ENVIRO-SCIENCES, INC.
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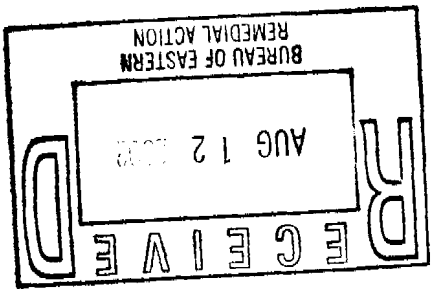
COPY

August 9, 2002



Mr. Jeffrey L. Dyber, P.E.
NYSDEC
Bureau of Eastern Remedial Action
Division of Environmental Remediation
625 Broadway
Albany, New York 12233-7015

Re: Pall Corporation
Revised In-situ Chemical Oxidation Pilot Test Design
NYSDEC IHWDS No. 1-30-053B

Dear Mr. Dyber,

In accordance with your request, Enviro-Sciences, Inc. (ESI) has revised the pilot test design submittal to address all comments received from the NYSDEC and the NYSDOH. Key revisions of note include:

- A revised injection sequencing and monitoring plan that includes individual injection and monitoring drawings and a monitoring summary table for each phase of the pilot test;
- Detailed design calculations indicating permanganate dosing, water make-up requirements and other key design parameters;
- Completion of modeling to simulate the injection events and the radii of influence of injection wells;
- Inclusion of six (6) new monitoring well couplets, located based upon modeling output, to better monitor performance of injection events at all well points;
- Inclusion of MW-3, MW-4, MW-4PI, and the SVE well in the permanganate injection pilot test;
- A revised project schedule that clearly distinguishes different phases of the pilot test program; and,
- Certification of the design by a Professional Engineer licensed to perform engineering services in the State of New York.

We trust this submittal will meet with your approval and we look forward to starting the pilot test program. It would be appreciated if you could complete your review as soon as possible so that we can initiate drilling and the Phase I injection tests throughout September and October before weather conditions complicate water handling and field operations.

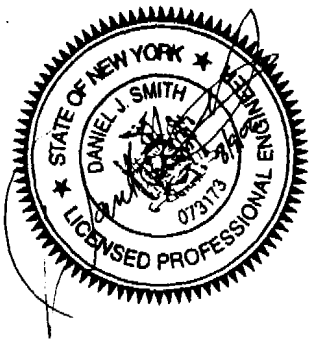
If you have any questions or comments, please do not hesitate to contact me at (631) 207-9005 extension 102. Thank you again for working with Pall and ESI to finalize the scope of this pilot test program.

Sincerely,
ENVIRO-SCIENCES, INC.

Daniel J. Smith, P.E.
Vice-President

DJS/djs
pall - cover letter 080902.doc

cc: M.A. Bartlett / Pall
W. Benzinger / Pall
K. Katz / Pall
S. Morrissey / Pall
K. Olson / MT&E



IN-SITU CHEMICAL OXIDATION PILOT TEST DESIGN

PALL CORPORATION
30 SEA CLIFF AVENUE
GLEN COVE, NEW YORK

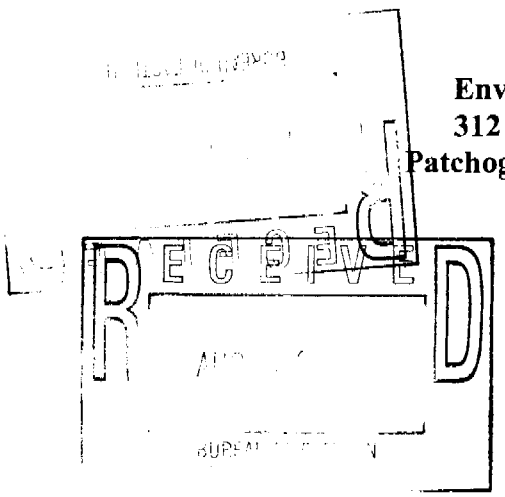
NYSDEC Inactive Hazardous Waste Disposal Site No. 1-30-053B

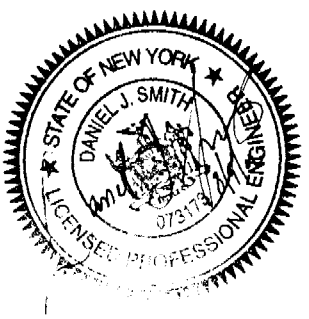
Submitted to:

New York State Department of Environmental Conservation
Bureau of Eastern Remedial Action
Division of Environmental Remediation
625 Broadway
Albany, New York 12233-7015

Prepared by:

Enviro-Sciences, Inc.
312 East Main Street
Patchogue, New York 11772





July 31, 2002

ENVIRO-SCIENCES, INC.
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IN-SITU CHEMICAL OXIDATION PILOT TEST DESIGN

PALL CORPORATION
30 SEA CLIFF AVENUE
GLEN COVE, NEW YORK

1.0 INTRODUCTION

Based upon the findings of the Feasibility Study (FS), Pall Corporation recommends *In-Situ* Chemical Oxidation (ISCO) as the remedy to address groundwater contamination underlying the Pall Corporation (Pall) facility located at 30 Sea Cliff Avenue in Glen Cove, New York. The analysis described in the FS showed that potassium permanganate would be an appropriate oxidizer to meet remedial objectives in a safe and cost-effective manner. Bench-scale treatability studies also verified that potassium permanganate will effectively react with the chlorinated volatile organic compounds (VOCs) of concern in the groundwater at the site to reduce chlorinated VOC concentrations to acceptable levels if a proper delivery system can be employed (See Appendix A). This ISCO Pilot Test Design outlines the field studies necessary to confirm that a proper delivery system can be installed and operated to ensure adequate mixing of reactants and destruction of the contaminants of concern within a reasonable time frame.

1.1 Scope and Objectives

This program is being initiated to confirm the effectiveness and feasibility of *in-situ* chemical oxidation technology to address shallow and intermediate zone groundwater impacts. Specifically, the scope and objectives of the pilot test shall include the following:

- Design of the pilot test system illustrating injection well locations, monitoring locations, and oxidizer injection equipment setups;
- Installation of approximately eighteen (18) new, shallow permanganate injection wells to evaluate the ability to inject the desired volume of permanganate and achieve adequate mixing in the shallow zone;
- Installation of approximately eighteen (18) new, intermediate permanganate injection wells to evaluate the ability to inject the desired volume of permanganate and achieve adequate mixing in the intermediate zone;
- Installation of a permanganate delivery / injection system including make-up

tanks, mixers, pumps, and control systems;

- Completion of one (1) permanganate injection event at the shallow and intermediate injection wells. During the injection event, parameters including optimum delivery rates, well fouling (if any), groundwater elevation changes, temperature changes, etc. will be monitored at existing monitoring wells. The permanganate solution makeup procedures will also be evaluated to optimize the full-scale delivery system.

- Completion of one (1) permanganate injection event at MW-3, MW-4P, MW-4PI and the horizontal SVE Well (below water table during high groundwater periods) to evaluate the effectiveness of permanganate injection directly into on-site monitoring wells.

- Installation of six (6) new monitoring well couplets (shallow and intermediate) to monitor permanganate injection events. The new monitoring wells will be used in conjunction with existing monitoring wells to provide a comprehensive injection monitoring network.

- Field monitoring during and following the permanganate injection event to determine the zone of influences, reaction rates, degree of reaction, contaminant reduction rates, estimates of the amount of unreacted reactants, etc. Monitoring will include collection and analyses of groundwater samples, colorimetric analyses, etc.; and,

- Issuance of a pilot test report documenting the findings of the study and identifying key design criteria and activities necessary for full-scale remediation to meet remedial objectives using this technology.

1.2 Overview of in-Situ Oxidation Using Permanganate

Permanganate ion (MnO_4^-) has been used as an oxidant to treat organic compounds in water and wastewater for many years. In recent years, it has been increasingly used *in-situ* to remediate groundwater contaminated with volatile organic compounds, primarily chlorinated organics. For this pilot test, potassium permanganate will be used, although sodium permanganate can also be used effectively. Oxidation using permanganate has several major benefits over more traditional remediation methods such as pump and treat systems in that it removes significantly more contaminant mass via a destructive technology; it greatly reduces the time to complete remediation (often by a decade or more); and, it is more cost-effective than other remedies requiring complex air handling and/or water treatment systems.

Permanganate is a very effective oxidizer with high water solubility (approximately 60 to 65 grams per liter). The high solubility makes it highly mobile and relatively easy to inject into the subsurface. In addition, the high solubility allows the permanganate to achieve greater *in-*

situ mixing and better contact with contaminants of concern. Permanganate is typically purchased in a crystalline form, or for smaller-scale applications, it may also be purchased as a solution. For this pilot test, it is anticipated that the permanganate will be purchased in 1500 kg bins in the crystalline form with feed solutions made up at the site.

For the primary contaminants of concern at the site including Tetrachloroethene, Trichloroethene, *cis*-1,2-Dichloroethene, and Vinyl Chloride, the generalized chemical reactions that drive remediation are presented below:

PCE: $4KMnO_4 + 3C_2Cl_4 + 4H_2O \rightarrow 6CO_2 + 4MnO_2 + 4K^+ + 12Cl^- + 8H^+$

TCE: $2KMnO_4 + C_2HCl_3 \rightarrow 2CO_2 + 2MnO_2 + 2K^+ + 3Cl^- + H^+$

DCE: $8KMnO_4 + 3C_2H_2Cl_2 \rightarrow 6CO_2 + 8MnO_2 + 8K^+ + 6Cl^- + 2OH^- + 2H_2O$

VC: $10KMnO_4 + 3C_2H_3Cl \rightarrow 6CO_2 + 10MnO_2 + 10K^+ + 3Cl^- + 7OH\text{-} + H_2O$

As indicated above, the volatile organic compounds are converted primarily to carbon dioxide (CO_2), manganese dioxide (MnO_2), water (H_2O), chloride ion (Cl^-), and potassium ion (K^+) at completion. Since dissolved manganese and chloride have secondary maximum contaminant levels (MCLs), the formation of these ions during the pilot test will be carefully monitored. Although the dissolved manganese levels may temporarily exceed the secondary MCL of 0.05 mg/l for manganese immediately after injection events, dissolved manganese typically attenuates as the manganese precipitates out of solution as MnO_2. Therefore, it is not anticipated that dissolved manganese levels will pose a problem after sufficient time is allowed for the precipitation of MnO_2. The secondary MCL for chloride is 250 mg/l. This relatively high MCL should not be exceeded based upon results from similar permanganate projects. One of the objectives of the pilot test will be to confirm the theoretical reaction yields, the degree of completion, and the intermediary and final products formed.

2.0 PILOT TEST SYSTEM DESCRIPTION

The test area was chosen based upon the results of Remedial Investigations completed by Enviro-Sciences, Inc. on behalf of Pall Corporation. During these investigations, it was concluded that the area of the highest concentrations of chlorinated VOCs in the shallow and intermediate groundwater zones is near the northern property line of the Pall site in the vicinity of well clusters at MW-5, MW-10, MW-2A, MW-11PS, and MW-12PS (see Drawing Y1). A complete description of the levels of contaminants, contaminant distribution, and geologic and

hydrogeologic factors influencing this pilot test was provided in the Remedial Investigation report and the Feasibility Study for the site. These documents are incorporated herein by reference.

The pilot test system layout and design is presented in Appendix B. As indicated in Appendix B, the Pilot Test area is bounded on the north by the northern site property line; the south by MW-3P and the horizontal SVE well, the east by the eastern Pall property line; and on the west by the MW-2A well cluster. This pilot test area has been selected to address the areas of highest concentrations and because of the extensive monitoring well network available for collection of data to monitor the progress of the pilot test. It should be noted that injection of potassium permanganate directly at MW-3P, MW-4P, MW-4PI, and the horizontal SVE are included in the pilot test scope to evaluate the effectiveness of injection directly into a single well. The single well injection events will serve as a basis of comparison for injection through multiple, clustered wells that is the focus of the remainder of the pilot test. The inclusion of direct injection at MW-3P, MW-4P, MW-4PI, and the horizontal SVE well, is being performed at the request of the NYSDEC.

The new shallow permanganate injection wells will be 4" diameter PVC wells screened from approximately 5 to 25 feet below grade surface. New intermediate injection wells will also be 4" diameter PVC wells and will be screened from approximately 35 to 55 feet below grade. The existing monitoring well clusters near the northern side of the Pall site will be used for monitoring and data collection during the pilot test. In addition, six (6) new monitoring well couplets are to be installed as part of the pilot test (See Drawing Appendix B). As a minimum, there will be at least one downgradient monitoring well couplet (shallow and intermediate) to monitor the oxidation reactions before, during, and after each injection event. Monitoring well couplet locations have been determined based upon modeling of the permanganate injection system to predict probable radii of influence and reaction rates.

The permanganate injection system will be skid mounted and will be set-up immediately adjacent to the pilot test area. The detailed design drawings in Appendix B provide the engineering details of the system and the injection phasing plan (e.g., piping and instrumentation diagram, elevations, equipment specifications, etc.). Power for the system will be provided from the existing building, or if not available, from a portable generator. Water will be supplied from the Pall building. All potassium permanganate and any other chemicals being staged prior to injection will be temporarily stored in the existing chemical storage area at the site north of the pilot test area. This area is ideal for chemical storage during the pilot test because it was previously used for chemical storage and was designed specifically to

prevent accidental releases of chemicals to the environment (i.e., secondary containment is provided, the floor coating is impervious, etc.).

3.0 PILOT TEST PROCEDURES

After installation of the pilot test injection wells and new monitoring points, the wells will be developed by pumping until development parameters such as turbidity, temperature, pH, and conductivity have stabilized. Development waters will be containerized and will be slowly introduced to the permanganate feed stream during pilot testing to destroy any chemical contaminants of concern and to minimize disposal costs. Alternatively, development water may also be disposed via the municipal sewer system if acceptable to the City of Glen Cove.

The NYSDEC, as well as August Thomsen, the Glen Cove Day Care Center, the EMS Garage, and the Glen Cove Water Department, will be given ten working days notice prior to the start of any fieldwork. At the request of the NYSDEC, initial pilot test activities (i.e., the actual permanganate injection event) will begin on a Friday evening or on a weekend when buildings in the vicinity of the pilot test are minimally occupied.

3.1 Pre-test (Baseline) Sampling

Prior to the start of any permanganate injection events, a baseline groundwater sampling event will be conducted from all on-site monitoring wells. All wells will be sampled for VOCs, Freons, $KMnO_4$ (colorimetric method), Oxidation-Reduction Potential (ORP), total organic carbon (TOC), chlorides, and the following metals: iron (*Fe*), manganese (*Mn*), and chromium (*Cr*). In addition, field monitoring will be performed for temperature, pH, conductivity, wellhead VOCs (with a photoionization detector), dissolved oxygen and groundwater level measurements. Data collected during the baseline sampling event shall be used as a basis of comparison for data generated during and following pilot testing. All analytical work will be prepared and delivered in accordance with ASP Category B protocols.

3.2 Treatability Study Results and Pilot Test Dosing Estimates

In order to evaluate the proper concentrations and dosing requirements for the permanganate injection pilot test, ESI completed a bench-scale treatability study in coordination with the Environmental Research Institute (ERI) at the University of Connecticut (UCONN). The complete text of the Treatability Study Report is provided in Appendix A. The significant findings of the bench-scale treatability study are summarized in Table 1.

As indicated in Table 1, the treatability study concluded that permanganate can rapidly degrade PCE, TCE, cis-12DCE, VC, and chlorotrifluoroethene in the site soil and/or groundwater. The

degradation of 1,1,2-trichloro-1,2,2-trifluoroethane in the control experiment was observed as well as in the permanganate injection test setup. Therefore, 1,1,2-trichlor-1,2,2-trifluoroethane degradation is expected to occur, only at a slower rate than the other compounds of concern. One of the primary objectives of the pilot test will be the evaluation of the effectiveness of *KMnO4* for 1,1,2-trichloro-1,2,2-trifluoroethane removal.

The soil oxidant demand was determined to be approximately 1 g/kg soil to 4 g/kg soil and increased with an increase in $KMnO_4$ concentration. This is representative of a relatively low soil demand factor thus making permanganate injection a very attractive remedy. A low *in-situ* $KMnO_4$ dosage concentration of 1 g/L to 2 g/L (approximately 0.1% to 0.2% by weight) was recommended for full-scale application and will be evaluated in the proposed pilot test.

Based upon the size of the pilot test area and the $KMnO_4$ demand determined during the bench-scale treatability study, as much as 480,600 pounds of oxidant may be required for full-scale remediation of the area of concern. This pilot test will include injection of approximately 146,900 pounds of potassium permanganate to achieve an *in-situ* dosage concentration of approximately 1 g/L (after accounting for a soil oxidant demand factor of 1g / kg). This amounts to an average of roughly 4,100 pounds of permanganate injected at each of the 36 pilot test injection wells. Assuming a 2% $KMnO_4$ makeup feed solution, approximately 884,900 gallons of make-up water will be required for injection during the entire pilot test (approximately 24,600 gallons per well). Preliminary modeling has indicated that mounding and spreading should not pose a concern at this injection rate given the site hydrogeologic factors as long as the injection flow rate is maintained at below 15 gallons per minute per well. Potential spreading of contamination will be carefully monitored by frequent well gauging and sampling at monitoring locations in all directions radially outward from the injection point. If field data indicates an unacceptable amount of mounding outside the injection area (i.e., more than 25 feet away), the pilot test will be temporarily discontinued and the injection concentrations and rates reevaluated in coordination with the NYSDEC.

Permanganate dosage calculations are provided in Appendix C. The results of permanganate injection system modeling to approximate radii of influence of injection wells and the rates of reaction are provided in Appendix D.

3.3 Permanganate Solution Make-up and Injection Sequence

The permanganate make-up and injection system consists of a dry chemical feed system, a make-up tank with a mixer, a potassium permanganate injection system that can be varied in the field, safety systems (e.g., relief valves, etc.), and monitoring instrumentation (e.g., pressure gauges, temperature gauges, flow meters, etc.).

An injection manifold will be developed to allow injection in several wells simultaneously. The injection of permanganate will be completed in phases so that monitoring data can be properly collected and catalogued. Injection will begin at Phase I near the MW-11P and MW-12P clusters. Injections will first be performed in the shallow wells (perpendicular to the groundwater flow direction) until the desired volume of the permanganate solution has been introduced. The injection events will then proceed to the intermediate wells. Monitoring will be performed until essentially all permanganate has been reacted to completion. After the initial phase of injection and before the start of the next phase, data will be evaluated and a letter report submitted to the NYSDEC. The NYSDEC will review the data with Pall and ESI to determine if modifications to the design of subsequent injection events will be necessary.

