals; developed microanalytical techniques involving gas chromatography and high pressure liquid chromatography for alkylating agents and DNA damage products.

Recent Work

- Managed and implemented a Phase II-Comprehensive Site Assessment under MCP, as revised, for a petroleum release site. Phase II investigation included a Method 2 Risk Characterization consisting of 25 contaminants, a potentially productive aquifer, and a Method 3 Stage I Environmental Screening.

- Managed MCP response actions for an industrial site. Site had 52 contaminants and is located in an Interim Wellhead Protection Area and Area of Critical Environmental Concern. Conducted Numerical Rank System scoring for the site. Planned and directed the field investigation to support the Risk Characterization. Directed a Method 3 Risk Characterization, and conducted a Method 3 Stage I Environmental Screening. Site qualified for a Class B-2 Response Action Outcome, with an Activity and Use Limitation.

- Directed tank removal and MCP response action activities for an industrial site. Response actions included: 72-hour notification of release with verbal approval for an Immediate Response Action; implementation of IRA and preparation of IRA Completion Report; subsurface investigation; documentation of coal/coal ash as source of background; risk characterization; and preparation of a Class A-2 RAO.

- Provided litigation support for a lawsuit involving contamination at a former circuit board research and development site.

- Investigated the industrial toxicology of propylene glycol ethers and methylene chloride used in the printing facilities of a national newspaper syndicate.

PUBLICATIONS (partial listing)

1. "Consideration of Non-Routinely Monitored Hazardous Substances for the Health Assessment", Proceedings of the HMCRI Superfund 90 Conference (pp. 144-147). Furlong, E.A., Barry, T.A., and Condon, S.K., 1990.

2. "Health Assessment for Baird and McGuire, Norfolk County, Holbrook, Massachusetts", Agency for Toxic Substances and Disease Registry and Massachusetts Department of Public Health. Furlong, E.A., Barry, T.A., and Condon, S.K., 1990.

3. "Role of Environmental Fate and Transport Data in Health Assessments: A Case Study", Proceedings of the HMCRI Superfund 90 Conference (pp. 128-132). Ulirsch, G., Hayes, L., and Furlong, E.A., 1990.

4. "Health Assessment for Wells G and H, Woburn, Massachusetts", Agency for Toxic Substances and Disease Registry and Massachusetts Department of Public Health. Furlong, E.A., Condon, S.K., DiSirio, M., and House, L., 1989.

5. "Addendum to Health Assessment for Sullivan's Ledge, New Bedford, Massachusetts", Agency to Toxic Substances and Disease Registry and Massachusetts Department of Public Health. Furlong, E.A., Condon, S.K., DiSirio, M., House, L., 1989.

6. "Health Assessment for Sullivan's Ledge, New Bedford, Massachusetts", 1 bid., 1988.

7. "Production of dihydrothymidine stereoisomers in DNA by gamma irradiation", Biochemistry 25:4344-4349, Furlong, E.A., Jorgensen, T.J., Henner, W.D., 1986.

8. "Trihalomethane levels in chlorinated Michigan drinking water", Ecological Modelling 32:215-225, Furlong, E.A., D'ltri, F.M., 1986.

Parrish C. Smolcha
Environmental Toxicologist

Union College
B.S., Biology 1994

SUNY College of Environmental Science and Forestry
Continuing Ed., Organic Chemistry

Additional Training

OSHA Hazardous Waste
Site Worker Training
[Title 29 CFR 1910.120(e)(8)]

Hazard Communication Training
[Title 29 CFR 1910.1200]

American Red Cross - Adult CPR;
Standard First Aid

Memberships

Sigma Xi National Research Honor Society, Associate Member

Environmental Toxocologist

- Parrish Smolcha has over 2 years of experience performing Risk Assessments (RAs) under the Massachusetts Contingency Plan (MCP) and in conjunction with Remedial Investigations/Feasibility Studies (RI/FS) under CERCLA/SARA. These RAs include data evaluation; contamination assessment; exposure assessment for soil, groundwater, and air; environmental fate and transport assessment; toxicity assessment; and risk characterization.

Recent Work

- At a former industrial facility in eastern Massachusetts, assisted in the preparation of a Method 2 risk characterization under the MCP. Identified human and environmental receptors, exposure points and pathways, exposure point concentrations, and site soil and groundwater categories. Developed Method 2 soil and groundwater standards for several site-related constituents using MADEP protocol.

- At a junior high school in southeastern Massachusetts, conducted a Method 1 risk characterization under the MCP resulting in a Class B-2 Response Action Outcome Statement.

- At a newspaper printing and publishing facility in southeastern Massachusetts, conducted a Method 1 risk characterization under the MCP resulting in a Class A-2 Response Action Outcome Statement.

- At a Superfund site in eastern Massachusetts, assisted in the preparation of a Method 2 risk characterization under the MCP. Identified potential human and environmental receptors and developed Method 2 soil standards for several site-related constituents.

Previous Work

- At an industrial site in eastern Massachusetts, assisted in the preparation of a combined Method 2 / Method 3 risk characterization resulting in a Class A-2 Response Action Outcome Statement.

- At a RCRA facility in western Massachusetts, assisted in the development of a background sampling plan for soil and groundwater. The plan was consistent with MCP and Hazardous and Solid Waste Amendments (1984) protocols.

- Following MCP guidance, prepared a target constituent analysis for sediment and floodplain soil along a major river system in western Massachusetts. The analysis was used to identify "target" constituents present at concentrations that warranted further downstream sampling.

- Prepared a baseline RA for a major New York State utility in support of the conversion of a warehouse into a child daycare facility. Developed hypothetical future exposure scenarios for daycare children and adult workers and recommended remedial measures to mitigate potential exposure to lead-based paint.

David T. Montplaisir
Manager Site Assessments

Education

St. Lawrence University
B.S., Geology 1989

Additional Training

OSHA Hazardous Waste
Site Worker Training (40 Hours)

OSHA Hazardous Waste
Site Worker Training Refresher
(8 Hours)

OSHA Hazardous Waste Site
Supervisor (8 Hours)

Asbestos Abatement for Inspectors
(24 Hours)

Asbestos Abatement for Inspectors
Annual Review (8 Hours)

Asbestos Management Planning
Training (16 Hours)

Massachusetts Licensed Asbestos
Inspector / Management Planner

Disposal Site Investigations

- David Montplaisir has over 6 years of experience conducting environmental site assessments in support of MGL Chapter 21E, subsurface investigations, site characterizations, and geophysical studies.

- Areas of contribution include :

  MCP Phase I Disposal Site Characterization

  MCP Phase II Comprehensive Site Assessments

  MCP Phase IV Implementation of the selected remedial response

  Response Action Outcome Statements

  Emergency Response Actions including Immediate Response Action and Release Abatement Measures

- Conducts comprehensive (AHERA and Non-AHERA) Asbestos Inspections for commercial and industrial facilities. Provides management plans.

- GEC coordinator and site supervisor on subsurface site assessment projects and MCP projects.

- Selects appropriate instrumentation for use during site investigations, develops worker health and safety plans, directs field personnel on geophysical remote sensing projects, and trains GEC staff on current in-house sampling protocols.

- Supervises monitoring well installation, conducts soil gas surveys, collects soil and groundwater samples for field screening with photoionization detectors.

Recent Work

- Recently completed work on a Phase II Comprehensive Site Assessment. Two independent contaminant plumes were identified in the course of the study, including chlorinated solvents associated with dry cleaning operations. The site is located within a sole source aquifer. Future studies will concentrate on remedial alternatives.

- Completed Phase IV activities for a disposal site. Remedial Response Alternatives as described in Phase III Activities were implemented. GEC completed all Phases of the MCP for this site.

Jason Mauro
Environmental Engineer

Education

Northeastern University (Boston)
B.S. in Civil Engineering
1995

Certifications

OSHA Hazardous Waste Site Worker Training (40 hours)

Business/Regulatory Affiliations

Member, American Society of Civil Engineers

Member, Order of the Engineer

- Jason Mauro is an environmental engineer with GEC with a background in the petroleum industry and strong experience in remediation of petroleum product releases.

Remediation Experience

- Strong understanding of remedial systems, including, but not limited to, soil vapor extraction, groundwater pump and treat, and sparging systems.
- Involved in preliminary design of Soil Vapor Extraction and Groundwater Pump & Treat systems for the remediation of petroleum impacted media. Provided field management during the installation and start up of these systems, as well as, assistance in the construction of these systems. Construction activities included well installation, connection to wells, trenching, installation of necessary piping, remediation equipment installation (air strippers, blowers, carbon vessels, catalytic oxidizers), shed construction, and associated electrical work.
- Developed Operation and Maintenance manuals for SVE and Groundwater Pump & Treat systems.
- Conducted monthly site visits to perform system maintenance including troubleshooting, making necessary adjustments to the system in order to maintain efficiency, and repair system when necessary. Repairs included replacing valves, rerouting of air stacks, cleaning out iron clogged air strippers, repairing faulty pumps, repairing damaged wells, and any associated electrical work.

Environmental Engineering

- Developed spreadsheets to track SVE system efficiency, including mass removal(s), and fuel consumption.
- Field experience in groundwater and soil sampling and well monitoring.
- Field engineer for the removal and installation of underground storage tanks. Designed and oversaw the installation of dewatering activities for projects taking place in coastal or high water table areas. Dewatering activities included the installation of tongue and groove sheet piles and whalers, pumps to remove the water, temporary treatment systems for contaminated water, permitting required to reinject water back into the ground via reinjection wells or to dispose of water via municipal storm sewer.

Field engineer for EPA retrofits to existing underground storage tanks. Retrofits included the installation of spill containment measures around fill pipes, sump pumps, and product dispensers. Also included was the installation and start up of modern leak detection equipment.

Project Manager for the demolition and rebuilding of a gasoline service station. Demolition activities included asbestos removal, the removal of USTs, associated piping, dispensers and hydraulic lifts in repair area. Responsible for the coordination of contaminated soil removal. Oversaw dewatering activities and temporary pump and treat system. Field engineer for installation of new building footings and pre-fabricated building. Responsible for the installation of new USTs, piping, and product dispensers. Field Engineer for the start up of UST leak detection system and construction punch list items.

Current Responsibilities

- Responsibilities include conducting environmental site assessments in support of MGL Chapter 21E and subsurface investigations.

- Performing field work, including groundwater and soil sampling for laboratory analysis, well monitoring, and site remediation.

Heather A. Boyd
Environmental Scientist

Education

University of New Hampshire
B.S., Environmental Affairs,
Minor, English, 1996

Additional Training

Asbestos Inspector
24 Hour Training, 1997

Experience

- Heather Boyd has extensive experience in reviewing local and state regulations in order to assist clients with various compliance issues.
- She has had experience in researching properties at local and state agencies for relevant issues within the scope of MGL Chapter 21E, ASTM Standard E1527-94, and the Massachusetts Contingency Plan (MCP).
- She has experience in conducting Phase I Environmental Site Assessments.
- She has had experience in identifying, inspecting and assessing asbestos containing materials (ACM) at residential, commercial and industrial properties.
- She has experience in the sampling of monitoring wells and topographic surveying.
- She is skilled at formatting clear and precise tables, and in developing organized written documents.

Recent Projects

- Assisted in the sampling of monitoring wells and topographic surveying of two commercial properties. Also completed local file searches on the subject sites for relevant information to be included in Subsurface Investigation Reports.
- Conducted a Phase I Environmental Site Assessment for a 481-acre parcel of land.
- Completed Environmental Transaction Screenings and Environmental Site Assessments for various commercial and residential properties in Massachusetts, Rhode Island, and New Hampshire for issues within the scope of MGL Chapter 21E, ASTM Standard E1527-94, and the Massachusetts Contingency Plan (MCP). The purpose of the assessments were to identify and define recognized environmental conditions arising from the use, disposal, or release of oil or hazardous materials (OHM) on the subject site and abutting properties.