After NYSDEC acceptance of the data for the first injection phase and any necessary design changes for subsequent injection events, the injection events at phases II, III, and IV will proceed sequentially as indicated in Appendix B. The injection events at wells MW-3P, MW-4P, MW-4PI, and the horizontal SVE well will be completed as Phase V following completion of injection events at the northern portion of the site.

Phases IA, IIA, and IIIA will each inject approximately 20,500 pounds of permanganate dissolved in 123,000 gallons of water into five shallow injection wells simultaneously. Phases IB, IIB, and IIIB, will each inject 20,500 pounds of permanganate dissolved in 123,000 gallons of water into five intermediate injection wells simultaneously. Phase IVA and IVB will each inject 12,300 pounds of permanganate dissolved in 73,800 gallons of water into three shallow wells simultaneously, and then the three intermediate injection wells simultaneously. Phase V will inject 16,400 pounds of permanganate dissolved in 98,400 gallons of water into monitoring wells 3P,4P, 4 PI, and the horizontal test well simultaneously.

3.4 Performance Monitoring and Sampling

As indicated in Appendix B and Table 2, the existing monitoring well network, as supplemented with the six (6) new monitoring well clusters, will be utilized for pilot test performance monitoring. The parameters to be monitored and the frequency of monitoring are also provided in Table 3

All analytical samples collected will be collected in accordance with the procedures outlined in the existing Quality Assurance Project Plan (QuAPP) for the site. Laboratory data will be presented following ASP Category B deliverables.

Field data will be documented in a dedicated field logbook or on field data sheets developed for the project. All original field data will be reproduced at least twice per week so that a backup of original data is maintained.

3.5 Termination of Field Pilot Tests

Field tests will be terminated after the desired mass of permanganate has been added to the subsurface and sufficient data has been collected to meet pilot test objectives. Upon termination of pilot testing, the pilot test well network may remain in place to support full-scale remediation.

4.0 DATA EVALUATION AND REPORTING

Data collected from the pilot test will be entered into a database for use during preparation of the Pilot Test Report that documents all pilot test activities. As a minimum, the Pilot Test Report will include the following:

- A description of the field procedures implemented;
- A discussion of the permanganate injection event(s) performed including calculation of dosing rates, injected concentrations, the mass of permanganate injected, etc.;
- Presentation and discussion of field monitoring data obtained during and following permanganate injection events;
- Estimation of full-scale design parameters including the radius of influence of injection wells, optimal dosing rates, injection well yields, contaminant reduction rates, and any other information that will support the full-scale implementation of the remedy.
- Development of a conceptual design for the full-scale remedy.

5.0 HEALTH AND SAFETY

The existing Health and Safety Plan (HASP) has been modified to specifically address the permanganate injection pilot test and to address the scope of work covered under this pilot test. Tailgate safety meetings will be held and documented for each day of field activities. In addition, all ESI employees working on the site will attend an internal training program to ensure that the field program is completed safely and effectively. Parties other than ESI or persons who have contracted directly with ESI shall be responsible for developing and implementing their own site-safety procedures. Access to the construction areas reflected in the Phase I, II, III, IV and V injection drawings will be restricted.

Although negative ambient air impacts are not expected or likely, an ambient air monitoring program will be included during the pilot test as a precautionary measure. Wellhead monitoring for carbon dioxide (CO_2), carbon monoxide (CO), and VOCs will be completed daily during injection events. In addition, breathing zone monitoring will be performed on the Pall site and immediately downgradient at the Glen Cove Day Care center property. The design of the pilot test system will minimize particulate emissions through use of covered mixing and transfer vessels and possible us of vacuum systems. Monitoring of the perimeter of the work area for particulates will be performed if there are any indications that particulates may be emitted during field activities (visual indications, olfactory indications, etc.). VOC and particulate monitoring, if necessary, will be completed in accordance with the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP). Additional information, including levels of VOCs, CO_2 and CO that will trigger actions to reduce potential exposures, will be provided in the Health and Safety Plan prior to the start of field activities.

6.0 PROJECT SCHEDULE

A project schedule is provided as Figure 1. Since one of the objectives of the pilot test is to evaluate the time required to inject the permanganate and determine that it has reacted with the site contaminants, this schedule is intended solely as a rough guideline. The actual time required to complete the pilot test will vary based upon actual field conditions.

TABLE 1
TREATABILITY STUDY RESULTS SUMMARY

The Site-Specific, Treatability Study concluded the following:

- $KMnO_4$ rapidly degraded PCE, TCE, *cis*-12DCE, VC, chlorotrifluoroethene, and the low level xylene that was present in the site groundwater under the experimental conditions.

- The degradation of 1,1,2-trichloro-1,2,2-trifluoroethane in the control experiment implied that active biological activities might have occurred in the control experiment during the treatability test. 1,1,2-Trichloro-1,2,2-trifluoroethane degradation in the site groundwater was also observed, although the degradation rate was slower than the other chlorinated VOCs. Due to the inconclusive nature of treatability testing for 1,1,2-trichloro-1,2,2-trifluoroethane, additional or alternative remedial measures may be necessary to address chlorofluorocarbon contamination in the groundwater at this site.

- Remediation using $KMnO_4$ oxidation is a feasible and effective alternative.

- The Pall site has a low $KMnO_4$ demand estimated at 1 to 4 g/kg soil. The oxidant demand increased with increasing $KMnO_4$ concentrations.

- The decomposition of $KMnO_4$ in the subsurface materials is slow. Therefore, a low $KMnO_4$ dose of 1 to 2 g/L is recommended for pilot testing.

- The impact of $KMnO_4$ injection on metal leaching was determined not to be significant.

- A site investigation and characterization (i.e., a Pilot Test) was suggested to design and implement an effective oxidant delivery system

TABLE 2

INJECTION AND MONITORING WELL SUMMARY – INJECTION SEQUENCING

Injection Phase	Injection Wells and Volume of KMnO4 Solution Injected	Monitoring Wells To Be Sampled for VOCs & Field Monitoring	Points to be Field Monitored for Colorimetric Response, Water Levels, pH, and DO
Phase I	Shallow: PT-14S, PT-15S, PT-16S, PT-17S, and PT-18S Intermediate: PT-14I, PT-15I, PT-16I, PT-17I, and PT-18I (26,400 gallons KMnO4 solution total in each well)	Wells to be monitored with samples submitted to lab for analyses: MW-11PS, MW-11PI, MW-12PS, MW-12PI, MW-5P, MW-5PI, MW-10P, MW-10PI, PTMW-1S, PTMW-1I, PTMW-2S, and PTMW-2I.	Wells to be field screened only: Active injection wells plus PT-9S, PT-9I, PT-10S, PT-10I, PT-11S, PT-11I, PT-12S, PT-12I, PT-13S, PT-13I, PT-1S, PT-1I, PT-2S, PT-2I, PT-3S, PT-3I, PT-4S, PT-4I, PT-5S, PT-5I
Phase II	Shallow PT-9S, PT-10S, PT-11S, PT-12S, and PT-13S Intermediate: PT-9I, PT-10I, PT-11I, PT-12I, and PT-13I (26,400 gallons KMnO4 solution total in each well)	Wells to be monitored with samples submitted to lab for analyses: MW-11PS, MW-11PI, MW-12PS, MW-12PI, MW-5P, MW-5PI, MW-10P, MW-10PI, PTMW-3S, PTMW-3I, PTMW-4S, and PTMW-4I.	Wells to be field screened only: Active injection wells plus PT-1S, PT-1I, PT-2S, PT-2I, PT-3S, PT-3I, PT-4S, PT-4I, PT-5S, PT-5I, PT-14S, PT-14I, PT-15S, PT-15I, PT-16S, PT-16I, PT-17S, PT-17I, PT-18S, and PT-18I.
Phase III	Shallow: PT-1S, PT-2S, PT-3S, PT-4S, and PT-5S Intermediate: PT-1I, PT-2I, PT-3I, PT-4I, and PT-5I (26,400 gallons KMnO4 solution total in each well)	Wells to be monitored with samples submitted to lab for analyses: MW-5P, MW-5PI, MW-10P, MW-10PI, PTMW-3S, PTMW-3I, PTMW-4S, PTMW-4I, PTMW-5S, PTMW-5I, PTMW-6S, PTMW-6I, MW-1GS and MW-1GI.	Wells to be field screened only: Active injection wells plus PT-9S, PT-9I, PT-10S, PT-10I, PT-11S, PT-11I, PT-12S, PT-12I, PT-13S, and PT-13I,
Phase IV	Shallow: PT-6S, PT-7S, PT-and PT-8S Intermediate: PT-6I, PT-7I, and PT-8I (26,400 gallons KMnO4 solution total in each well)	Wells to be monitored with samples submitted to lab for analyses: MW-10P, MW-10PI, MW-2A, MW-2AI, MW-2GS, and MW-2GI	Wells to be field screened only: Active injection wells plus PT-5S, and PT-5I.
Phase V	Shallow: MW-3, MW-4, Horizontal SVE Well (when water table is high) Intermediate: MW-4PI	Wells to be monitored with samples submitted to lab for analyses: PT-15S, PT-15I, PT-17S, and PT-17I	Wells to be field screened only: Active injection wells plus PT-14S, PT-14I, PT-15S, PT-15I, PT-16S, PT-16I, PT-17S, PT-17I, PT-18S, and PT-18I

Note: A final round of field screening from all points will be performed after all injection events have been completed.

TABLE 3
PERFORMANCE MONITORING DATA COLLECTION

Field Screening & Monitoring Program:

Field Monitoring Parameter	Field Monitoring Frequency	Purpose of Monitoring
Depth to Water	Baseline Before Injection, Twice Daily During Injection, Weekly Following Injection until Reaction is Complete	Evaluate potential mounding. Evaluate ROI of injection events.
Groundwater Temperature	Baseline Before Injection, Twice Daily During Injection, Weekly Following Injection until Reaction is Complete	Monitor for heat of reaction, health and safety.
Groundwater Conductivity	Baseline Before Injection, Twice Daily During Injection, Weekly Following Injection until Reaction is Complete	Assist in evaluation of possible metals in solution
Groundwater pH	Baseline Before Injection, Twice Daily During Injection, Weekly Following Injection until Reaction is Complete	Data required to evaluate extent of reaction, reaction kinetics, and general system performance
Dissolved Oxygen in Groundwater	Baseline Before Injection, Twice Daily During Injection, Weekly Following Injection until Reaction is Complete	Data required to evaluate extent of reaction, reaction kinetics, and general system performance
Groundwater Turbidity	Baseline Before Injection, Twice Daily During Injection, Weekly Following Injection until Reaction is Complete	Indicator of possible presence / absence of KMnO4 when used in conjunction with other data.
Permanganate in Groundwater (color)	Baseline Before Injection, Twice Daily During Injection, Weekly Following Injection until Reaction is Complete	Direct KMnO4 measurement, extent of reaction, ROI of injection wells, etc.

Continued on next page . . .

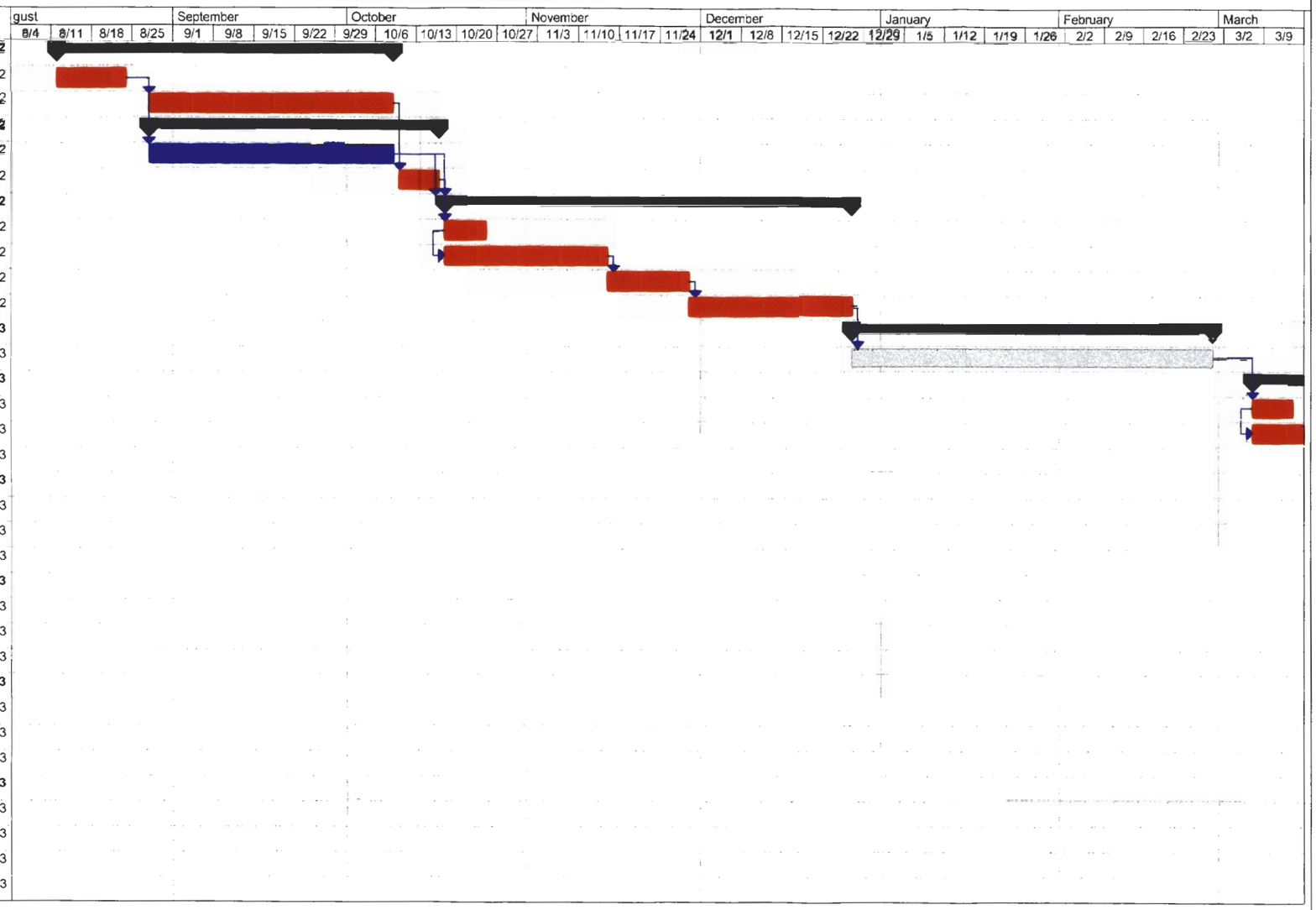
TABLE 3 (CONTINUED)

Analytical Sample Collection & Analysis Program:

Sample Analyses Parameter	When Sampled	Purpose of Monitoring
VOCs and Freons in Groundwater	Baseline prior to injection, Once on day following initial injection, Once on last day days of injection, Weekly thereafter until field monitoring indicates completion of reaction..	Indicates effectiveness and degree of completion of reaction, residual contaminant levels, etc.
Metals in Groundwater	Baseline prior to injection, Once on day following initial injection, Weekly thereafter until field monitoring indicates completion of reaction..	Indicates potential bi-products of reaction, ion formation, etc.
ORP in Groundwater	Baseline prior to injection, Once on last day days of injection, Weekly thereafter until field monitoring indicates completion of reaction..	Assist in evaluating reaction effectiveness
TOC in Groundwater	Baseline prior to injection, Once on day following initial injection, Once on last day days of injection, Weekly thereafter until field monitoring indicates completion of reaction..	Indicator of soil and groundwater oxidant demand, input parameter for model verifications, extent of reaction indicator, etc.
Chloride in Groundwater	Baseline prior to injection, Once on day following initial injection, Once on last day days of injection, Weekly thereafter until field monitoring indicates completion of reaction..	Indicates potential bi-products of reaction, degree of reaction completed, etc.

Figure 1
Permanganate Pilot Test Schedule

ID	Task Name	Start	Finish
1	**1 Administration & Mobilization**	**Mon 8/12/02**	**Tue 10/8/02**
2	1.1 NYSDEC Review & Approval of De	Mon 8/12/02	Fri 8/23/02
3	1.2 Procurement and Mobilization	Wed 8/28/02	Tue 10/8/02
4	**2 Field Preparation & Drilling**	**Wed 8/28/02**	**Wed 10/16/02**
5	2.1 Well Installation	Wed 8/28/02	Tue 10/8/02
6	2.2 Injection System Field Setup	Thu 10/10/02	Wed 10/16/02
7	**3 Phase I Injection & Monitoring**	**Fri 10/18/02**	**Thu 12/26/02**
8	3.1 Phase I Injections	Fri 10/18/02	Thu 10/24/02
9	3.2 Phase I Monitoring	Fri 10/18/02	Thu 11/14/02
10	3.3 NYSDEC Status Report Prep.	Fri 11/15/02	Thu 11/28/02
11	3.4 NYSDEC Reviews & Revisions	Fri 11/29/02	Thu 12/26/02
12	**4 Winter Shutdown**	**Fri 12/27/02**	**Thu 2/27/03**
13	4.1 Postponement Until Spring Thaw	Fri 12/27/02	Thu 2/27/03
14	**5 Phase II Injection & Monitoring**	**Fri 3/7/03**	**Thu 4/17/03**
15	5.1 Phase II Injections	Fri 3/7/03	Thu 3/13/03
16	5.2 Phase II Monitoring	Fri 3/7/03	Thu 4/3/03
17	5.3 Status Report - Phase II	Fri 4/4/03	Thu 4/17/03
18	**6 Phase III Injection & Monitoring**	**Fri 4/11/03**	**Thu 5/22/03**
19	6.1 Phase III Injections	Fri 4/11/03	Thu 4/17/03
20	6.2 Phase III Monitoring	Fri 4/11/03	Thu 5/8/03
21	6.3 Status Report - Phase III	Fri 5/9/03	Thu 5/22/03
22	**7 Phase IV Injection & Monitoring**	**Fri 5/16/03**	**Thu 6/26/03**
23	7.1 Phase IV Injections	Fri 5/16/03	Thu 5/22/03
24	7.2 Phase IV Monitoring	Fri 5/16/03	Thu 6/12/03
25	7.3 Status Report - Phase IV	Fri 6/13/03	Thu 6/26/03
26	**8 Phase V Injection & Monitoring**	**Fri 6/20/03**	**Thu 7/31/03**
27	8.1 Phase V Injections	Fri 6/20/03	Thu 6/26/03
28	8.2 Phase V Monitoring	Fri 6/20/03	Thu 7/17/03
29	8.3 Status Report - Phase V	Fri 7/18/03	Thu 7/31/03
30	**9 Final Reports & Documentation**	**Fri 8/1/03**	**Thu 10/9/03**
31	9.1 Draft Summary Report Prep.	Fri 8/1/03	Thu 8/28/03
32	9.2 NYSDEC Review & Comments	Fri 8/29/03	Thu 9/11/03
33	9.3 Final Report Prep.	Fri 9/12/03	Thu 9/25/03
34	9.4 NYSDEC Approval, Project Compl	Thu 10/9/03	Thu 10/9/03



Project: Pall Permanganate Pilot Test S
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Rolled Up Task
Rolled Up Split
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
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Figure 1
Permanganate Pilot Test Schedule

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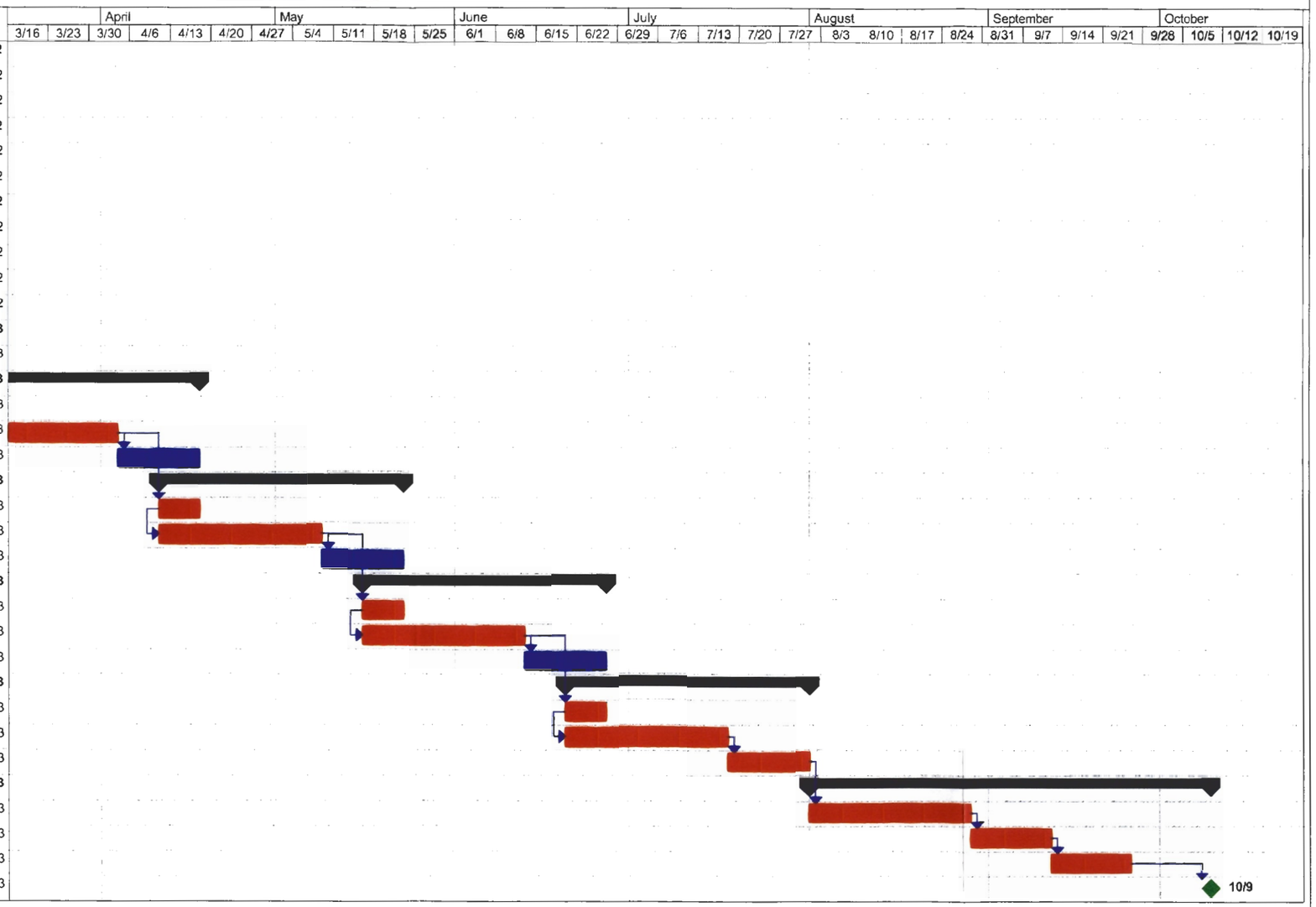
20	6.2 Phase III Monitoring	Fri 4/11/03	Thu 5/8/03
21	6.3 Status Report - Phase III	Fri 5/9/03	Thu 5/22/03
22	**7 Phase IV Injection & Monitoring**	**Fri 5/16/03**	**Thu 6/26/03**
23	7.1 Phase IV Injections	Fri 5/16/03	Thu 5/22/03
24	7.2 Phase IV Monitoring	Fri 5/16/03	Thu 6/12/03
25	7.3 Status Report - Phase IV	Fri 6/13/03	Thu 6/26/03
26	**8 Phase V Injection & Monitoring**	**Fri 6/20/03**	**Thu 7/31/03**
27	8.1 Phase V Injections	Fri 6/20/03	Thu 6/26/03
28	8.2 Phase V Monitoring	Fri 6/20/03	Thu 7/17/03
29	8.3 Status Report - Phase V	Fri 7/18/03	Thu 7/31/03
30	**9 Final Reports & Documentation**	**Fri 8/1/03**	**Thu 10/9/03**
31	9.1 Draft Summary Report Prep.	Fri 8/1/03	Thu 8/28/03
32	9.2 NYSDEC Review & Comments	Fri 8/29/03	Thu 9/11/03
33	9.3 Final Report Prep.	Fri 9/12/03	Thu 9/25/03
34	9.4 NYSDEC Approval, Project Comple	Thu 10/9/03	Thu 10/9/03



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Feasibility Study of $KMnO_4$ Oxidation of VOCs and Soils For the Glen Cove, New York Site

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1. Introduction

A groundwater remediation program is being implemented at a facility located at Glen Cove, New York (GCNY). The groundwater at the site is contaminated with volatile organic compounds (VOCs) that primarily include tetrachloroethylene (PCE), trichloroethylene (TCE), dichloroethylenes (DCEs), vinyl chloride (VC) and two freons (i.e., chloro-triflouoroethene and 1,1,2-trichloro-1,2,2-trifluoroethane).

In-Situ Chemical Oxidation is being evaluated as the remedial technology for the restoration of the GCNY site. Potassium permanganate ($KMnO_4$) is the oxidant that is evaluated as the oxidant to be used in this site. The Environmental Research Institute (ERI) of the University of Connecticut was retained by Enviro-Sciences Inc. (ESI) to conduct bench-scale tests for evaluating the feasibility of using $KMnO_4$ to destroy PCE, TCE, DCEs, VC and freons. In particular, the study has focused on the following: (1) a preliminary characterization of the site soil and groundwater (2) the degradation of target VOCs by permanganate ions in the site groundwater (3) the determination of oxidant demand for the actual site soil (4) the impact of oxidant injection on soil metal leaching.

2. Goals of Proposed Tests

Four bench-scale tests recognized as Tasks 1A, 1B, 1C and 1D were conducted.

- **Task 1A**: Preliminary soil and groundwater characterization
- **Task 1B**: Oxidation of VOCs in the site contaminated groundwater by $KMnO_4$
- **Task 1C**: Determination of oxidant ($KMnO_4$) demand of the GCNY site soil
- **Task 1D**: Examination of the extent of metals leaching from soils due to $KMnO_4$ oxidation

The goals of the tests were to investigate the feasibility of using $KMnO_4$ to remediate the VOCs at the GCNY site. In addition, the oxidant demand of the actual site soil and the impact of oxidant injection on metal leaching from the site soil were determined. Investigation methods used to fulfill the proposed tests are described below.

3. Experimental Section

3.1 Soil and Groundwater Characterization (Task 1A)

The characteristics of the site soil and groundwater are valuable and useful for data interpretation of the proposed tests and for future field applications. Duplicate soil samples (sample ID TS1-S) and groundwater samples (sample ID TS1-GW), collected near MW-12PS, were characterized for parameters including metal content [e.g., iron (Fe), aluminum (Al), manganese (Mn), chromium (Cr), arsenic (As), selenium (Se) and lead (Pb)], pH and total organic carbon content (TOC). The soil was also characterized for its grain size distribution. A list of the analysis methods employed is summarized in Table 1.

- **Selection of Sample Soil and Groundwater for the Tests**

Five soil samples (labeled as TS1-S to TS5-S) and five groundwater samples (labeled as TS1-GW to TS5-GW) were collected from the GCNY site on 03/14/01 and delivered to ERI on 03/15/01 by ESI. The groundwater samples were first analyzed for their VOC levels by the SW-846 8260 method. The results showed that the TS1-GW groundwater contained all targeted VOCs [i.e., chlorinated ethenes (CEs) and freons]. Thus, TS1-S soil and TS1-GW groundwater were selected as the media for this study.

- **Sampling for Characterization of Metals and TOC in Soil (TS1-S) and Groundwater (TS1-GW)**

Samples for metal and TOC analysis were collected in duplicate from the TS1-S soil and from the TS1-GW groundwater, both samples were stored in 2-L amber glass jars and preserved at 4 °C after being received. Sampling of the GCNY soil for metal analysis involved placing approximately 25 g of soil from the soil container into two 20-mL glass vials. The two vials were capped and delivered to ERI's Metal Laboratory for metal analysis, following ERI's QA/QC protocol. Two 40-mL glass vials were used to collect the TS1-GW groundwater. The level of selected metals (i.e., Fe, Al, Mn, As, Cr, Se and Pb) in both soil and groundwater samples was determined using an induced-couple plasma atomic emission system (Perkin-Elmer ICP-Optima 3300 XL) or a graphite furnace atomic adsorption system (Perkin-Elmer Zeeman 5100 PC).

Samples for TOC analysis were collected in duplicate into two 20-mL glass vials for both the sample soil and groundwater. These samples were delivered to ERI's Nutrient Laboratory for TOC measurement using CHN Elemental Analyzer (for soil samples) or TOC Analyzer (for groundwater samples).

- **Soil pH Measurement and Grain Size Analysis**

The soil pH measurement is performed by following SW-846 Method 9045C, an electrometric procedure for measuring pH in soils, sludge and waste samples. The measurement of the soil pH involved adding 20 g of the site soil (with moisture content of 8.1% by weight) and 20 mL of D.I. water in a 50-mL beaker. The beaker was covered with aluminum foil and continuously stirred for 5 minutes. The soil suspension was then let to stand for 1 hour to allow most of the suspended particles to settle down. The soil pH was determined by measuring the pH of the supernatant in the soil-water mixture.

The grain size distribution of the GCNY soil was determined following ASTM Method D 422-63. The fraction of gravel, sand, silt and clay in the sample soil was determined using a series of sieves of specified openings

3.2 Oxidation of VOCs in the GCNY Groundwater by $KMnO_4$ (Task 1B)

The ability of $KMnO_4$ to degrade VOC contaminants in the site groundwater was investigated in three sets of batch experiments (1B-1, 1B-2 and 1B-3), 1B-1 and 1B-2 being two experiments with $KMnO_4$ in different doses (i.e., 0.25 g/L and 1 g/L) and 1B-3 being a control experiment (i.e., without adding $KMnO_4$ solution). Five groundwater samples were analyzed for its VOC levels prior to usage in the tests. The TS1-GW groundwater was found to have VOC levels that were comparable to those reported in an early site investigation report. It was thus selected as the media for the Task 1B study.

The experiments, as shown in Table 2, were conducted under isothermal, completely mixed and headspace free conditions using syringe reactors (Figure 1). A typical experimental system consisted of a 100-mL gas-tight glass syringe connected to a sampling syringe by means of a control valve and luer-lock fitting. The loss of VOCs due to evaporation was minimized by maintaining a zero-headspace condition in the reactor by moving the plungers

of both the sampling and reactor syringes simultaneously during the injection of reactants or sampling. At least two samples were collected each day from the reactor and analyzed by a GC-MS system for VOC levels. The samples after being collected were immediately quenched with 5 (1B-1) or 20 μL (1B-2) of 1N sodium thiosulfate ($Na_2S_2O_3$) to stop the reactions between $KMnO_4$ and VOCs. Other parameters including pH, chloride and $KMnO_4$ concentrations were monitored only in the beginning and at the end of the experiments. The experiments were continued for a period of three days (72 h). A list showing experimental conditions and monitored parameters for Task 1B is shown in Table 2. The tests established the VOC degradation by $KMnO_4$ oxidation against time.

In a typical run, ~110 mL of contaminated site groundwater (preserved at 4 °C) and a Teflon-coated stirrer bar were first placed into a syringe reactor. Two samples (5 mL each) were then collected from the reactor and injected into 43-mL volatile organic analysis (VOA) vials that had deionized (DI) water of 38 mL. These two samples were used to determine initial VOC levels in the reactor. Subsequently, 2.5 mL of stock $KMnO_4$ solutions (10 g/L for 1B-1 and 40 g/L for 1B-2) was injected into the reactor to obtain a desired initial $KMnO_4$ concentration (i.e., 0.25 g/L and 1 g/L) and to initiate the reactions. A control experiment (without $KMnO_4$ injection, Task 1B-3) was conducted paralleled to Tasks 1B-1 and 1B-2 to elucidate the degradation of targeted VOCs by $KMnO_4$ oxidation. Parameters such as chlorinated ethenes and two detected freons were monitoring with time by the GC-MS analysis. Other parameters including $KMnO_4$, chloride and pH were measured in the beginning and at the end of the experiment.

- **Measurement of Monitored Parameters ($KMnO_4$, chloride and pH)**

$KMnO_4$ concentrations were determined using an UV-VIS spectrometer (Milton Roy, Spectronic 601). The instrument was set-up for this particular experiment at the wavelength of 526 nm, where $KMnO_4$ shows its maximum of light absorbance. $KMnO_4$ samples were filtered using 0.45 μm filters and measured immediately after sampling. The concentration of $KMnO_4$ was obtained using a pre-built calibration curve, which relates the absorbance as a function of the concentration. Chloride was determined using an ion chromatograph (Dionex

DX-500) equipped with an ion exchange column (Dionex Ionpac 4 mm AS9H). All the pH determinations were made using a pH meter (Accumet, Fisher Scientific).

3.3 Determination of Oxidant Demand of the GCNY Soil (Task 1C)

The GCNY sample soil was determined for its $KMnO_4$ demand through a set of vial experiments performed in duplicate. The experiments were conducted using a vial rotator system (minimizing the breakdown of soil particles) under various $KMnO_4$/soil ratios (e.g., 1 mg/g, 2 mg/g, 4 mg/g, 8 mg/g, 16 mg/g, 40 mg/g) at 20 °C (Figure 2). A summary of the experimental conditions is shown in Table 3. $KMnO_4$ concentrations were monitored every two to three days during the test. The soil oxidant demand (SOD) was determined using equation 1.

$$SOD = V(C_0-C_s)/m_{soil} \quad (1)$$

where V = total volume of $KMnO_4$ solution in the vials; C_0 = initial $KMnO_4$ concentration; C_s = $KMnO_4$ concentration at the relatively steady state or at 14 days reaction period; m_{soil} = the mass of dry soil in reactors

The test was terminated and the SOD was calculated when $KMnO_4$ concentration reached a steady state condition or the experiments reached a 14-day testing period (whichever came first). The results of the test provided the oxidant demand of the GCNY soil and the information on reactivity of the site soil with $KMnO_4$.

3.4 Impact of $KMnO_4$ oxidation on Soil Metal Leaching (Task 1D)

The impact of $KMnO_4$ oxidation on the leaching of several metals (i.e., Pb, Cr, As and Se) from the soil was investigated by determining the increase in dissolved metal ions in the samples (made in Section 3.3) at the end of the test. The amount of the increase in dissolved metal ions was determined by comparing the metal ion concentrations of control samples with those of the $KMnO_4$-containing samples. The pH and oxidation-reduction potential (ORP) of all samples were measured so that the correlation between metal leaching with pH, ORP and $KMnO_4$ concentration could be established. The results of Task 1D provide the

information on the impact of $KMnO_4$ injection on the leaching of metal ions from the site soil.

4. Results and Discussion

4.1 Soil and Groundwater Characterization (Task 1A)

The soil and groundwater collected from a location near MW-12PS at the GCNY site were characterized for VOCs, metals, TOC and pH. The metal contents of the sample soil and groundwater are listed in Tables 4 and 5, respectively. The GC-MS analysis data of the TS1-GW groundwater is shown in Appendix A. The results indicate that the groundwater is contaminated by *cis*-1, 2-DCE (374 μg/L and 375 μg/L), TCE (91.1 μg/L and 93.8 μg/L), VC (27.7 μg/L and 24.6 μg/L) and two freons (i.e., chloro-triflouoroethene and 1,1,2-trichloro-1, 2, 2-trifluoroethane). The two detected freons are not in the chemical list of the EPA SW-846 8260 method and their quantification standards are currently not available in the market. Therefore, integration area based on the GC-MS chromatogram was used to evaluate their degradation in this study. Two other contaminants (i.e., m-xylene + p-xylene (7.2 μg/L and 7.3 μg/L) and dichloromethane (18 μg/L) were also found in the TS1-GW groundwater.

The metal analysis indicates that iron (5260 mg/kg and 5160 mg/kg) and aluminum (1558 mg/kg and 1811 mg/kg) are relatively abundant in the sample soils (Table 4). Se, As and Cr are three metal elements whose mobilization due to $KMnO_4$ injection is of concern. The soil contains Cr in the level of 9 to 14 mg/kg and has As and Se close to the instrument detection limits (Table 4).

Grain size analysis shows that the sample soil primarily consists of fine sand (32%) and silt (32%) mixed with medium and coarse sand (18%), gravel (12%) and clay (6%) as shown in Figure 3. This soil has a pH of ~8.0 and a total organic carbon content of ~0.1%.

The TS1-GW groundwater contains iron (9960 μg/L and 10900 μg/L), aluminum (5170 μg/L and 5710 μg/L) and manganese (3510 μg/L and 3520 μg/L) (Table 5). As and Se are below

the instrument limit and Cr is in the level of 22 to 24 μg/L. The sample ground water has a pH level of 6.8 and a TOC level of 29 mg/L.