APPENDIX B
Health and Safety Plan

HEALTH AND SAFETY PLAN

GEC has prepared a site-specific Health and Safety Plan designed to protect personnel involved in the performance of investigatory and remedial activities at the site. This plan addresses health and safety concerns that may be encountered during the sampling and investigation activities proposed in this work plan. The Health and Safety Plan should be updated in the event that additional information regarding site contaminants is encountered or in the event that activities not specified in the plan are conducted.

The Health and Safety Plan, included with this Work Plan, does not specifically address health and safety issues associated with personnel not conducting the site investigation but who may be working at the site. Contamination at the site is limited to the presence of metals and volatile organic compounds in subsurface soil and groundwater. As such, the plan is protective of those likely to come in contact with subsurface soil and/or groundwater; i.e. those conducting the investigations. During investigation of remedial activities, GEC will establish an exclusion zone, within which only personnel covered by the health and safety plan will be permitted.

The Health and Safety Plan has been prepared in accordance with 29 CFR 1910 and all other applicable standards by a Health and Safety Professional.

Community Air Monitoring Plan

Real-time air monitoring for volatile compounds and particulate levels at the perimeter of the work area is necessary. The plan must include the following:

- Volatile organic compounds must be monitored at the downwind perimeter of the work area on a continuous basis. If total organic vapor levels exceed 5 ppm above background, work activities must be halted and monitoring continued under the provisions of a Vapor Emission Response Plan. All readings must be recorded and be available for State (DEC & DOH) personnel to review.

- Particulates should be continuously monitored upwind, downwind and within the work area at temporary particulate monitoring stations. If the downwind particulate level is 150 $\mu g/m^3$ greater than the upwind particulate level, then dust suppression techniques must be employed. All readings must be recorded and be available for State (DEC & DOH) personnel to review.

Vapor Emission Response Plan

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the work area, activities will be halted and monitoring continued. If the organic vapor level decreases below 5 ppm above background, work activities can resume provided:

- the organic vapor level 200 ft. downwind of the work area or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. When work shutdown occurs, downwind air monitoring as directed by the Safety Officer will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

Major Vapor Emission

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the work area, then the air quality must be monitored within 200 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If efforts to abate the emission source are unsuccessful and if the following levels persist for more than 30 minutes in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be placed into effect;

- if organic vapor levels are approaching 5 ppm above background.

However, the Major Vapor Emission Response Plan shall be immediately placed into effect if organic vapor levels are greater than 10 ppm above background.

Major Vapor Emission Response Plan

Upon activation, the following activities will be undertaken:

1. All Emergence Response Contacts as listed in the Health & Safety Plan of the work plan will go into effect .

2. The local police authorities will immediately be contacted by the Safety Officer and advised of the situation.

3. Frequent air monitoring will be conducted at 30 minute intervals within the 20 Foot Zone. If two successive readings below action levels are measured air monitoring may be halted or modified by the Safety Officer.

HEALTH AND SAFETY PLAN
GOLDMAN ENVIRONMENTAL CONSULTANTS

SITE DESCRIPTION

Date of Original Plan: 9/30/94

Project Number: 444-006-94

Date of Revision: 8/18/97

Site Name: Jameco Industries, Inc.

Site Address: 248 Wyandanch Avenue
Wyandanch, New York

Site Conditions: Industrial facility with unpaved and paved areas.

Entry Objectives: Slug tests; drilling operations; soil and groundwater sampling; excavation activities including but not limited to; test pitting, UST removals, contaminated soil excavations and stockpiling, and trenching; and the installation and operation of remedial systems.

Sketches Attached: Yes ☐ No ☒

Is this a disposal site as defined under the Massachusetts MCP or an uncontrolled hazardous waste site under Superfund, Yes/No? Yes
Listed as a controlled waste site by NYDEC

EMERGENCY INFORMATION

Nearest Phone & Location: Inside building - 516-643-3500

Nearest two-way radio: None Available

	Number	Location
Fire:	643-5300	Wyandanch Vol. F.D.
Police:	854-8100	1st Precinct, Babylon
Ambulance:	911	Wyandanch F.D.
Hospital:	516-376-3000	1000 Montauk Highway