4.2 Oxidation of VOCs in the GCNY Groundwater by $KMnO_4$ (Task 1B)

The ability of $KMnO_4$ to degrade target VOCs (i.e., PCE, TCE, DCEs, VC and freons) in the GCNY groundwater was investigated at 20 °C and under completely mixed conditions. Three sets of batch experiments under various reaction conditions were conducted (Table 2). In the first and second set (1B-1 and 1B-2), different concentrations of $KMnO_4$ solutions (i.e., 0.25 g/L and 1 g/L) were employed separately to degrade VOCs in the site groundwater. The third set (1B-3) was the control experiment where no oxidant was added in the reactor. Degradation of PCE, TCE, *cis*-DCE and VC in the three sets of batch experiments is given in Figures 4 to 6, Table 6 and Appendix B (showing the GC-MS raw data of Task 1B samples). The results indicated that $KMnO_4$ degraded both VC and *cis*-DCE within 2 hrs (the first sampling point). TCE and PCE were degraded to below their method detection limits (~1 μg/L) within 32 h. The ability of $KMnO_4$ to degrade PCE, TCE, *cis*-DCE and VC is illuminated when comparing the data of 1B1 and 1B2 experiments with that of 1B-3 (the control experiment). The control experiment in which no oxidant was added showed relatively constant concentrations of VOCs in the GCNY groundwater during the experiment.

Indeed, the behavior of rapid degradation of chlorinated ethenes (CEs) including PCE, TCE, DCEs and VC by $KMnO_4$ was expected. While the degradation rates of these compounds were too fast to determine under the test conditions (i.e., low CE concentrations), the kinetics data of oxidation of CEs with $KMnO_4$ can be found in the literature (Huang et al., 2001). The kinetics study by Huang et al. (1999 and 2001) indicates that $KMnO_4$ can completely mineralize CEs (i.e., oxidatively transform CEs into chloride and carbon dioxides). Permanganate is primarily reduced to manganese oxides during the reactions. The final products of $KMnO_4$ oxidation of CEs are nontoxic to the environment.

Of the two detected freons, chloro-triflouroethene was rapidly degraded (i.e., within 2 h) in $KMnO_4$ solutions in sets 1-B1 and 1-B2 (Tables 7 and 8) while 1,1,2-trichloro-1,2,2-trifluoro was degraded in a relatively slow rate. However, it is expected that both ferons may go further to completion once the oxidant remains in the solutions. Additionally, in 1B-3 (the

control experiment), degradation of 1,1,2-trichloro-1,2,2-trifluoro ethane was observed, indicating biological activities might have occurred in 1B-3 during the experiment. Of the two other trace contaminants found in the groundwater, m-xylene and p-xylene were rapidly degraded by $KMnO_4$ while dichloromethane showed little reaction with $KMnO_4$ (Appendix B).

The pH, chloride and $KMnO_4$ were measured for all the three sets in the beginning and at the end of the experiments. The results are shown in Table 9. The average pH value was 6.84 for all the three sets in the beginning and was 6.74 for 1B-1, 6.86 for 1-B2 and 6.96 for 1-B3 at the end of the experiments. $KMnO_4$ concentrations decreased from 250 mg/L to 195 mg/L in 1B-1 and from 1000 mg/L to 773 mg/L in 1B-2. The chloride concentration in 1B-1 and 1B-2 remained ~45 mg/L because the influence from dechlorination of the VOCs (in μg/L level) in the sample groundwater was not significant.

4.3 Oxidant Demand of the GCNY Soil (Task 1C)

The oxidant demand of the GCNY soil was determined through a set of vial experiments under various $KMnO_4$/soil ratios and a water/soil ratio of ~4:1 at 20 °C. The results are shown in Figures 7 and 8, where the $KMnO_4$ concentration (in C/Co) versus time (h) was made to show the consumption tendency of $KMnO_4$ in the actual site soil and in DI water, respectively. It is evident that $KMnO_4$ concentrations remained nearly unchanged in DI water over the course of the test (Figure 8), while $KMnO_4$ degraded in the GCNY soil (Figure 7 and Appendix C). $KMnO_4$ concentration in higher $KMnO_4$ dose vials (i.e., 4 g/L) decreased rapidly in the early stage and slowed down after a reaction period of 120 h. Since the $KMnO_4$ concentration remained relatively constant in control experiments (with no soils), the consumption of $KMnO_4$ in the site soils revealed the demand of soil constituents for $KMnO_4$. For lower concentration vials (0.25 g/L), $KMnO_4$ concentration changed more rapidly during the tests and it was almost completely consumed by 336 h.

The data, observed in the test period of 14 days, was used to determine the SOD using equation 1. The results as shown in Figure 9 and Appendix D indicated that the SOD of the GCNY soil varied from ~1.0 to 4 g $KMnO_4$/kg soil, influenced by the oxidant concentration. The SOD increased as the dosed $KMnO_4$ concentration increased, most likely because the

reactivity of permanganate with many organic and inorganic compounds is greater in a higher $KMnO_4$ concentration. In addition, soil-induced $KMnO_4$ decomposition may also contribute in a significant degree to the observed phenomena.

4.4 Impact of $KMnO_4$ oxidation on Soil Metal Leaching (Task 1D)

The impact of $KMnO_4$ concentration and ORP on the mobility of four selected metals (i.e., Pb, As, Cr and Se) of environmental concern was investigated. The change in dissolved concentrations of the four selected metals after 14 days of tests is shown in Table 10 and Appendix E. The data indicates that As remained in not-detected level while Cr, Pb and Se had little increase (in μg/L level) at the end of the tests. The increase in Se is likely from the impurities of $KMnO_4$ used in this study since the Se level in both the sample soil and groundwater is not detected. The slight increase in Cr, most likely the hexavalent Cr under the test conditions, is possibly mainly due to the oxidation of naturally occurring chromium oxides in the soil. However, the increased level (e.g., 102~215 μg/L) is likely to be attenuated by natural soils through both adsorption onto soil surface or by soil reducing capacity. The impact of $KMnO_4$ oxidation and increased ORP during the tests on the metal leaching of As, Pb, Se and Cr from the GCNY soil appears to be insignificant.

5. Conclusions and Recommendations

CONCLUSIONS:

This study was conducted to investigate the feasibility of using $KMnO_4$ as the in-situ oxidant to degrade VOC contaminants at the GCNY site. In addition, the oxidant demand of the GCNY site soil was determined, and the impact of $KMnO_4$ injection on metal ion leaching from the soil was evaluated. Based on the experimental results, the following conclusions were made:

- $KMnO_4$ rapidly degraded PCE, TCE, *cis*-1,2-DCE, VC, chloro-trifluoroethene and xylenes in the GCNY sample groundwater under the experimental conditions.

Remediation of soil and groundwater contaminated with the above compounds by in-situ $KMnO_4$ oxidation is a feasible and effective alternative.

- The degradation of 1,1,2-trichloro-1,2,2-trifluoroethane in the control experiment implied that active biological activities might have occurred in the control experiment during the test. In addition, 1,1,2-trichloro-1,2,2-trifluoroethane in the site groundwater was slowly degraded by $KMnO_4$ oxidation.
- . The oxidant demand of the GCNY soil was in the range of 1~4 g/kg soil for $KMnO_4$ and it appeared to increase with the increase in $KMnO_4$ concentration.
- The soil has a low oxidant demand. $KMnO_4$ consumption by soil substances is not considered a hindrance to the use of in situ $KMnO_4$ oxidation technologies.
- The sample soil contains Cr in the level of 9 to 14 mg/kg and has As, Pb and Se close to or below the instrument detection limit (0.199 mg/kg). The data in Table 10 indicates that the impact of $KMnO_4$ injection on the metal leaching of As, Pb, Se and Cr from the GCNY soil is not significant.

RECOMMENDATIONS:

This feasibility study illuminates the ability of $KMnO_4$ to destroy VOCs including PCE, TCE, *cis*-1,2-DCE, VC, chloro-trifluoroethene and xylenes in the GCNY groundwater. It appears that In Situ $KMnO_4$ Oxidation is a feasible remedial technology for the GCNY site. To enhance the effectiveness of $KMnO_4$ oxidation in the remediation application, based on the experimental results, ERI recommends the followings:

- The GCNY soil has a low $KMnO_4$ demand, and the decomposition of $KMnO_4$ in the soil matrix is slow. Thus, a low $KMnO_4$ dose (e.g., 1 g/L or 2 g/L) is recommended to be used during the remediation application.
- The permanganate oxidation technology, like other chemical flushing technologies, requires delivery of the oxidant to contaminants. While the ability of $KMnO_4$ to destroy VOCs and the suitability of the oxidant being used in the site soil have been demonstrated, the success of using this technology for clean-up of the contaminated site depends on whether the oxidant is able to contact the contaminants. Thus, a precise site

investigation and characterization is suggested so that an effective oxidant delivery system can be developed.

6. References

Huang, K. C., Hoag, G. E., Chheda, P., Woody, B. A., and Dobbs, G. (1999). Kinetic Study of Oxidation of Trichloroethylene by Potassium Permanganate. *Environ. Eng. Sci.* 16 (4), pp.265-274.

Huang, K. C., Hoag, G. E., Chheda, P., Woody, B. A., and Dobbs, G. (2001). Kinetics Study of Oxidation of Chlorinated Ethenes with Permanganate. *Journal of Hazardous Materials.* (In Press)

Table 1. A Summary of Analytical Methods Used in the Study

Parameters	Instruments	Analytical Method
pH, ORP and grain size analysis	pH meter (Accumet Fisher Scientific) and standard sieves	Standard methods
$KMnO_4$	Spectrophotometer (Milton Roy)	Colorimetric method
VOCs	GC-MS	USEPA SW-846 8260
Total organic Carbon	TOC Analyzer (for groundwater) and CHN Analyzer (for soil)	Standard methods for water and soil
Metals (Fe, Al, Mn, Pb, Cr, As and Se)	ICP-AES/OES or AA-GFAAS	3050A for digestion/6010A for ICP or 7000A for GFAA (SW-846)

Table 2. Experimental conditions of Task 1B conducted to investigate the oxidation of VOCs in the GCNY groundwater by $KMnO_4$

[illegible] experiment	[illegible]	[illegible] media	Experimental condition: Oxidant (g/L)	Temp. (°C)	Monitored parameters
Aqueous batch Set 1 (1B-1)	Oxidation of VOCs in the GCNY groundwater by $KMnO_4$	VOC-contaminated groundwater	$KMnO_4$ (0.25 g/L)	20	VOCs, pH, $KMnO_4$ and chloride
Aqueous batch Set 2 (1B-2)	Oxidation of VOCs in the GCNY groundwater by $KMnO_4$	VOC-contaminated groundwater	$KMnO_4$ (1 g/L)	20	VOCs, pH, $KMnO_4$ and chloride
Aqueous batch Set 3 (1B-3)	Control experiment	VOC-contaminated groundwater	None	20	VOCs and pH and chloride

Note: $KMnO_4$, pH and chloride were measured in the beginning and at the end of each run.

Table 3. Test conditions of the vial experiments for determining soil oxidant demand

SOD Batch [log]	Soil Source	Initial Oxidant Dose [mg/g]	Oxidant/Soil Ratio [mg/g soil]	Water/Soil Ratio [v/m]
1	GCNY Site Soil	0.25	1	~4:1
2	GCNY Site Soil	0.5	2	~4:1
3	GCNY Site Soil	1	4	~4:1
4	GCNY Site Soil	2	8	~4:1
5	GCNY Site Soil	4	16	~4:1
6	GCNY Site Soil	10	40	~4:1

Note 1. All experiments were conducted in duplicate.

Table 4. Results of metal characterization of the GCNY site soil

Sample ID	[illegible]	[illegible]	[illegible]	[illegible]	Cr	Fe	[illegible]
ES-soil-M	1.09	1.44	ND	1558	14.4	5260	160
ES-soil-M(D)	0.748	1.80	ND	1811	8.73	5160	195
Detection Limit	0.199	0.199	0.199	0.496	0.248	0.496	0.248

Note: (D) = duplicated

Table 5. Results of metal characterization of the GCNY site groundwater

Sample ID	Metal content (ppb)						
	As	Pb	Se	Al	Cr	Fe	Zn
ES-GW-M	ND	6	ND	5170	22	9960	3510
ES-GW-M(D)	ND	7	ND	5710	24	10900	3520
Detection Limit	4	4	4	10	5	10	5

Note: (D) = duplicated

Table 6. Degradation of VOCs by $KMnO_4$ against time in the GCNY groundwater

Sample	Time (d)	TCE (µg/L)	cDCE (µg/L)	PCE (µg/L)	TCE (µg/L)
1B1	0	54.18/55.9	278.64/291.54	67.94/62.9	ND
	2	ND	ND	6.02	8.6
	8	ND	ND	5.16	ND
	22	ND	ND	5.16	ND
	32	ND/ND	ND/ND	ND/ND	ND/ND
	48	ND	ND	ND	ND
	56	ND	ND	ND	ND
	72	ND/ND	ND/ND	ND/ND	ND/ND
1B2	0	54.18/53.32	275.2/281.22	66.22/68.8	11.18/11.18
	2	ND	ND	4.3	ND
	8	ND	ND	4.3	ND
	22	ND	ND	ND	ND
	32	ND/ND	ND/ND	ND/ND	ND/ND
	48	ND	ND	ND	ND
	56	ND	ND	ND	ND
	72	ND/ND	ND/ND	ND/ND	ND/ND
1B3	0	54.18	273.48	66.22	16.18
	2	52.46	270.9	69.66	13.76
	8	51.6	268.32	71.38	15.48
	22	52.46	268.32	68.8	17.20
	32	50.74	259.72	67.08	17.20
	48	49.02	256.28	67.94	17.20
	56	49.88	254.56	65.36	17.20
	72	50.74	254.56	67.08	16.34

N.D.= Non-detected

Table 7. Degradation of chloro-triflouroethene by $KMnO_4$ with time in the GCNY groundwater

Time (h)	[illegible]	[illegible]	[illegible]
0	1.00/1.00	1.00/1/00	1.00/1.00
2	0	0	0.92
8	0	0	0.86
22	0	0	0.90
32	0/0	0/0	0.82
48	0	0	0.75
56	0	0	0.74
72	0/0	0/0	0.71

Table 8. Degradation of 1,1,2-trichloro-1,2,2-trifluoro ethane by $KMnO_4$ with time in the GCNY groundwater

0	1.00	1.00	1.00
2	0.85	0.93	0.85
8	0.88	0.98	0.80
22	0.87	0.83	0.82
32	0.86/0.86	0.87	0.77
48	0.75	0.79	0.70
56	0.72/0.76	0.73/0.76	0.66
72	0.73/0.7	0.77/0.75	0.62

Table 9. The pH, chloride and $KMnO_4$ in the beginning and at end of Task 1B experiments

Samples	Time (hr)					
	0			72		
	pH	chloride, mg/L	KMnO4, mg/L	pH	chloride, mg/L	KMnO4, mg/L
1 B1	6.84	44.15	250	6.74	44.24	194.72
1B2	6.84	43.93	1000	6.86	44.4	772.86
1 B3	6.84	45.28	0	6.91	44.84	Control

Table 10. The dissolved concentrations of Pb, As, Cr and Se in Task 1D vials after a reaction period of 14 days

Sample	[illegible]	[illegible]	[illegible]	Metal concentration, µg/L			
				As	Cr	Pb	Se
0104025-ES-0D	0.00	7.85	360.00	ND	10	ND	ND
010425-ES-0.25	13.87	7.59	440.15	ND	102	ND	ND
010425-ES-0.5	119.69	7.52	566.25	ND	142	60	16
010425-ES-1	508.99	7.51	590.75	ND	127	15	46
010425-ES-2	3263.91	7.43	611.20	ND	153	29	107
010425-ES-4	6179.96	7.40	627.90	ND	150	65	254
010425-ES-10	9096.15	7.38	651.40	ND	215	166	320

[1] 0104025-ES-0.25 = Sampling date-ESI sample soil-$KMnO_4$ concentration

[2] Parameters measured at the end of the tests.