Does hospital have chemical trauma capability? Yes ☒ No ☐

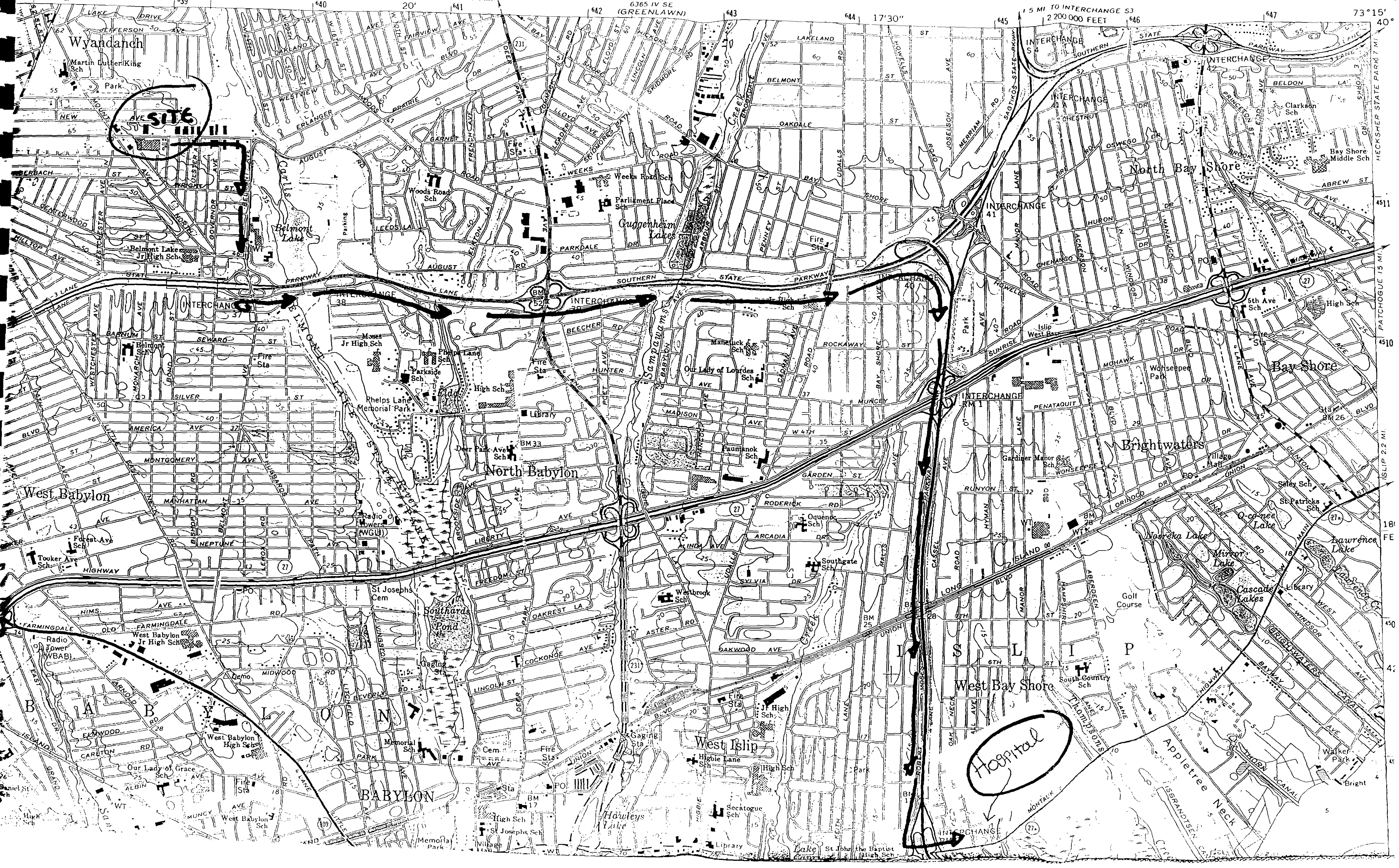
Directions to Hospital: From the site turn right onto Wyandanch Ave. At end, after approximately one half mile, take a right onto Belmont Avenue. Follow Belmont Ave. to South State Parkway. Follow SS Parkway south to exit 40 (south) and onto Robert Moses Causeway (south). Follow to Exit 27A West and take right off exit onto Montauk Highway. Follow through three traffic lights and hospital is on the left.

SEE MAP ATTACHED

ED STATES
T OF THE INTERIOR
ICAL SURVEY

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION

7.5 MINUTE SERIES (TOPOGRAPHIC)



Additional Important Phone Numbers:

Goldman Environmental Consultants	(781) 356-9140
DEP Spill Reporting	
Other State Agency: None	
Chemtrec	(800) 424-9300
National Response Center	(800) 424-8802
ATSDR	DAY: (404) 329-2888
AT & F (Explosive Information)	(800) 424-9555
Pesticide Information Service	(800) 845 7633
CMA Chemical Referral Center	(800) 262-8200
National Poison Control Center	(800) 942-5969
U. S. DOT	DAY: (202) 366-0656
LEPC Contact:	Not Applicable

Name: ____________ Title: ____________

Phone Number ____________

SPECIAL LOCAL EMERGENCY PLANNING COMMITTEE REQUIREMENTS (if any)

NA

DIGSAFE INFORMATION (if warranted)

LILCO No.: 820113 Agencies Contacted: LILCO - gas & electric
Date / Time: N/A NYNEX

PERSONAL PROTECTIVE EQUIPMENT

The following level of protection will be used:

Tasks to be Performed	Level of Protection	Coverall	Glove In/Out Latex/Nitrile	Air Purification Cartridge
1. Sample Collection slug tests, drilling and excavation activities and operations of remedial systems.	D	Coverall	Latex/Nitrile	None
2. Upgrade for all tasks	C	Tyvek	Latex/Nitrile	Organic

Additional Equipment:	
Hard Hat	X
Face Shield	
Safety Glasses	X
Ear Protection	X
Steel Toe Boots	
Rubber Boots	
Other	

Anticipated Monitoring:	
Radiation Meter (A.3)	
Gas Chromatograph (A.4)	
TIP/HNU HW-101	X
Draegger Tubes	
Oxygen Meter	
Other	

HAZARD DESCRIPTION

Physical Hazards

Heat (A.8) X   Cold (A.9) X   Noise (A.10) X   Underground Utilities X

Overhead Utilities X   Heavy Equipment X

Confined Spaces ______   Pressurized Airlines ______   Explosive (A.11) ______

Ladders or Scaffolds ______   Unguarded floor/ground openings ______

Liquids in open containers, ponds, or lagoons ______   Radiation (A.12) ______

Physical Hazards (A.13) X   Oxygen Deficiency (A.14) ______

Traffic X

Other ______________________________

HAZARD EVALUATION

Suspected Sources of Contamination:

Groundwater has been shown to contain petroleum, volatile organic compounds including chlorinated solvents, and metals typical of foundry use. Concentrations of groundwater contaminants have not yet been determined. Free-phase petroleum has been detected in monitoring wells on the site.