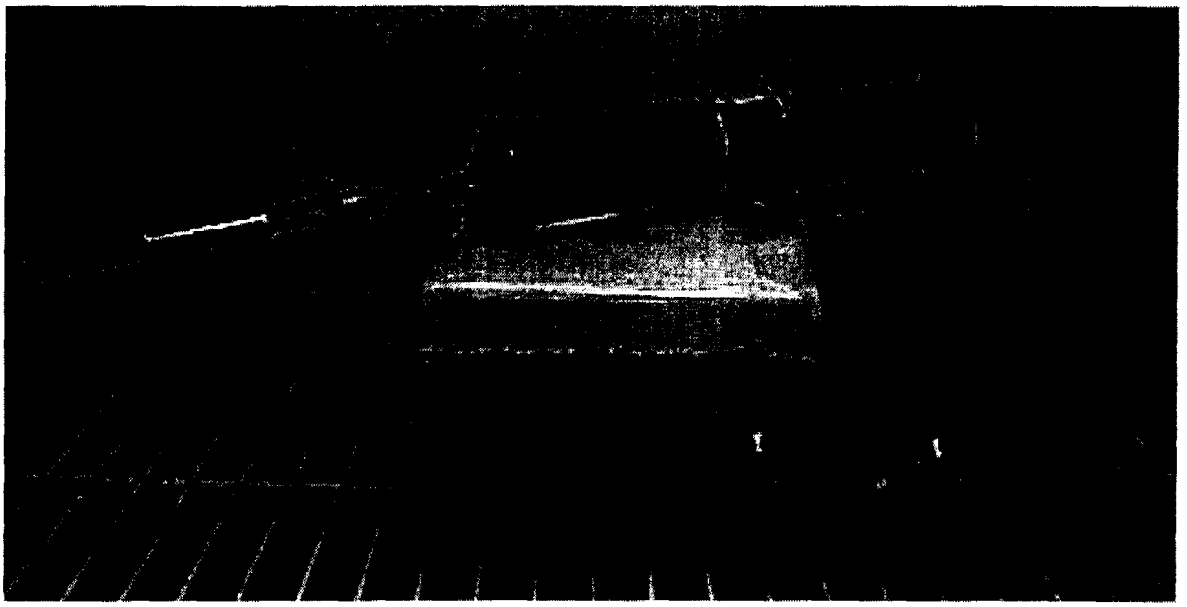

Figure 1. The syringe reactor system used in Task 1B experiment

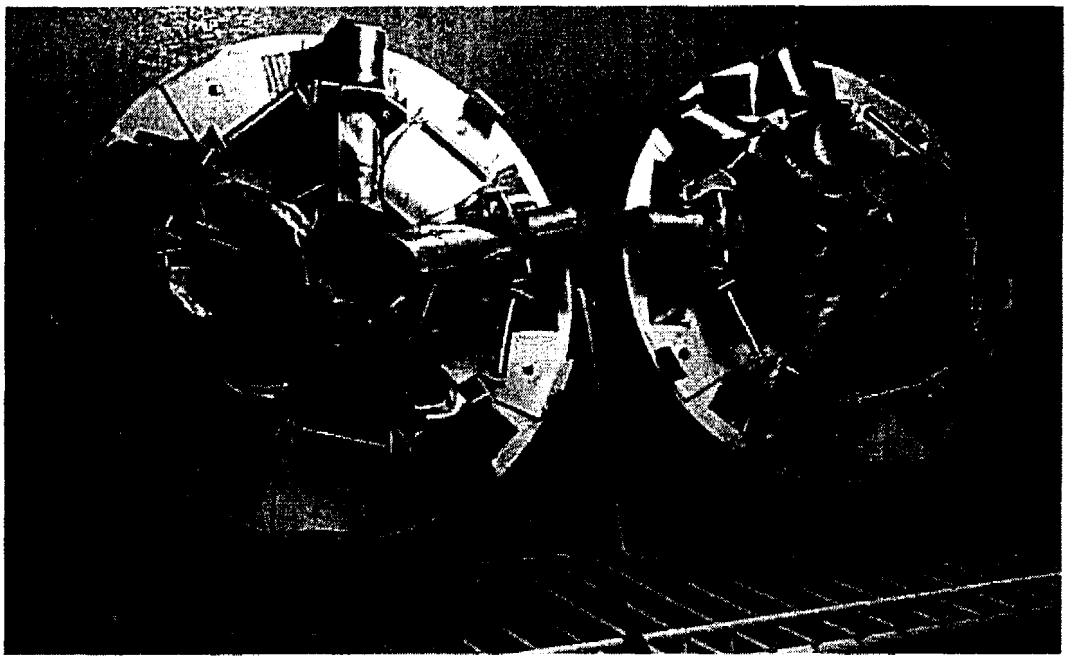

Figure 2. The rotator system used to determine soil oxidant demand

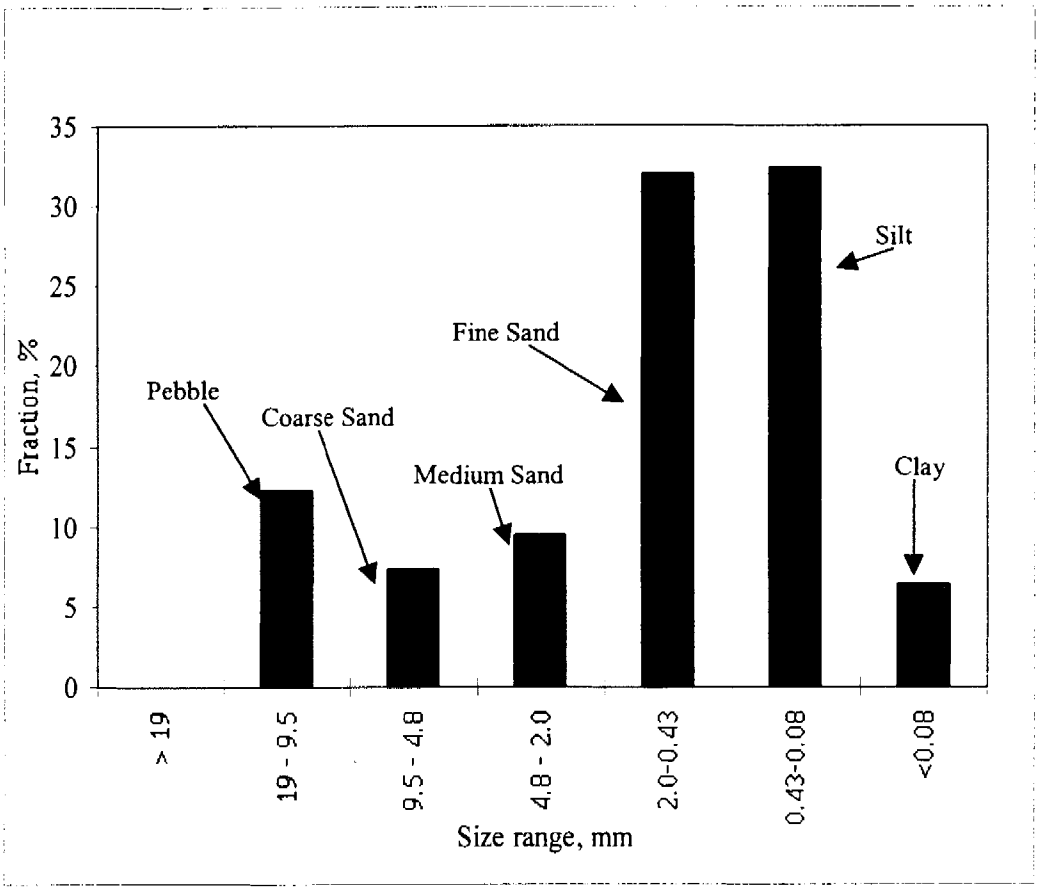

Figure 3. Grain size distribution of the GCNY sample soil.

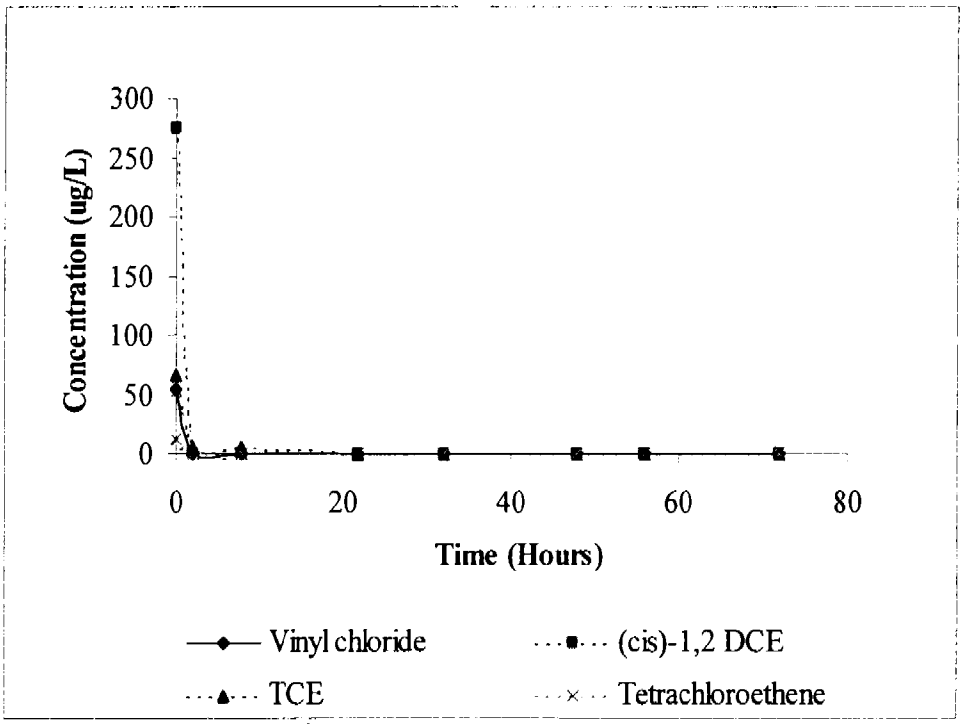

Figure 4 . Degradation of PCE, TCE, cis-1,2-DCE and VC by $KMnO_4$ in Task 1B-1. Temp. = 20 °C; Initial concentration = 0.25 g/L $KMnO_4$

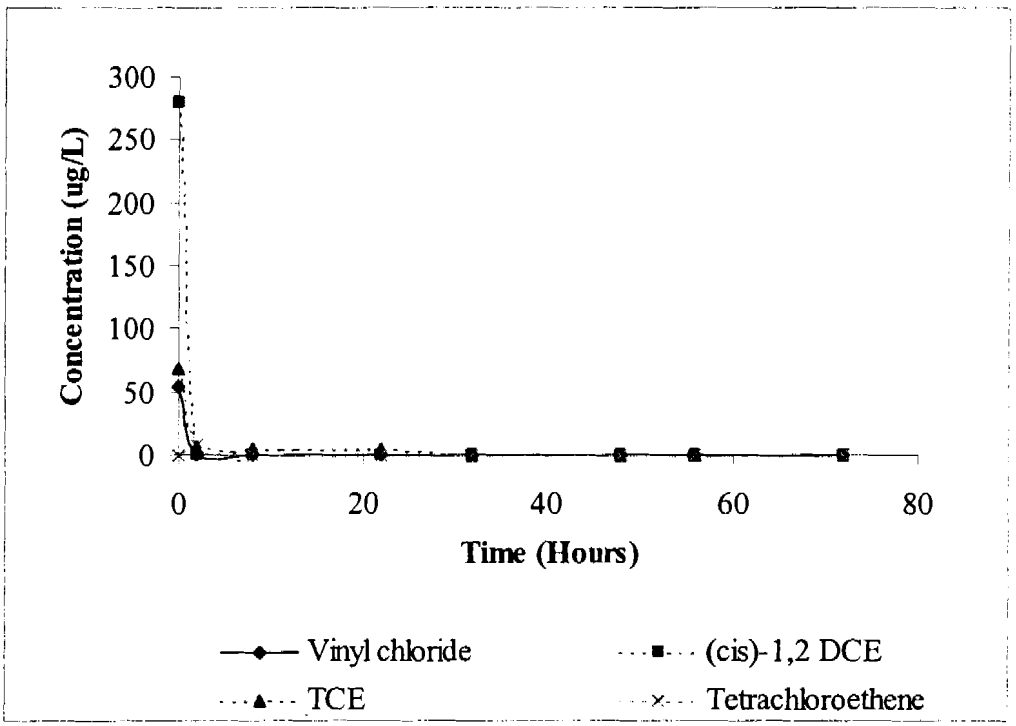

Figure 5 . Degradation of PCE, TCE, cis-1,2-DCE and VC by $KMnO_4$ in Task 1B-2. Temp. = 20 °C; Initial concentration of 1 g/L $KMnO_4$

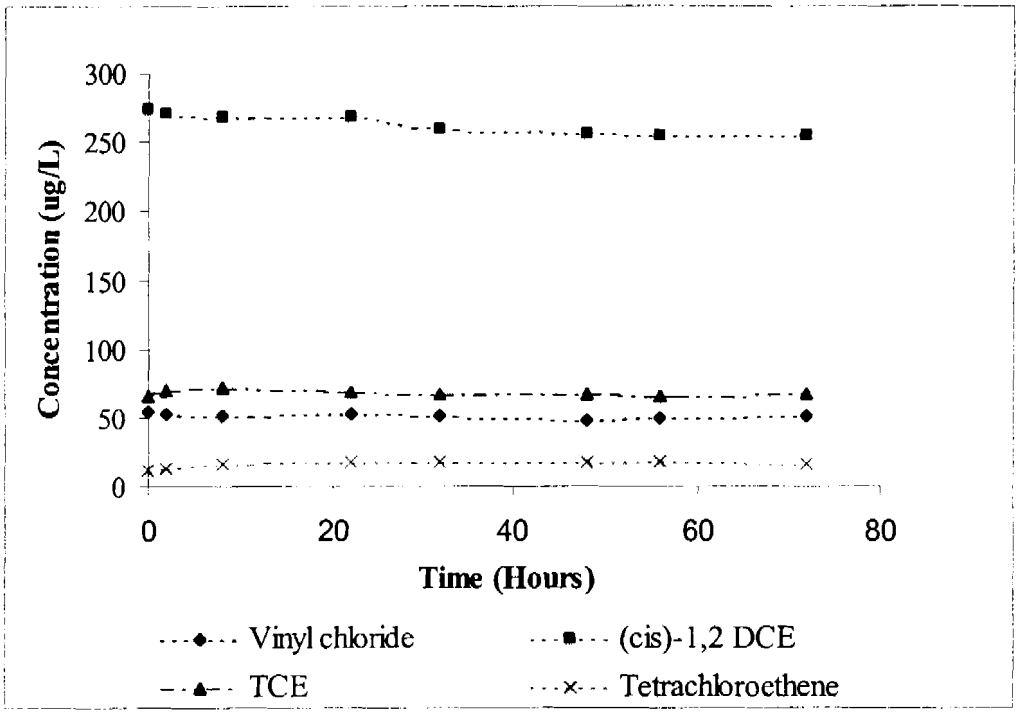

Figure 6. The variation of PCE, TCE, cis-1,2-DCE and VC during Task 1B-3 (the control experiment). = 20 °C; $KMnO_4$ concentration = 0 g/L

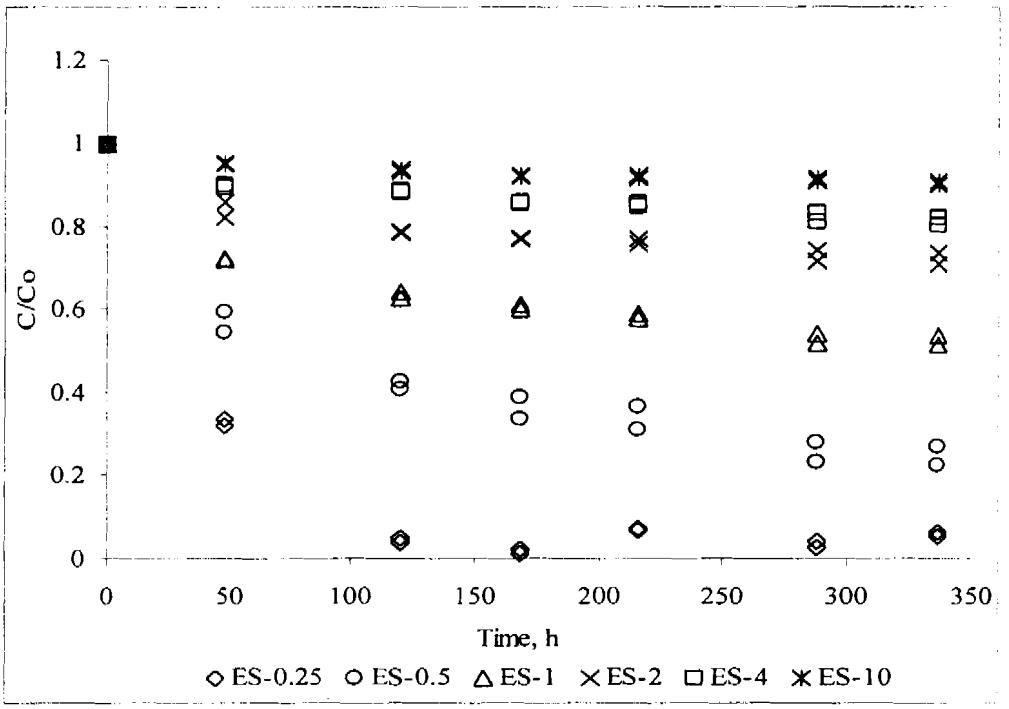

Figure 7. $KMnO_4$ concentration (in C/C_0) versus time during the SOD tests for the GCNY soil. Temp. = 20 °C; Rotator rpm = 0.7; ES-2 = GCNY soil with initial concentration of 2 g/L $KMnO_4$

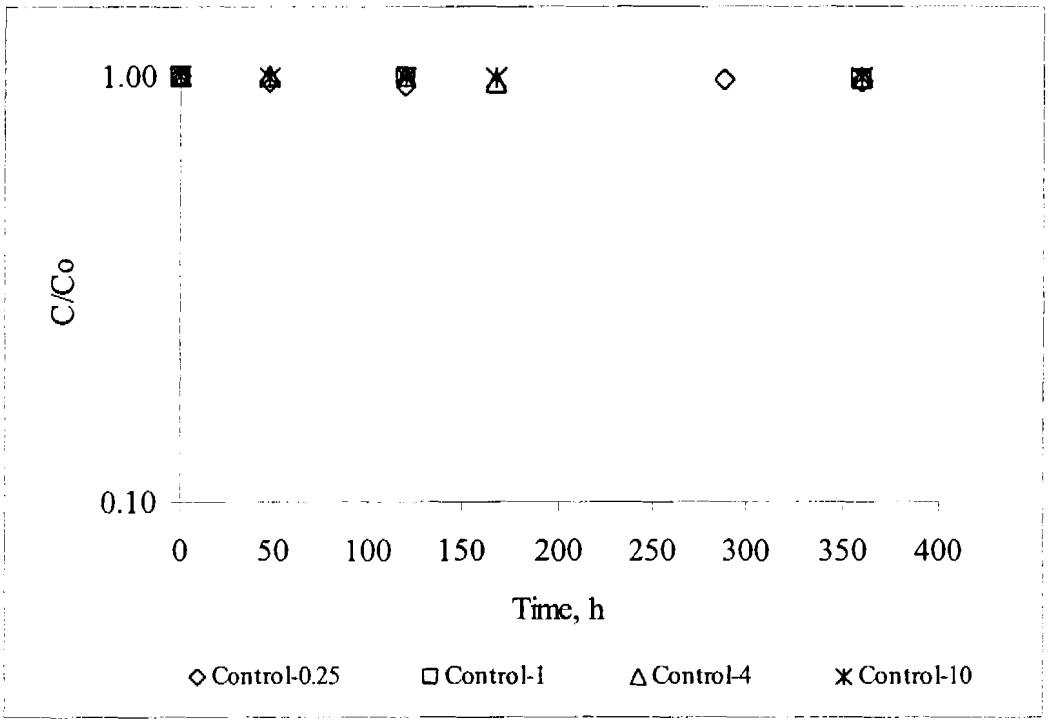

Figure 8. $KMnO_4$ concentration (in C/C_0) versus time during the SOD tests in the control experiment

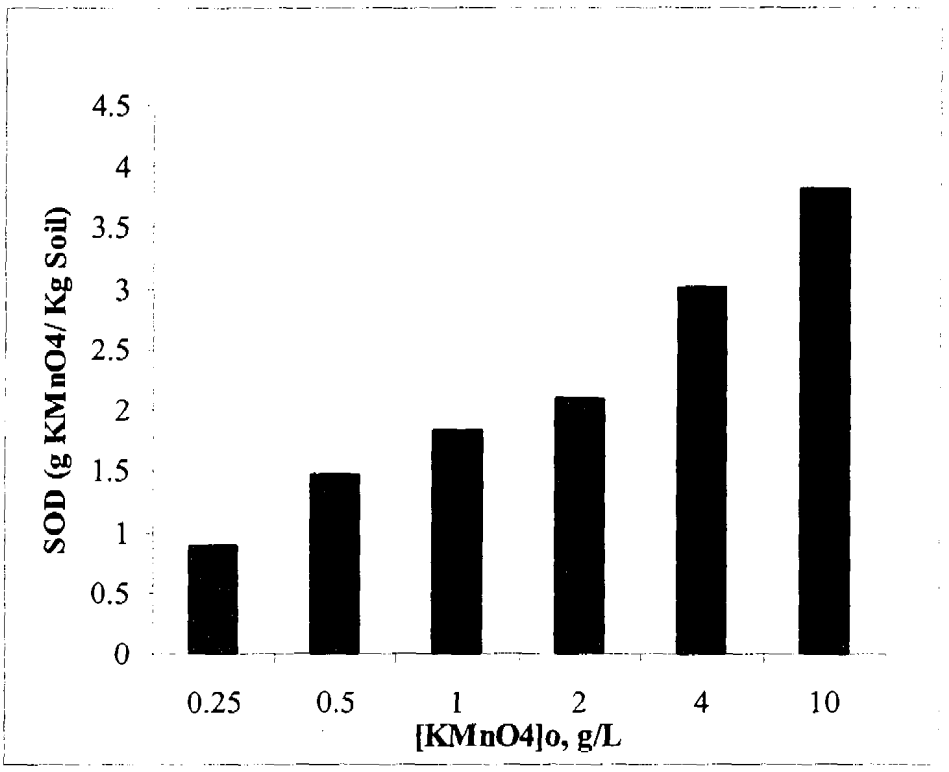

Figure 9. Oxidant demand of the GCNY soil, determined in a reaction period of 14 days.

APPENDIX A:

The GC-MS analysis raw data of TS-1 GW sample groundwater (in duplicate)

ERI Chain of Custody

Environmental Research Institute
270 Middle Turnpike U-5210
Storrs, Ct 06269-5210 (860)486-4015
Customersupport@eri.uconn.edu

Page 1 of 1

ERI Use Only		
Customer ID	Project ID	Invoice ID

Turn Around Time (circle): 28 Day | 14 Day | 7 Day | Specify

Company	Engineering Lab/ERI (ES KMnO4 Oxidaiton Treatibility Test)	Project Contact	Ken Huang	Billing Contact	
Address	U-5210, Room 164	Phone	486-5893	Phone	
		E-Mail	khuang@eri.uconn.edu	E-Mail	
City	State Zip	Reporting Request		Purchase Order Reference Number	

Sample			Transfer		
Relinquished By Print/sign	Ken Huang	Date 03/21/2001 Time 16:00	Relinquished By: Print/sign	Date Time	
Received By: Print/sign		Date Time	Received By Print/sign	Date Time	

Storage Location 0

W- Walk-in AP- Avery M- Metals O- Organics

Test Parameter or CAS Number

	Field Number	ERI ID	Collection Date	Collection Time	Matrix (Key Below)	Preservation (Key Below)	Number of Containers	Comment
1	010321-ES-TS1	0103032-001	03/21/01	15:00	L	R	1	1. These samples need to be analyzed for VOCs
2	010321-ES-TS1D	2	03/21/01	15:00	L	R	1	using the SW-846 8260 method
3	010321-ES-TS2	3	03/21/01	15:00	L	R	1	
4	010321-ES-TS3	4	03/21/01	15:00	L	R	1	2. The data needs to be obtained within 7 days for the
5	010321-ES-TS4	5	03/21/01	15:00	L	R	1	subsequent tests for the ES project
6	010321-ES-TS5	6	03/21/01	15:00	L	R	1	
7	010321-ES-TS5D	0103032-007	03/21/01	15:00	L	R	1	
8								
9								
10								
11								
12								
13								
14								
15								

Additional Comments/ Special Handling

Matrix: DW- Drinking Water GW- Groundwater WW- Wastewater SW- Seawater L- Liquid SO- Soil S- Solid F- Filter A- Air T- Ecological Tissue O- Other

Preservation: R- Refrigerate (4°C) F- Freeze H- Nitric Acid HC- Hydrochloric Acid S- Sulfuric Acid A- Methanol M- Methylene Chloride SB- Sodium Bisulfite C- Chloroform O- Other

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound ES TREATBILITY TEST

Sample Identification:	*LAB BLK*	**Reporting Date:**	3/27/01
Laboratory Identification:		**Sample Matrix:**	Aqueous
Sampling Date:		**Report Data File:**	ol010325L.xls
Sample Receiving Date:		**Raw Data File:**	01032503.D
Date Analyzed:	*03/26/20 -1:2:*	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.5
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	ND	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	104	80-116	Pass
1,2-dichloroethane-d4(surr2)	104	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	101	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project:

Sample Identification:	*'0103032-001,010321-ES-TS1,1/10*	**Reporting Date:**	3/27/01
Laboratory Identification:	0103032-001	**Sample Matrix:**	Aqueous
Sampling Date:	3/21/01	**Report Data File:**	ol010325L.xls
Sample Receiving Date:	3/21/01	**Raw Data File:**	01032510.D
Date Analyzed:	*03/26/20 -1:6.*	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	3.0
74-87-3	Chloromethane	ND	1.0
75-01-4	Chloroethene(Vinyl Chloride)	27.7	2.0
74-83-9	Bromomethane	ND	2.0
75-00-3	Chloroethane	ND	2.0
75-69-4	Trichlorofluoromethane	ND	1.0
75-35-4	1,1-Dichloroethene	ND	10
75-09-2	Dichloromethane	18	10
01634-04-4	MTBE	ND	3.0
156-60-5	(trans)-1,2-Dichloroethene	ND	3.0
75-34-3	1,1-Dichloroethane	ND	1.0
78-93-3	Methyl Ethyl Ketone (MEK)	ND	10
594-20-7	2,2-Dichloropropane	ND	1.0
156-59-2	(cis)-1,2-Dichloroethene	373.6	1.0
74-97-5	Bromochloromethane	ND	3.0
67-66-3	Chloroform	ND	1.0
71-55-6	1,1,1-Trichloroethane	ND	1.0
563-58-6	1,1-Dichloropropene	ND	2.0
56-23-5	Tetrachloromethane	ND	1.0
71-43-2	Benzene	ND	1.0
107-06-2	1,2-Dichloroethane	ND	1.0
79-01-6	Trichloroethene	91.1	1.0
78-87-5	1,2-Dichloropropane	ND	1.0
74-95-3	Dibromomethane	ND	1.0
75-27-4	Bromodichloromethane	ND	2.0
10061-01-5	(cis)-1,3-Dichloropropene	ND	2.0
108-10-1	MIBK	ND	2.0
108-88-3	Toluene	ND	1.0
10061-02-6	(trans)-1,3-Dichloropropene	ND	1.0
79-00-5	1,1,2-Trichloroethane	ND	3.0
142-28-9	1,3-Dichloropropane	ND	2.0
127-18-4	Tetrachloroethene	17.7	2.0
124-48-1	Dibromochloromethane	ND	3.0
106-93-4	1,2-Dibromoethane	ND	1.0
108-90-7	Chlorobenzene	ND	1.0
630-20-6	1,1,1,2-Tetrachloroethane	ND	2.0
100-41-4	Ethylbenzene	ND	1.0
108-38-3	m-Xylene + p-Xylene	7.2	2.0
95-47-6	o-Xylene	ND	1.0
100-42-5	Styrene	ND	2.0
75-25-2	Bromoform	ND	1.0
98-82-8	iso-Propylbenzene	ND	2.0
79-34-5	1,1,2,2-Tetrachloroethane	ND	2.0
96-18-4	1,2,3-Trichloropropane	ND	2.0
108-86-1	Bromobenzene	ND	1.0
103-65-1	n-Propylbenzene	ND	1.0
108-67-8	1,3,5-Trimethylbenzene	ND	1.0
106-43-4	4-Chlorotoluene	ND	1.0
95-49-8	2-Chlorotoluene	ND	1.0
98-06-9	tert-Butylbenzene	ND	1.0
95-63-6	1,2,4-Trimethylbenzene	ND	2.0
135-98-8	sec-Butylbenzene	ND	1.0
99-87-6	4-iso-Propyltoluene	ND	1.0
541-73-1	1,3-Dichlorobenzene	ND	1.0
106-46-7	1,4-Dichlorobenzene	ND	1.0
104-51-8	n-Butylbenzene	ND	1.0
95-50-1	1,2-Dichlorobenzene	ND	1.0
96-12-8	1,2-Dibromo-3-chloropropane	ND	6.0
120-82-1	1,2,4-Trichlorobenzene	ND	10
87-68-3	Hexachlorobutadiene	ND	3.0
91-20-3	Naphthalene	ND	2.0
87-61-6	1,2,3-Trichlorobenzene	ND	10
67-64-1	Acetone	ND	10

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	102	80-116	Pass
1,2-dichloroethane-d4(surr2)	103	80-116	Pass
toluene-d8(surr3)	101	80-116	Pass
4-bromofluorobenzene(surr4)	102	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project:

Sample Identification:	*'0103032-002,010321-ES-TS1D,1/1*	**Reporting Date:**	3/27/01
Laboratory Identification:	'0103032-002	**Sample Matrix:**	Aqueous
Sampling Date:	3/21/01	**Report Data File:**	ol010325L.xls.
Sample Receiving Date:	3/21/01	**Raw Data File:**	01032511.D
Date Analyzed:	*03/26/20 -1:7*	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	3.0
74-87-3	Chloromethane	ND	1.0
75-01-4	Chloroethene(Vinyl Chloride)	24.6	2.0
74-83-9	Bromomethane	ND	2.0
75-00-3	Chloroethane	ND	2.0
75-69-4	Trichlorofluoromethane	ND	1.0
75-35-4	1,1-Dichloroethene	ND	10
75-09-2	Dichloromethane	26	10
01634-04-4	MTBE	ND	3.0
156-60-5	(trans)-1,2-Dichloroethene	ND	3.0
75-34-3	1,1-Dichloroethane	ND	1.0
78-93-3	Methyl Ethyl Ketone (MEK)	ND	10
594-20-7	2,2-Dichloropropane	ND	1.0
156-59-2	(cis)-1,2-Dichloroethene	374.7	1.0
74-97-5	Bromochloromethane	ND	3.0
67-66-3	Chloroform	ND	1.0
71-55-6	1,1,1-Trichloroethane	ND	1.0
563-58-6	1,1-Dichloropropene	ND	2.0
56-23-5	Tetrachloromethane	ND	1.0
71-43-2	Benzene	ND	1.0
107-06-2	1,2-Dichloroethane	ND	1.0
79-01-6	Trichloroethene	93.8	1.0
78-87-5	1,2-Dichloropropane	ND	1.0
74-95-3	Dibromomethane	ND	1.0
75-27-4	Bromodichloromethane	ND	2.0
10061-01-5	(cis)-1,3-Dichloropropene	ND	2.0
108-10-1	MIBK	ND	2.0
108-88-3	Toluene	2.0	1.0
10061-02-6	(trans)-1,3-Dichloropropene	ND	1.0
79-00-5	1,1,2-Trichloroethane	ND	3.0
142-28-9	1,3-Dichloropropane	ND	2.0
127-18-4	Tetrachloroethene	18.0	2.0
124-48-1	Dibromochloromethane	ND	3.0
106-93-4	1,2-Dibromoethane	ND	1.0
108-90-7	Chlorobenzene	ND	1.0
630-20-6	1,1,1,2-Tetrachloroethane	ND	2.0
100-41-4	Ethylbenzene	ND	1.0
108-38-3	m-Xylene + p-Xylene	7.3	2.0
95-47-6	o-Xylene	ND	1.0
100-42-5	Styrene	ND	2.0
75-25-2	Bromoform	ND	1.0
98-82-8	iso-Propylbenzene	ND	2.0
79-34-5	1,1,2,2-Tetrachloroethane	ND	2.0
96-18-4	1,2,3-Trichloropropane	ND	2.0
108-86-1	Bromobenzene	ND	1.0
103-65-1	n-Propylbenzene	ND	1.0
108-67-8	1,3,5-Trimethylbenzene	ND	1.0
106-43-4	4-Chlorotoluene	ND	1.0
95-49-8	2-Chlorotoluene	ND	1.0
98-06-9	tert-Butylbenzene	ND	1.0
95-63-6	1,2,4-Trimethylbenzene	ND	2.0
135-98-8	sec-Butylbenzene	ND	1.0
99-87-6	4-iso-Propyltoluene	ND	1.0
541-73-1	1,3-Dichlorobenzene	ND	1.0
106-46-7	1,4-Dichlorobenzene	ND	1.0
104-51-8	n-Butylbenzene	ND	1.0
95-50-1	1,2-Dichlorobenzene	ND	1.0
96-12-8	1,2-Dibromo-3-chloropropane	ND	6.0
120-82-1	1,2,4-Trichlorobenzene	ND	10
87-68-3	Hexachlorobutadiene	ND	3.0
91-20-3	Naphthalene	ND	2.0
87-61-6	1,2,3-Trichlorobenzene	ND	10
67-64-1	Acetone	ND	10

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	101	80-116	Pass
1,2-dichloroethane-d4(surr2)	103	80-116	Pass
toluene-d8(surr3)	99	80-116	Pass
4-bromofluorobenzene(surr4)	101	80-120	Pass

ND = Not Detected

APPENDIX B:

The GC-MS analysis raw data of Task 1B samples

ERI Chain of Custody

ENVIRONMENTAL RESEARCH INSTITUTE

Environmental Research Institute
270 Middle Turnpike U-5210
Storrs, Ct 06269-5210 (860)486-4015
Customersupport@eri.uconn.edu

Customer ID

Company	Engineering Lab ERI	Project Contact	Ken Huang
Address	(ES Treatibility Tests)	Phone	486-5893
		E-Mail	khuang@eri.uconn.edu
City	State Zip	Reporting Request	

Sample				Transfer
Relinquished By	Ken Huang	Date	4.6.01	Relinquished By
Print/sign		Time	11:00	
Received By:		Date		Received By
Print/sign		Time		
Storage Location	W	W: Walker	AP: Avery	M: Metals O: Organics

Field Number	ERI ID	Collection Date	Collection Time	Matrix (Key Below)	Preservation (Key Below)	Number of Containers	Comment
10403-1B1-0h	0104012-C01	04-03-01	10:30	L	R	1	These samples need to be analyzed for VOC
10403-1B1-0(D)	002	04-03-01	10:30	L	R	1	by SW-846 8260
10403-1B2-0h	C03	04-03-01	10:30	L	R	1	
10403-1B2-0(D)	C04	04-03-01	10:30	L	R	1	
10403-1B3-0h	C05	04-03-01	10:30	L	R	1	
10403-1B1-2h	C06	04-03-01	12:30	L	R	1	
10403-1B2-2h	C07	04-03-01	12:30	L	R	1	
10403-1B3-2h	C08	04-03-01	12:30	L	R	1	
10403-1B1-8h	C09	04-03-01	18:00	L	R	1	
10403-1B2-8h	C10	04-03-01	18:00	L	R	1	
10403-1B3-8h	C11	04-03-01	18:00	L	R	1	
10404-1B1-22h	C12	04-04-01	8:00	L	R	1	
10404-1B2-22h	C13	04-04-01	8:00	L	R	1	
10404-1B3-22h	C14	04-04-01	8:00	L	R	1	

Additional Comments/ Special Handling

Matrix: DW: Drinking Water GW: Groundwater SO: Soil
Preservation: R: Refrigerate (4 C)

ERI Chain of Custody

ENVIRONMENTAL RESEARCH INSTITUTE

Environmental Research Institute
270 Middle Turnpike U-5210
Storrs, CT 06269-5210 (860)486-4015
Customersupport@eri.uconn.edu

Company	Engineering Lab ERI	Contact	Ken Huang
Address	(ES Treatibility Tests)	Phone	4865893
		E-Mail	khuang@eri.uconn.edu
City	State Zip	Reporting Request	

Sample				Transfer			
Relinquished By	Ken Huang	Date	4/6/01	Relinquished By		Date	
Print/sign		Time	11:00	Print/sign		Time	
Received By:		Date		Received By		Date	
Print/sign		Time		Print/sign		Time	

Storage Location 0 — W- Walk-in AP- Avery M- Metals O- Organics

	Field Number	ERI ID	Collection Date	Collection Time	Matrix (Key Below)	Preservation (Key Below)	Number of Containers	Comment
1	10404-1B1-32h	0104012-015	04.04.01	18:30	L	R	1	These samples need to be analyzed for VOC
2	10404-1B1-32(D)	016	04.04.01	18:30	L	R	1	by SW-846 8260
3	10404-1B2-32h	017	04.04.01	18:30	L	R	1	
4	10404-1B2-32(D)	018	04.04.01	18:30	L	R	1	
5	10404-1B3-32h	019	04.04.01	18:30	L	R	1	
6	10405-1B1-48h	020	04.05.01	10:30	L	R	1	
7	10405-1B2-48h	021	04.05.01	10:30	L	R	1	
8	10405-1B3-48h	022	04.05.01	10:30	L	R	1	
9	10405-1B1-56h	023	04.05.01	18:00	L	R	1	
10	10405-1B1-56(D)	024	04.05.01	18:00	L	R	1	
11	10405-1B2-56h	025	04.05.01	18:00	L	R	1	
12	10405-1B2-56(D)	026	04.05.01	18:00	L	R	1	
13	10405-1B3-56h	027	04.05.01	18:00	L	R	1	
14	10406-1B1-72h	028	04.06.01	[illegible]	L	R	1	
15	10406-1B1-72(D)	029	04.06.01	[illegible]				