Respiratory Hazards:

The chemical contaminants detected on-site can represent an exposure hazard in concentrated form. Inhalation of petroleum vapors emitted from soils or groundwater is the primary respiratory hazard. During soil boring and well installation air in the breathing zone will be monitored using a PID calibrated to a benzene equivalent. Readings consistently above 5 ppm TIC threshold limit in the breathing zone will require an upgrade to level C protection Soil samples collected during soil boring will also be screened with the PID for TICs.
During sample collection, the PID will be used to monitor the breathing zone for TICs. Readings consistently above the 5 ppm TIC threshold limit will require an upgrade to level C. If such a situation exists, personnel who have not been fit tested for work at level C will remain upwind of the area, where TIC threshold cannot be exceeded. Transient exceedences above the 5 ppm TICs in the

breathing zone will require Level D work stoppage until levels return to sub-threshold levels, after which work in level D may resume.

Dermal Hazards:

Contact to skin during sample collection will be minimized as protective clothing will be worn by workers. Latex and nitrile gloves should provide sufficient protection from the dermal hazards. Workers will adhere to good personal hygiene practices.

Ingestion Hazards:

Ingestion of contaminated water is considered unlikely as hand to mouth contact will be avoided and face shields will be worn during water sampling. Personal hygiene should be sufficient to prevent ingestion of contaminants.

Physical Hazards:

Heavy equipment and obstacles typical of construction sites may be present. Extreme care will be exercised while conducting all on site work with respect to physical hazards. GEC employees will not enter trenches or excavations deeper than 4 feet.

DECONTAMINATION

Step by Step Decontamination Procedures and Solutions:

Personal Protective Equipment (PPE): Tyvek suits will be disposed as solid waste. All other PPE will be rinsed with soapy water, DI water, and methanol and DI water. For gasoline/oil contaminated PPE/sampling equipment, acetone, then hexane should be substituted for methanol to remove stubborn petroleum residue.
Sampling Equipment: Scrubbed with soapy water, rinsed with DI water and methanol and DI water.

Other Equipment: See sampling equipment

Disposal of waste clothing, decontamination solution, etc.: Decon solutions will be allowed to evaporate, clothing discarded into the dumpster.

MSDS(s) for Methanol are attached.

WORK LIMITATIONS OR PRECAUTIONS

Describe limitations due to time of day, weather, situations, if any:
On site work may be suspended due to severe weather conditions, and night time work will be avoided.

Sample Preservatives: Acids and caustics used as preservatives should be handled with gloves and safety glasses.

SIGNATURES

All site personnel have read the above plan and are familiar with its provisions:

Name	Signature

Written by: David Montplaisir Date: 9/30/96

Approved by: Date:

A.8
HEAT STRESS

EFFECTS OF HEAT

Heat produced within the body is brought to the surface largely by the blood stream. When at the surface, the heat escapes the body by conduction, radiation and convection. Interference with heat loss leads to a raised body temperature similar to a fever. This accelerates certain body processes which in turn produce more heat, requiring not only the normal elimination of heat, but an extra requirement for heat loss.

When the temperature of the air becomes equal to or higher than the body temperature, the body must rely on losing it's body heat through the sweating process. As the air becomes more humid, this type of heat loss becomes inefficient and heat loss decreases. It is on such days, hot with high humidity, or a succession of such days, that the conditions are ideal for heat stress. Emergencies due to heat stress are described by three categories: heat cramps, heat exhaustion, and heat stroke.

HEAT STRESS SYMPTOMS AND FIRST AID

1) Heat Cramps

CAUSE

Profuse sweating leads to a loss of body salts and electrolytes. If these are not replaced, painful cramps occur. Cramps could also occur by drinking ice water or other drinks too quickly or in too large a quantity.

SYMPTOMS

a. Muscle cramps in legs and abdomen.
b. Pain accompanying cramps.
c. Faintness.
d. Profuse perspiration.

FIRST AID

a. Remove individual to a cool place.
b. Give individual sips of Gatorade or equivalent to replace salts and electrolytes.
c. Apply manual pressure to cramped muscle.
d. Remove patient to a hospital if more serious conditions exist.

2) Heat Exhaustion

CAUSE

Occurs in individuals working in hot environments, and may be associated with heat cramps. It is brought about by the pooling of blood near the surface of the skin. Heat is transported by the blood to the surface of the skin. This process dilates the skin vessels so that a large amount of blood is pooled in the skin and lower extremities. This condition can lead to an inadequate return of blood to the heart and then to collapse.

SYMPTOMS

Weak pulse; Rapid and unusually shallow breathing; Generalized weakness; Pale and clammy skin; Profuse sweating; Dizziness; Unconscious; Appearance of having fainted.

FIRST AID

a. Remove victim to a cool place and remove as much clothing as possible.
b. Administer cool water, Gatorade, or its equivalent.
c. If possible, fan the victim to remove heat by convection, but do not allow chilling or overcooling.
d. Treat for shock if necessary, and remove to a medical facility if serious conditions persist.

3) Heat Stroke

CAUSE

Heat stroke is a profound disturbance of the heat regulating mechanism. It occurs from direct exposure to the sun for prolonged periods. Poor air circulation and poor physical condition add to this threat. This is a serious threat to life and carries a twenty percent mortality rate.

SYMPTOMS

Sudden onset; Dry, hot and flushed skin; Dilated pupils; Early loss of consciousness; Full and fast pulse; Breathing deep at first, later shallow and almost absent; Muscle twitching; Excessively high body temperatures.

FIRST AID

a. Transportation to a medical facility should occur as quickly as possible.
b. Remove patient to a cool environment and remove as much clothing as possible.
c. Assure an open airway.
d. Cool body by dousing with water or wrapping in a wet sheet.
e. Place cold packs or ice under the arms, around the neck, at the ankles, or on forehead.
f. Protect victim from injury during convulsions.

PREVENTIVE MEASURES

a. Assure that all employees drink plenty of fluid. A fluid is needed, such as Gatorade, that will replace body salts and electrolytes. Such fluids should be consumed for a period that includes 12 hours before to 12 hours after the anticipated activities which induce heat stress. Tap water is insufficient to replace body salts and electrolytes under heat stress conditions.
b. Assure frequent breaks to avoid over heating.
c. Revise work schedules, when necessary, to take advantage of the cooler parts of the day.

A.9
COLD EXPOSURE

COLD EXPOSURE SYMPTOMS AND FIRST AID

1) Hypothermia

CAUSE

This is a result of the body losing heat faster than it can produce it. Most critical condition for hypothermia is above freezing weather on a wet and windy day. The mind thinks it is too warm for danger and therefore disregards the symptoms. The wetness against the body acts as a conductor which takes excessive amounts of heat from the body. This heat loss affects the internal organs. Hypothermia sets in when the body temperature reduces to 95 degrees Fahrenheit. (Note- Alcohol and drugs accelerate heat loss through vasodilation. This means that the blood vessels dilate.)

STAGES AND SYMPTOMS

a. Shivering.
b. Apathy.(Key Symptom)
c. Unconsciousness.
d. Freezing.
e. Death.

FIRST AID

a. Remove individual from the cold.
b. Remove wet clothes, get out of the wind.
c. Rewarm victim:
   1. Actively- Apply heat to the body. This can be done with a powered heat source, the sun, or by the heat of another individuals body heat.
   2. Passively- Wrap individual in a blanket so that they begin to rewarm themselves.

2) Frostbite

THREE TYPES

1) Frostnip- Whitened or grayish area of the skin. A burning sensation is experienced.
2) Superficial Frostbite- This is slightly worse than frostnip. The skin is whitened or grayish with a waxy feeling to it. The skin experiences very little pain at this point.
3) Deep Frostbite- Completely frozen area, perhaps to the bone. The area is white and hard. The individual loses sensation in that area.

FIRST AID

1) For Frostnip and Superficial Frostbite

a. Remove victim from the cold.
b. Give the individual liquids.
c. Remove clothing from the area.
d. Soak affected area in a warm water bath- 102-108°F.

2) For Deep Frostbite

a. Keep area frozen.
b. Get the victim to a doctor as quickly as possible.
c. Do not try to treat this in the field.

PREVENTIVE MEASURES

a. Dress warmly, but do not overdress. Sweating will only form a conduction to take heat away from the body.
b. Don't touch cold metal.
c. Keep moving.
d. Take shelter whenever possible.
e. Drink warm soups and liquids periodically.
f. Wear layered clothing and a hat.
g. Have a spare dry set of clothing on site.

A.10
NOISE

Exposure Route or Cause

Compressors, machinery, and large equipment.

Suspected Site Specific Sources

Symptoms and Effects

Temporary or permanent hearing loss, aural pain, nausea, reduced muscular control (when exposures are severe), distraction, and interference with communication.

Measurement or Measure Devices

Sound levelmeter and octave band analyzer.

Prevention

a. Shielding or enclosure of source.
b. Distance/ isolation.
c. Substitution of equipment/machines generating less noise.

Personal Protection

Ear muffs, ear plugs, or noise-insulating earphone

Additional Comments

a. Use of earphones with communication built-in can improve coordination and warnings.
b. Use of earplugs must include consideration of potential indirect chemical exposures if the earplugs become contaminated.

REFERENCES:
Information on this page extraceted from:
Martin, W. F., Lippit, J. M., Prothero, T. G., Hazardous Waste Handbook for Health and Safety.Butterworth Publishers, pp. 10-11, 1987.

Last Revised: 6/29/89

MATERIAL SAFETY DATA SHEET

4011

DU PONT IS A
SUPPLIER OF
METHANOL SOLD
BY STERLING-CLARK-
LURTON CORP.

IDENTIFICATION

Name
Methanol

Grade

Synonyms Methyl alcohol, Wood
ılcohol, Carbinol

CAS Name
Methanol

I.D. Nos./Codes
NIOSH Registry No. PC1400000

Manufacturer/Distributor
E. I. du Pont de Nemours & Co. (Inc.)

ddress
Wilmington, DE 19898

Chemical Family
Alcohol

Formula
CH_3OH

CAS Registry No.
67-56-1

Du Pont Registry No.

Product Information and Emergency Phone
(302) 774-2421

Transportation Emergency Phone
(800) 424-9300

HYSICAL DATA

oiling Point, 760 mm Hg
.7°C (148.5°F)

ecific Gravity
792 at 20°C (68°F)

por Density
.1 (Air = 1)

Volatiles by Vol.
0%

Melting Point
-97.8°C (-144°F)

Vapor Pressure
138 mm Hg at 25°C (77°F)
200 mm Hg at 37.7°C (100°F)

Solubility in H_2O
100%

Evaporation Rate (Butyl Acetate = 1) > 1

rm	*Appearance*	*Color*	*Odor*
quid	Clear	Colorless	Faint alcoholic

Information

Octanol/Water Partition Coefficient

ZARDOUS COMPONENTS

terial(s)	*Approximate %*
hanol	100

ZARDOUS REACTIVITY

bility
ble

mpatibility Reacts vigorously with strong oxidizers, chromic anhydride, lead
hlorate, perchloric acids.

mposition
rs from heat and reaction with materials above.

merization
. not occur.

717 Date: 7/82

RE AND EXPLOSION DATA

Flash Point	*Method*	*Autoignition Temperature*
11°C (52°F)	TCC	385°C (725°F)

Flammable Limits in Air, % by Vol.

Lower 6.0%

Upper 36 %

Fire and Explosion Hazards Flammable. Flame is invisible in daylight. Methanol-water mixtures will burn unless very dilute; mixtures with 25% or more methanol are DOT Class I flammable liquids.

Extinguishing Media

Dry chemical, CO_2, water spray, "alcohol" foam.

Special Fire Fighting Instructions

Use water spray to cool tanks or containers.

HEALTH HAZARD INFORMATION

Exposure Limits

OSHA 8-hour Time Weighted Average (TWA) and ACGIH TLV® TWA = 200 ppm, 260 mg/m^3. ACGIH adds "skin" notation.

Significant Routes and Effects of Exposure

Harmful if inhaled.

May be fatal or cause blindness if swallowed.