Test Parameter or CAS Number

Additional Comments/ Special Handling

Matrix: DW- Drinking Water GW- Groundwater SO- Soil A- Air

Preservation: R- Refrigerate (4 C) F- Freeze

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	***ST MIX 40 PPB***	**Reporting Date:**	4/11/01
Laboratory Identification:		**Sample Matrix:**	Aqueous
Sampling Date:		**Report Data File:**	010409.xls.
Sample Receiving Date:		**Raw Data File:**	01040904.D
Date Analyzed:	***04/9/20-1:2:***	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	Recovery %
75-71-8	Dichlorodifluoromethane	23.3	58%
74-87-3	Chloromethane	31.1	78%
75-01-4	Chloroethene(Vinyl Chloride)	31.2	78%
74-83-9	Bromomethane	38.2	95%
75-00-3	Chloroethane	35.8	90%
75-69-4	Trichlorofluoromethane	30.2	75%
75-35-4	1,1-Dichloroethene	36	89%
75-09-2	Dichloromethane	43	108%
01634-04-4	MTBE	40.7	102%
156-60-5	(trans)-1,2-Dichloroethene	36.9	92%
75-34-3	1,1-Dichloroethane	38.9	97%
78-93-3	Methyl Ethyl Ketone (MEK)	37	92%
594-20-7	2,2-Dichloropropane	43.6	109%
156-59-2	(cis)-1,2-Dichloroethene	38.6	97%
74-97-5	Bromochloromethane	38.4	96%
67-66-3	Chloroform	39.4	99%
71-55-6	1,1,1-Trichloroethane	36.1	90%
563-58-6	1,1-Dichloropropene	36.0	90%
56-23-5	Tetrachloromethane	34.0	85%
71-43-2	Benzene	40.2	101%
107-06-2	1,2-Dichloroethane	40.5	101%
79-01-6	Trichloroethene	36.8	92%
78-87-5	1,2-Dichloropropane	40.9	102%
74-95-3	Dibromomethane	39.8	100%
75-27-4	Bromodichloromethane	39.5	99%
10061-01-5	(cis)-1,3-Dichloropropene	40.9	102%
108-10-1	MIBK	36.2	91%
108-88-3	Toluene	38.5	96%
10061-02-6	(trans)-1,3-Dichloropropene	39.8	100%
79-00-5	1,1,2-Trichloroethane	38.8	97%
142-28-9	1,3-Dichloropropane	39.9	100%
127-18-4	Tetrachloroethene	35.7	89%
124-48-1	Dibromochloromethane	37.7	94%
106-93-4	1,2-Dibromoethane	37.8	95%
108-90-7	Chlorobenzene	38.7	97%
630-20-6	1,1,1,2-Tetrachloroethane	38.1	95%
100-41-4	Ethylbenzene	38.9	97%
108-38-3	m-Xylene + p-Xylene	78.0	98%
95-47-6	o-Xylene	39.6	99%
100-42-5	Styrene	38.5	96%
75-25-2	Bromoform	35.3	88%
98-82-8	iso-Propylbenzene	37.4	93%
79-34-5	1,1,2,2-Tetrachloroethane	38.9	97%
96-18-4	1,2,3-Trichloropropane	38.7	97%
108-86-1	Bromobenzene	38.4	96%
103-65-1	n-Propylbenzene	38.1	95%
108-67-8	1,3,5-Trimethylbenzene	38.2	95%
106-43-4	4-Chlorotoluene	38.2	96%
95-49-8	2-Chlorotoluene	40.4	101%
98-06-9	tert-Butylbenzene	41.7	104%
95-63-6	1,2,4-Trimethylbenzene	38.8	97%
135-98-8	sec-Butylbenzene	36.4	91%
99-87-6	4-iso-Propyltoluene	37.6	94%
541-73-1	1,3-Dichlorobenzene	40.2	100%
106-46-7	1,4-Dichlorobenzene	38.0	95%
104-51-8	n-Butylbenzene	37.4	93%
95-50-1	1,2-Dichlorobenzene	38.3	96%
96-12-8	1,2-Dibromo-3-chloropropane	32.7	82%
120-82-1	1,2,4-Trichlorobenzene	37	92%
87-68-3	Hexachlorobutadiene	34.8	87%
91-20-3	Naphthalene	35.4	89%
87-61-6	1,2,3-Trichlorobenzene	37	92%
67-64-1	Acetone	36	90%

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	98	80-116	Pass
1,2-dichloroethane-d4(surr2)	99	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	101	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*ST MIX 40 PPB ULTRA*	Reporting Date:	4/11/01
Laboratory Identification:		Sample Matrix:	Aqueous
Sampling Date:		Report Data File:	010409.xls.
Sample Receiving Date:		Raw Data File:	01040905.D
Date Analyzed:	*04/ 9/20 -1:1:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	Recovery %
75-71-8	Dichlorodifluoromethane	55.5	139%
74-87-3	Chloromethane	43.7	109%
75-01-4	Chloroethene(Vinyl Chloride)	45.2	113%
74-83-9	Bromomethane	39.9	100%
75-00-3	Chloroethane	37.5	94%
75-69-4	Trichlorofluoromethane	38.1	95%
75-35-4	1,1-Dichloroethene	44	110%
75-09-2	Dichloromethane	45	113%
01634-04-4	MTBE	ND	NA
156-60-5	(trans)-1,2-Dichloroethene	43.2	108%
75-34-3	1,1-Dichloroethane	43.9	110%
78-93-3	Methyl Ethyl Ketone (MEK)	ND	NA
594-20-7	2,2-Dichloropropane	48.3	121%
156-59-2	(cis)-1,2-Dichloroethene	40.8	102%
74-97-5	Bromochloromethane	41.0	102%
67-66-3	Chloroform	42.8	107%
71-55-6	1,1,1-Trichloroethane	41.1	103%
563-58-6	1,1-Dichloropropene	40.5	101%
56-23-5	Tetrachloromethane	40.5	101%
71-43-2	Benzene	43.6	109%
107-06-2	1,2-Dichloroethane	43.2	108%
79-01-6	Trichloroethene	40.5	101%
78-87-5	1,2-Dichloropropane	42.9	107%
74-95-3	Dibromomethane	41.4	103%
75-27-4	Bromodichloromethane	42.4	106%
10061-01-5	(cis)-1,3-Dichloropropene	44.1	110%
108-10-1	MIBK	ND	NA
108-88-3	Toluene	41.0	102%
10061-02-6	(trans)-1,3-Dichloropropene	43.2	108%
79-00-5	1,1,2-Trichloroethane	40.2	100%
142-28-9	1,3-Dichloropropane	39.7	99%
127-18-4	Tetrachloroethene	39.2	98%
124-48-1	Dibromochloromethane	39.2	98%
106-93-4	1,2-Dibromoethane	39.3	98%
108-90-7	Chlorobenzene	41.2	103%
630-20-6	1,1,1,2-Tetrachloroethane	40.3	101%
100-41-4	Ethylbenzene	42.2	106%
108-38-3	m-Xylene + p-Xylene	84.9	106%
95-47-6	o-Xylene	42.8	107%
100-42-5	Styrene	40.3	101%
75-25-2	Bromoform	37.0	92%
98-82-8	iso-Propylbenzene	39.7	99%
79-34-5	1,1,2,2-Tetrachloroethane	39.5	99%
96-18-4	1,2,3-Trichloropropane	39.2	98%
108-86-1	Bromobenzene	40.1	100%
103-65-1	n-Propylbenzene	42.1	105%
108-67-8	1,3,5-Trimethylbenzene	41.5	104%
106-43-4	4-Chlorotoluene	40.9	102%
95-49-8	2-Chlorotoluene	43.8	110%
98-06-9	tert-Butylbenzene	41.1	103%
95-63-6	1,2,4-Trimethylbenzene	41.6	104%
135-98-8	sec-Butylbenzene	39.7	99%
99-87-6	4-iso-Propyltoluene	39.7	99%
541-73-1	1,3-Dichlorobenzene	40.5	101%
106-46-7	1,4-Dichlorobenzene	40.4	101%
104-51-8	n-Butylbenzene	42.2	105%
95-50-1	1,2-Dichlorobenzene	41.0	102%
96-12-8	1,2-Dibromo-3-chloropropane	35.4	88%
120-82-1	1,2,4-Trichlorobenzene	40	99%
87-68-3	Hexachlorobutadiene	39.1	98%
91-20-3	Naphthalene	37.7	94%
87-61-6	1,2,3-Trichlorobenzene	40	99%
67-64-1	Acetone	ND	#VALUE!

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	99	80-116	Pass
1,2-dichloroethane-d4(surr2)	101	80-116	Pass
toluene-d8(surr3)	101	80-116	Pass
4-bromofluorobenzene(surr4)	102	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*ST MIX 40 PPB*	Reporting Date:	4/11/01
Laboratory Identification:		Sample Matrix:	Aqueous
Sampling Date:		Report Data File:	010409.xls.
Sample Receiving Date:		Raw Data File:	01040933.D
Date Analyzed:	*04/10/20 -1:0:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	Recovery %
75-71-8	Dichlorodifluoromethane	24.5	61%
74-87-3	Chloromethane	32.8	82%
75-01-4	Chloroethene(Vinyl Chloride)	31.8	80%
74-83-9	Bromomethane	38.7	97%
75-00-3	Chloroethane	37.1	93%
75-69-4	Trichlorofluoromethane	32.4	81%
75-35-4	1,1-Dichloroethene	38	94%
75-09-2	Dichloromethane	45	112%
01634-04-4	MTBE	40.1	100%
156-60-5	(trans)-1,2-Dichloroethene	38.9	97%
75-34-3	1,1-Dichloroethane	40.1	100%
78-93-3	Methyl Ethyl Ketone (MEK)	36	90%
594-20-7	2,2-Dichloropropane	29.1	73%
156-59-2	(cis)-1,2-Dichloroethene	40.1	100%
74-97-5	Bromochloromethane	39.4	99%
67-66-3	Chloroform	41.7	104%
71-55-6	1,1,1-Trichloroethane	38.8	97%
563-58-6	1,1-Dichloropropene	38.2	95%
56-23-5	Tetrachloromethane	36.1	90%
71-43-2	Benzene	42.3	106%
107-06-2	1,2-Dichloroethane	42.9	107%
79-01-6	Trichloroethene	44.5	111%
78-87-5	1,2-Dichloropropane	41.8	104%
74-95-3	Dibromomethane	41.1	103%
75-27-4	Bromodichloromethane	41.1	103%
10061-01-5	(cis)-1,3-Dichloropropene	38.3	96%
108-10-1	MIBK	35.9	90%
108-88-3	Toluene	39.8	99%
10061-02-6	(trans)-1,3-Dichloropropene	36.1	90%
79-00-5	1,1,2-Trichloroethane	38.9	97%
142-28-9	1,3-Dichloropropane	40.0	100%
127-18-4	Tetrachloroethene	36.5	91%
124-48-1	Dibromochloromethane	37.0	93%
106-93-4	1,2-Dibromoethane	38.0	95%
108-90-7	Chlorobenzene	40.3	101%
630-20-6	1,1,1,2-Tetrachloroethane	38.7	97%
100-41-4	Ethylbenzene	41.1	103%
108-38-3	m-Xylene + p-Xylene	82.2	103%
95-47-6	o-Xylene	41.8	104%
100-42-5	Styrene	40.4	101%
75-25-2	Bromoform	33.9	85%
98-82-8	iso-Propylbenzene	39.4	99%
79-34-5	1,1,2,2-Tetrachloroethane	30.8	77%
96-18-4	1,2,3-Trichloropropane	36.8	92%
108-86-1	Bromobenzene	39.0	98%
103-65-1	n-Propylbenzene	39.8	100%
108-67-8	1,3,5-Trimethylbenzene	39.8	100%
106-43-4	4-Chlorotoluene	39.6	99%
95-49-8	2-Chlorotoluene	41.6	104%
98-06-9	tert-Butylbenzene	43.8	110%
95-63-6	1,2,4-Trimethylbenzene	40.0	100%
135-98-8	sec-Butylbenzene	37.9	95%
99-87-6	4-iso-Propyltoluene	38.4	96%
541-73-1	1,3-Dichlorobenzene	38.8	97%
106-46-7	1,4-Dichlorobenzene	38.4	96%
104-51-8	n-Butylbenzene	38.1	95%
95-50-1	1,2-Dichlorobenzene	38.9	97%
96-12-8	1,2-Dibromo-3-chloropropane	32.0	80%
120-82-1	1,2,4-Trichlorobenzene	36	89%
87-68-3	Hexachlorobutadiene	35.2	88%
91-20-3	Naphthalene	35.2	88%
87-61-6	1,2,3-Trichlorobenzene	36	89%
67-64-1	Acetone	38	94%

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethane-d4(surr2)	102	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	103	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*ST MIX 40 PPB ULTRA*	Reporting Date:	4/11/01
Laboratory Identification:		Sample Matrix:	Aqueous
Sampling Date:		Report Data File:	010409.xls.
Sample Receiving Date:		Raw Data File:	01040934.D
Date Analyzed:	*04/10/20 -1:0:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	Recovery %
75-71-8	Dichlorodifluoromethane	46.8	117%
74-87-3	Chloromethane	46.1	115%
75-01-4	Chloroethene(Vinyl Chloride)	41.4	103%
74-83-9	Bromomethane	47.3	118%
75-00-3	Chloroethane	42.0	105%
75-69-4	Trichlorofluoromethane	34.5	86%
75-35-4	1,1-Dichloroethene	40	101%
75-09-2	Dichloromethane	43	108%
01634-04-4	MTBE	ND	NA
156-60-5	(trans)-1,2-Dichloroethene	40.3	101%
75-34-3	1,1-Dichloroethane	41.1	103%
78-93-3	Methyl Ethyl Ketone (MEK)	ND	NA
594-20-7	2,2-Dichloropropane	28.5	71%
156-59-2	(cis)-1,2-Dichloroethene	38.2	96%
74-97-5	Bromochloromethane	39.5	99%
67-66-3	Chloroform	40.2	101%
71-55-6	1,1,1-Trichloroethane	38.3	96%
563-58-6	1,1-Dichloropropene	37.4	93%
56-23-5	Tetrachloromethane	37.3	93%
71-43-2	Benzene	41.3	103%
107-06-2	1,2-Dichloroethane	42.2	105%
79-01-6	Trichloroethene	42.5	106%
78-87-5	1,2-Dichloropropane	40.5	101%
74-95-3	Dibromomethane	41.1	103%
75-27-4	Bromodichloromethane	40.1	100%
10061-01-5	(cis)-1,3-Dichloropropene	38.1	95%
108-10-1	MIBK	ND	NA
108-88-3	Toluene	38.5	96%
10061-02-6	(trans)-1,3-Dichloropropene	37.5	94%
79-00-5	1,1,2-Trichloroethane	38.3	96%
142-28-9	1,3-Dichloropropane	38.2	96%
127-18-4	Tetrachloroethene	35.3	88%
124-48-1	Dibromochloromethane	37.2	93%
106-93-4	1,2-Dibromoethane	38.3	96%
108-90-7	Chlorobenzene	38.8	97%
630-20-6	1,1,1,2-Tetrachloroethane	38.5	96%
100-41-4	Ethylbenzene	39.6	99%
108-38-3	m-Xylene + p-Xylene	78.8	98%
95-47-6	o-Xylene	40.2	100%
100-42-5	Styrene	38.1	95%
75-25-2	Bromoform	34.6	86%
98-82-8	iso-Propylbenzene	37.0	92%
79-34-5	1,1,2,2-Tetrachloroethane	33.0	83%
96-18-4	1,2,3-Trichloropropane	37.9	95%
108-86-1	Bromobenzene	38.2	95%
103-65-1	n-Propylbenzene	38.7	97%
108-67-8	1,3,5-Trimethylbenzene	38.6	96%
106-43-4	4-Chlorotoluene	36.8	92%
95-49-8	2-Chlorotoluene	40.4	101%
98-06-9	tert-Butylbenzene	42.9	107%
95-63-6	1,2,4-Trimethylbenzene	38.6	96%
135-98-8	sec-Butylbenzene	35.9	90%
99-87-6	4-iso-Propyltoluene	36.3	91%
541-73-1	1,3-Dichlorobenzene	37.6	94%
106-46-7	1,4-Dichlorobenzene	38.1	95%
104-51-8	n-Butylbenzene	36.7	92%
95-50-1	1,2-Dichlorobenzene	38.4	96%
96-12-8	1,2-Dibromo-3-chloropropane	32.0	80%
120-82-1	1,2,4-Trichlorobenzene	36	89%
87-68-3	Hexachlorobutadiene	33.7	84%
91-20-3	Naphthalene	34.2	85%
87-61-6	1,2,3-Trichlorobenzene	36	89%
67-64-1	Acetone	ND	NA

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	99	80-116	**Pass**
1,2-dichloroethane-d4(surr2)	103	80-116	**Pass**
toluene-d8(surr3)	100	80-116	**Pass**
4-bromofluorobenzene(surr4)	103	80-120	**Pass**

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*LAB BLK*	Reporting Date:	4/11/01
Laboratory Identification:		Sample Matrix:	Aqueous
Sampling Date:		Report Data File:	010409.xls.
Sample Receiving Date:		Raw Data File:	01040910.D
Date Analyzed:	*04/9/20 -1:4:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	ND	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	101	80-116	Pass
1,2-dichloroethane-d4(surr2)	108	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	102	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*LAB BLK (SP1)*	**Reporting Date:**	4/11/01
Laboratory Identification:		**Sample Matrix:**	Aqueous
Sampling Date:		**Report Data File:**	010409.xls.
Sample Receiving Date:		**Raw Data File:**	01040907.D
Date Analyzed:	*04/ 9/20 -1:2:*	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	22	1
75-09-2	Dichloromethane	ND	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1-
71-43-2	Benzene	23.9	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	21.2	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	22.0	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	22.0	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	102	80-116	Pass
1,2-dichloroethane-d4(surr2)	109	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	102	80-120	Pass

ND = Not Detected

Environmental Research Institute
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Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	***10403-1B1-0h***	**Reporting Date:**	4/11/01
Laboratory Identification:	0104012-001 ,-	**Sample Matrix:**	Aqueous
Sampling Date:	4/6/01	**Report Data File:**	010409.xls.
Sample Receiving Date:	4/9/01	**Raw Data File:**	01040915.D
Date Analyzed:	***04/ 9/20 -1:8:***	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	6.3	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	ND	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	32.4	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	7.9	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	0.7	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	99	80-116	**Pass**
1,2-dichloroethane-d4(surr2)	108	80-116	**Pass**
toluene-d8(surr3)	100	80-116	**Pass**
4-bromofluorobenzene(surr4)	102	80-120	**Pass**

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10403-1B1-0(D)*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-002,-	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040916.D
Date Analyzed:	*04/9/20 -1:9:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	6.5	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	1	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	33.9	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	8.4	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	1.5	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	0.7	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethane-d4(surr2)	108	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	104	80-120	Pass

ND = Not Detected

Environmental Research Institute
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Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10403-1B2-0h*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-003-	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040917.D
Date Analyzed:	*04/9/20 -1:0:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	6.3	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	ND	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	32.0	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1-
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	7.7	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	1.3	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	0.7	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	101	80-116	Pass
1,2-dichloroethane-d4(surr2)	109	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	104	80-120	Pass