Cannot be made nonpoisonous.

May cause irritation.

LD50 (oral, rats) = 12,900 mg/kg; LC50 (rats, 1 hour) = 145,000 ppm.

Safety Precautions

Avoid contact with eyes, skin or clothing.

Avoid prolonged or repeated breathing of vapor.

Wash thoroughly after handling.

First Aid

f swallowed: Induce vomiting immediately by giving two glasses of water and sticking finger down throat.

f inhaled: Remove to fresh air. If not breathing, give artificial respiration; preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician.

n case of eye contact: Immediately flush with plenty of water for at least 15 minutes. Call a physician.

n case of skin contact: Flush with water.

ntilation

ood general ventilation should be provided to keep vapor concentrations below exposure limits.

Personal Protective Equipment

Have available and wear where appropriate: Safety spectacles (side shields preferred), chemical splash goggles, hard hat with brim, face shield (full length), neoprene coated cotton gloves, solvent resistant gloves, rubber safety shoes or rubber overshoes, rubber apron, appropriate respiratory protection (See Reference 2, page 4).

Other

DISPOSAL INFORMATION

Aquatic Toxicity

TLm 96: > 1000 ppm

Spill, Leak or Release

Dike large spills. Flush spill area with plenty of water. Do not flush to sewer. Comply with federal, state, and local regulations on reporting releases.

Waste Disposal

Comply with federal, state and local regulations. If approved, incineration, bio-oxidation, subsurface injection, or disposal contractor may be used.

SHIPPING INFORMATION

Transportation

*DOT Hazard Class.**: Flammable Liquid

IMCO Class.: 3.2

*DOT Shipping Name**: Methyl Alcohol

UN No.: 1230

NA No.:

*RQ Quantity**:

*49 CFR 172.101

Shipping Containers

Barge, railroad tank cars, tank trucks.

Storage Conditions

Keep away from heat, sparks and flame. Keep container tightly closed. Do not store or mix with strong oxidizers, chromic anhydride, lead perchlorate or perchloric acid. Store in adequately ventilated area.

DITIONAL INFORMATION AND REFERENCES

Reference 1) Du Pont Methanol Properties, Uses, Storage and Handling Bulletin.

2) DHEW (NIOSH) Publication No. 76-189" A Guide to Industrial Respiratory Protection", available from Dept. HHS/NIOSH, 4676 Columbia Parkway, Cincinnati, OH 45226, phone (513) 684-4287.

APPENDIX C
Citizen Participation Plan

CITIZEN PARTICIPATION PLAN

The following is a Citizen Participation Plan, developed in accordance with 6 NYCRR Part 375 - Inactive Hazardous Waste Disposal Site Remedial Plan, revised May 1992.

Citizen Participation Measures

Upon completion, the RI/FS draft final Work Plan will be placed into the information repositories, listed below. A fact-sheet, describing the RI/FS Work Plan will be produced and disseminated to those on the Distribution List. NOTE: Prior to dissemination of the fact-sheet, a draft will be forwarded to NYSDEC and, once approved, will be disseminated to the public.

Once the Remedial Investigation Report is complete, a copy will be placed in the information repositories and a fact-sheet will be disseminated to the public contact list (including to the media contacts). Furthermore, a public meeting may be held at this juncture, as determined by NYSDEC and based on the following factors: the level of public interest; the significance of the data gathered; the timing between the RI completion and the next major milestone for citizen involvement; and the Proposed Remedial Action Plan. If an RI meeting is held, the fact-sheet will also serve as a meeting invitation, and the public will also be notified through a NYSDEC press notice, distributed to the media on the contact list.

At the juncture of the Proposed Remedial Action Plan (PRAP), a meeting invitation / fact sheet, describing the PRAP, will be disseminated to those on the Distribution List. The public will also be notified of the PRAP public meeting through a press notice to the media (i.e., Media Contact / Public Contact list). There will also be a public comment period. The State's consideration of comments will be documented in a Responsiveness Summary, which will be placed in the repositories and may be more widely distributed as appropriate. The Public will also be notified of the Record of Decision.

Public Contact List

The following individuals will be included on the distribution list and will be provided with copies of documentation forwarded to NYSDEC. Included below is a list of those entities who have expressed an interest in site activities and who have been provided with information relative to site investigations.

Local Contacts

Richard H. Schaffer
Supervisor - Town of Babylon
200 East Sunrise Highway
Lindenhurst, NY 11757

Office of the Town Clerk
Town of Babylon
200 East Sunrise Highway
Lindenhurst, NY 11757

Mr. Ronald Kluesner
Town of Babylon
281 Phelps Lane
North Babylon, NY 11703

Media Contacts:

The Beacon
P.O. Box 670
Babylon, NY 11702

South Bay Newspaper
150 West Hoffman Avenue
Lindenhurst, NY 11757

Newsday
Government Watch - Long Island Beat
Newsday - Long Island Desk
235 Pinelawn Road
Mellville, NY 11747-4250
ATTN: Mary Ellen Pereira

Department Contacts

Robert Becherer, P.E.
Attn: Jamie Ascher - Geologist
Div. of Hazardous
Waste Remediation
NYSDEC
SUNY Building 40
Stony Brook, NY 11790-2356

Mr. John Olm
NYSDOH
Bur. Environmental Exposure Inv.
2 University Place
Albany, NY 11203-3399
(518) 458-6305 ext. 6305

Ms. Nina Knapp
Health Liaison Specialist

Joshua Epstein, Ph.D.
Citizen Participation Specialist

State Department of Health
2 University Place
Albany, NY 12203-3399
(800) 458-1158 ext. 6402

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Stony Brook, New York 11790-2356

G. Anders Carlson, Ph. D.
Director, Bureau of
Environmental Exposure
Investigation
NY State Dept. of Health
2 University Place
Albany, NY 12203

Salvatore Ervolina, P.E.
NY State Dept. of Environmental
Conservation
50 Wolf Road
Albany, NY 12233-7010

Residents in the Area of the Site

This will [illegible]

(No residents in the area ~~of the~~ site have ~~been identified, either~~ individually or as groups, ~~as being active and~~ willing or who ~~have expressed~~ an interest in the site.) Until ~~such an individual~~ or group is identified. Fact Sheets ~~will be prepared and distributed to~~ all residences within a 1/5 mile radius of the site, as well as all residents within a 1/4 mile radius downgradient of the site. Moreover, [illegible]

Contacts for Further Information

Those individuals interested in obtaining more information regarding RI/FS activities or who have questions regarding activities will be referred to the individuals listed below.

Ms. Nina Knapp, Health Liaison Specialist, or
Mr. John Olm, at Bur. Environmental Exposure Inv.
NYSDOH
2 University Place
Albany, NY 12203-3399
(800) 458-1158 Ms. Knapp at ext. 6402
Mr. Olm at ext. 6305

Joshua Epstein, Ph.D.
Citizen Participation Specialist
NYSDEC
Building 40
SUNY
Stony Brook, New York 11790-2356

(516) 444-0249

In addition, Samuel Butcher, of Goldman Environmental Consultants, Inc. will be identified as the technical contact for information on specific site activities.

Information Repositories

Information repositories are places where people can go to read the relevant, public documents associated with the site.

Public repositories will be established at the following locations:

NYSDEC Regional Office
Div. of Env. Remediation
SUNY Campus
Building 40
Stony Brook, NY 11790
561-444-0249

ATTN: Public Repositories
Wendell Cherry - Director
Wyandanch Public Library
14 South 20th Street
Wyandanch, NY 11798

The Citizen Participation Plan will not include distribution of complete documentation to all parties. These parties listed as "Department Contacts" and "Information Repositories" will receive complete reports. Those parties listed as "Local Contacts" and "Residents in the Area of the Site" will be provided with a copy of the document transmittal letter, Fact Sheet, and information regarding (public meetings) the availability of reports, ~~and other documentation~~.

The contact list presented above is subject to change, As new interested parties ~~are identified.~~ individual express interest in the [illegible], they will be added to the [illegible]

Glossary of Terms

Citizen Participation - A process to inform and involve the interested/affected public in the decision-making process during identification, assessment and remediation of inactive hazardous waste sites. This process helps to assure that the best decisions are made from environmental, human health, economic, social and political perspectives.

Citizen Participation Plan - A document that describes the site-specific citizen participation activities that will take place to complement the "technical" (remedial) activities. It also provides site background and rationale for the selected citizen participation program for the site. A plan may be updated or altered as public interest or the technical aspects of the program change.

Citizen Participation Specialist - A Department staff member who provides guidance, evaluation and assistance to help the Project Manager carry out his/her site-specific Citizen Participation program.

Contact List - Names, addresses and/or telephone numbers of individuals, groups, organizations and media interested and/or affected by a particular hazardous waste site. Compiled and updated by the Department. Interest in the site, stages of remediation and other factors guide how comprehensive the list becomes. Used to assist the Department to inform and involve the interested/affected public.

Document Repository - Typically a regional DEC office and/or public building, such as a library, near a particular site, at which documents related to remedial and citizen participation activities at the site are available for public review. Environmental Management Councils (EMCs), Conservation Advisory Committees (CACs), as well as active local groups often can serve as supplemental document repositories.

Fact Sheet (Information Sheet) - A written discussion of a site's remedial process, or some part of it, prepared by the Department for the public in easily understandable language. May be prepared for the "general" public or a particular segment. Uses may include, for example: discussion of an element of the remedial program, opportunities for public involvement, availability of a report or other information, or announcement of a public meeting. May be mailed to all or part of the interested public, distributed at meetings and availability sessions or sent on an "as requested" basis.

Feasibility Study - A process for developing, evaluating and selecting remedial actions, using data gathered during the remedial investigation to: define the objectives of the remedial program for the site and broadly develop remedial action alternatives; perform an initial screening of these alternatives; and perform a detailed analysis of a limited number of alternatives which remain after the initial screening stage.

Project Manager - A Department staff member within the Division of Hazardous Waste Remediation (usually an engineer, geologist or hydrogeologist) responsible for the day-to-day administration of activities, and ultimate disposition of one or more hazardous waste sites. The Project Manager works with the Office of Public Affairs as well as fiscal and legal staff to accomplish site-related goals.

Public - The universe of individuals, groups and organizations: a) affected (or potentially affected) by an inactive hazardous waste site and/or its remedial program; b) interested in the site and/or its remediation; c) having information about the site and site history.

Public Meeting - A scheduled gathering of the Department staff and the public to give and receive information, ask questions and discuss concerns. May take one of the following forms: large group meeting called by the Department; participation by the Department at a meeting sponsored by another organization such as a town board or Department of Health; working group or workshop; tour of the hazardous waste site.

Public Notice - A written or verbal informational technique for telling people about an important part of a site's remedial program coming up soon (examples: announcement that the report for the RI/FS is publicly available; a public meeting has been scheduled. The public notice may be formal and meet legal requirements (for example: what it must say, such as announcing beginning of a public comment period; where, when and how it is published.

> Publish - for purposes of 6NYCRR Part 375.7, at a minimum requires publication of a legal notice in a local newspaper of general circulation.

Another kind of public notice may be more informal and may not be legally required (examples: paid newspaper advertisement; telephone calls to key citizen leaders; targeted mailings).

Remedial Investigation (RI) - A process to determine the nature and extent of contamination by collecting data and analyzing the site. It includes sampling and monitoring, as necessary, and includes the gathering of sufficient information to determine the necessity for, and proposed extent of, a remedial program for the site.

Responsiveness Summary - A formal or informal written or verbal summary and response by the Department to public questions and comments. Prepared during or after important elements in a site's remedial program. The responsiveness summary may list and respond to each question, or summarize and respond to questions in categories.