ND = Not Detected

Environmental Research Institute
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Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10403-1B2-0(D)*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-004-	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040918.D
Date Analyzed:	*04/ 9/20 -1:0:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	6.2	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	ND	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	32.7	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	8.0	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	1.3	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	0.7	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethane-d4(surr2)	110	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	103	80-120	Pass

ND = Not Detected

Environmental Research Institute
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Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10403-1B3-0h*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-005,-	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040919.D
Date Analyzed:	*04/ 9/20 -1:1:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	6.3	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	ND	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	31.8	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	7.7	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	1.3	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	0.7	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	101	80-116	Pass
1,2-dichloroethane-d4(surr2)	108	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	104	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	***10403-1B1-2h***	**Reporting Date:**	4/11/01
Laboratory Identification:	0104012-006	**Sample Matrix:**	Aqueous
Sampling Date:	4/6/01	**Report Data File:**	010409.xls.
Sample Receiving Date:	4/9/01	**Raw Data File:**	01040920.D
Date Analyzed:	***04/10/20 -1:2:***	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	1	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	0.7	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	1.0	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	102	80-116	Pass
1,2-dichloroethane-d4(surr2)	109	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	104	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	***10403-1B2-2h***	**Reporting Date:**	4/11/01
Laboratory Identification:	0104012-007	**Sample Matrix:**	Aqueous
Sampling Date:	4/6/01	**Report Data File:**	010409.xls.
Sample Receiving Date:	4/9/01	**Raw Data File:**	01040921.D
Date Analyzed:	***04/10/20 -1:1:***	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	2	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	0.5	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	101	80-116	Pass
1,2-dichloroethane-d4(surr2)	109	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	103	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	***10403-1B3-2h***	**Reporting Date:**	4/11/01
Laboratory Identification:	0104012-008	**Sample Matrix:**	Aqueous
Sampling Date:	4/6/01	**Report Data File:**	010409.xls.
Sample Receiving Date:	4/9/01	**Raw Data File:**	01040922.D
Date Analyzed:	***04/10/20 -1:1:***	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	6.1	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	1	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	31.5	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1-
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	8.1	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	1.6	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	0.7	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethane-d4(surr2)	109	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	104	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10403-1B1-8h*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-009	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040923.D
Date Analyzed:	*04/10/20 -1:2:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	1	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	0.8	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	0.6	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethane-d4(surr2)	109	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	102	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10403-1B2-8h*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-010	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040924.D
Date Analyzed:	*04/10/20 -1:3:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	2	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	0.5	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethane-d4(surr2)	109	80-116	Pass
toluene-d8(surr3)	99	80-116	Pass
4-bromofluorobenzene(surr4)	104	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10403-1B3-8h*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-011	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040925.D
Date Analyzed:	*04/10/20 -1:4:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	6.0	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	1	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	31.2	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	8.3	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	1.8	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethane-d4(surr2)	109	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	104	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10404-1B1-22h*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-012	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040926.D
Date Analyzed:	*04/10/20 -1:4:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	1	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	0.9	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	0.6	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethane-d4(surr2)	108	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	100	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10404-1B2-22h*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-013	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040927.D
Date Analyzed:	*04/10/20 -1:5:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	3	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	102	80-116	Pass
1,2-dichloroethane-d4(surr2)	110	80-116	Pass
toluene-d8(surr3)	101	80-116	Pass
4-bromofluorobenzene(surr4)	102	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10404-1B3-22h*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-014	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040928.D
Date Analyzed:	*04/10/20 -1:6:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	6.1	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	1	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	31.2	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	8.0	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	2.0	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	101	80-116	Pass
1,2-dichloroethane-d4(surr2)	110	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	104	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10404-1B1-32h*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-015	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040929.D
Date Analyzed:	*04/10/20 -1:7:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	1	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	0.8	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	101	80-116	**Pass**
1,2-dichloroethane-d4(surr2)	110	80-116	**Pass**
toluene-d8(surr3)	101	80-116	**Pass**
4-bromofluorobenzene(surr4)	102	80-120	**Pass**

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	***10404-1B1-32(D)***	**Reporting Date:**	4/11/01
Laboratory Identification:	0104012-016	**Sample Matrix:**	Aqueous
Sampling Date:	4/6/01	**Report Data File:**	010409.xls
Sample Receiving Date:	4/9/01	**Raw Data File:**	01040930.D
Date Analyzed:	***04/10/20 -1:7:***	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	1	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	0.8	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1-
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	101	80-116	**Pass**
1,2-dichloroethane-d4(surr2)	108	80-116	**Pass**
toluene-d8(surr3)	101	80-116	**Pass**
4-bromofluorobenzene(surr4)	100	80-120	**Pass**

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10404-1B2-32h*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-017	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls
Sample Receiving Date:	4/9/01	Raw Data File:	01040940.D
Date Analyzed:	*04/10/20 -1:3:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	4	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	0.8	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	0.7	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	101	80-116	Pass
1,2-dichloroethane-d4(surr2)	110	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	103	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10404-1B2-32(D)*	**Reporting Date:**	4/11/01
Laboratory Identification:	0104012-018	**Sample Matrix:**	Aqueous
Sampling Date:	4/6/01	**Report Data File:**	010409.xls
Sample Receiving Date:	4/9/01	**Raw Data File:**	01040941.D
Date Analyzed:	*04/10/20 -1:3:*	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	3	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1 -
71-43-2	Benzene	0.6	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethane-d4(surr2)	109	80-116	Pass
toluene-d8(surr3)	101	80-116	Pass
4-bromofluorobenzene(surr4)	103	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10404-1B3-32h*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-019	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040942.D
Date Analyzed:	*04/10/20 -1:4:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	5.9	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	2	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	30.2	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1-
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	7.8	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	2.0	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	99	80-116	Pass
1,2-dichloroethane-d4(surr2)	108	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	103	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10405-1B1-48h*	**Reporting Date:**	4/11/01
Laboratory Identification:	0104012-020	**Sample Matrix:**	Aqueous
Sampling Date:	4/6/01	**Report Data File:**	010409.xls.
Sample Receiving Date:	4/9/01	**Raw Data File:**	01040943.D
Date Analyzed:	*04/10/20 -1:5:*	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	2	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	0.6	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	99	80-116	Pass
1,2-dichloroethane-d4(surr2)	107	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	103	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	***10405-1B2-48h***	**Reporting Date:**	4/11/01
Laboratory Identification:	0104012-021	**Sample Matrix:**	Aqueous
Sampling Date:	4/6/01	**Report Data File:**	010409.xls.
Sample Receiving Date:	4/9/01	**Raw Data File:**	01040944.D
Date Analyzed:	***04/10/20 -1:6:***	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	5	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	0.8	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethane-d4(surr2)	107	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	103	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	***10405-1B3-48h***	**Reporting Date:**	4/11/01
Laboratory Identification:	0104012-022	**Sample Matrix:**	Aqueous
Sampling Date:	4/6/01	**Report Data File:**	010409.xls.
Sample Receiving Date:	4/9/01	**Raw Data File:**	01040945.D
Date Analyzed:	***04/10/20 -1:6:***	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	5.7	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	2	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	29.8	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	7.9	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	2.0	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	99	80-116	Pass
1,2-dichloroethane-d4(surr2)	109	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	102	80-120	Pass

ND = Not Detected

Environmental Research Institute
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Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	***10405-1B1-56h***	**Reporting Date:**	4/11/01
Laboratory Identification:	0104012-023	**Sample Matrix:**	Aqueous
Sampling Date:	4/6/01	**Report Data File:**	010409.xls
Sample Receiving Date:	4/9/01	**Raw Data File:**	01040946.D
Date Analyzed:	***04/10/20 -1:7:***	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	ND	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	0.7	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	101	80-116	**Pass**
1,2-dichloroethane-d4(surr2)	108	80-116	**Pass**
toluene-d8(surr3)	100	80-116	**Pass**
4-bromofluorobenzene(surr4)	104	80-120	**Pass**

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	***10405-1B1-56(D)***	**Reporting Date:**	4/11/01
Laboratory Identification:	0104012-024	**Sample Matrix:**	Aqueous
Sampling Date:	4/6/01	**Report Data File:**	010409.xls.
Sample Receiving Date:	4/9/01	**Raw Data File:**	01040947.D
Date Analyzed:	***04/10/20 -1:8:***	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	ND	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	0.8	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1-
71-43-2	Benzene	0.7	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	101	80-116	**Pass**
1,2-dichloroethane-d4(surr2)	108	80-116	**Pass**
toluene-d8(surr3)	100	80-116	**Pass**
4-bromofluorobenzene(surr4)	103	80-120	**Pass**

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10405-1B2-56h*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-025	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040948.D
Date Analyzed:	*04/10/20 -1:9:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	5	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	0.9	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	101	80-116	Pass
1,2-dichloroethane-d4(surr2)	109	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	102	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10405-1B2-56(D)*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-026	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040949.D
Date Analyzed:	*04/10/20 -1:9:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	5	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	0.8	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethane-d4(surr2)	110	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	102	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10405-1B3-56h*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-027	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040950.D
Date Analyzed:	*04/10/20 -1:0:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	5.8	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	ND	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	29.6	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	7.6	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	2.0	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethene-d4(surr2)	108	80-116	Pass
toluene-d8(surr3)	101	80-116	Pass
4-bromofluorobenzene(surr4)	102	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	***10406-1B1-72h***	**Reporting Date:**	4/11/01
Laboratory Identification:	0104012-028	**Sample Matrix:**	Aqueous
Sampling Date:	4/6/01	**Report Data File:**	010409.xls.
Sample Receiving Date:	4/9/01	**Raw Data File:**	01040951.D
Date Analyzed:	***04/10/20 -1:1:***	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	ND	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	0.8	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	**Pass**
1,2-dichloroethane-d4(surr2)	110	80-116	**Pass**
toluene-d8(surr3)	100	80-116	**Pass**
4-bromofluorobenzene(surr4)	103	80-120	**Pass**

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10406-1B1-72(D)*	**Reporting Date:**	4/11/01
Laboratory Identification:	0104012-029	**Sample Matrix:**	Aqueous
Sampling Date:	4/6/01	**Report Data File:**	010409.xls.
Sample Receiving Date:	4/9/01	**Raw Data File:**	01040952.D
Date Analyzed:	*04/11/20 -1:2:*	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	ND	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	0.8	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	0.8	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethane-d4(surr2)	108	80-116	Pass
toluene-d8(surr3)	101	80-116	Pass
4-bromofluorobenzene(surr4)	103	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	***10406-1B2-72h***	**Reporting Date:**	4/11/01
Laboratory Identification:	0104012-030	**Sample Matrix:**	Aqueous
Sampling Date:	4/6/01	**Report Data File:**	010409.xls.
Sample Receiving Date:	4/9/01	**Raw Data File:**	01040953.D
Date Analyzed:	***04/11/20 -1:2:***	**Method:**	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	7	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	0.8	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	1.1	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	**Pass**
1,2-dichloroethane-d4(surr2)	108	80-116	**Pass**
toluene-d8(surr3)	99	80-116	**Pass**
4-bromofluorobenzene(surr4)	102	80-120	**Pass**

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10406-1B2-72(D)*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-031	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls
Sample Receiving Date:	4/9/01	Raw Data File:	01040954.D
Date Analyzed:	*04/11/20 -1:1:*	Method:	EPA-8260

CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	ND	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	7	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	ND	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	1.1	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	ND	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	ND	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethane-d4(surr2)	109	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	104	80-120	Pass

ND = Not Detected

Environmental Research Institute
The University of Connecticut

Volatile Organic Compound Results, Project: ESTreatibility Tests

Sample Identification:	*10403-1B3-72h*	Reporting Date:	4/11/01
Laboratory Identification:	0104012-032	Sample Matrix:	Aqueous
Sampling Date:	4/6/01	Report Data File:	010409.xls.
Sample Receiving Date:	4/9/01	Raw Data File:	01040955.D
Date Analyzed:	*04/11/20 -1:2:*	Method:	EPA-8260

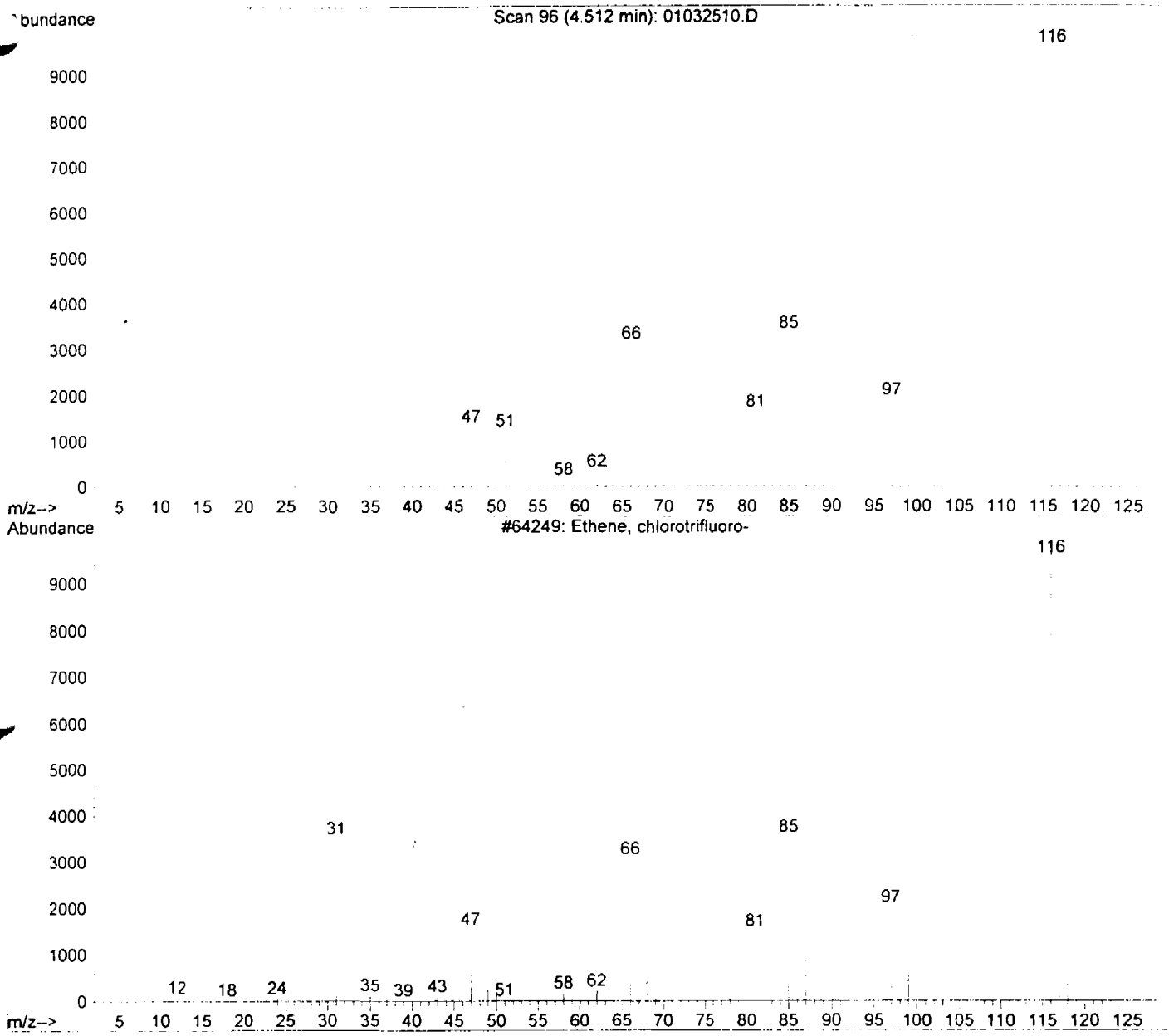
CAS Number	Name	Concentration(ug/L)	MDL (ug/L)
75-71-8	Dichlorodifluoromethane	ND	0.3
74-87-3	Chloromethane	ND	0.1
75-01-4	Chloroethene(Vinyl Chloride)	5.9	0.2
74-83-9	Bromomethane	ND	0.2
75-00-3	Chloroethane	ND	0.2
75-69-4	Trichlorofluoromethane	ND	0.1
75-35-4	1,1-Dichloroethene	ND	1
75-09-2	Dichloromethane	ND	1
01634-04-4	MTBE	ND	0.3
156-60-5	(trans)-1,2-Dichloroethene	ND	0.3
75-34-3	1,1-Dichloroethane	ND	0.1
78-93-3	Methyl Ethyl Ketone (MEK)	ND	1
594-20-7	2,2-Dichloropropane	ND	0.1
156-59-2	(cis)-1,2-Dichloroethene	29.6	0.1
74-97-5	Bromochloromethane	ND	0.3
67-66-3	Chloroform	ND	0.1
71-55-6	1,1,1-Trichloroethane	ND	0.1
563-58-6	1,1-Dichloropropene	ND	0.2
56-23-5	Tetrachloromethane	ND	0.1
71-43-2	Benzene	ND	0.1
107-06-2	1,2-Dichloroethane	ND	0.1
79-01-6	Trichloroethene	7.8	0.1
78-87-5	1,2-Dichloropropane	ND	0.1
74-95-3	Dibromomethane	ND	0.1
75-27-4	Bromodichloromethane	ND	0.2
10061-01-5	(cis)-1,3-Dichloropropene	ND	0.2
108-10-1	MIBK	ND	0.2
108-88-3	Toluene	ND	0.1
10061-02-6	(trans)-1,3-Dichloropropene	ND	0.1
79-00-5	1,1,2-Trichloroethane	ND	0.3
142-28-9	1,3-Dichloropropane	ND	0.2
127-18-4	Tetrachloroethene	1.9	0.2
124-48-1	Dibromochloromethane	ND	0.3
106-93-4	1,2-Dibromoethane	ND	0.1
108-90-7	Chlorobenzene	ND	0.1
630-20-6	1,1,1,2-Tetrachloroethane	ND	0.2
100-41-4	Ethylbenzene	ND	0.1
108-38-3	m-Xylene + p-Xylene	ND	0.2
95-47-6	o-Xylene	ND	0.1
100-42-5	Styrene	ND	0.2
75-25-2	Bromoform	ND	0.1
98-82-8	iso-Propylbenzene	ND	0.2
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.2
96-18-4	1,2,3-Trichloropropane	ND	0.2
108-86-1	Bromobenzene	ND	0.1
103-65-1	n-Propylbenzene	ND	0.1
108-67-8	1,3,5-Trimethylbenzene	ND	0.1
106-43-4	4-Chlorotoluene	ND	0.1
95-49-8	2-Chlorotoluene	ND	0.1
98-06-9	tert-Butylbenzene	ND	0.1
95-63-6	1,2,4-Trimethylbenzene	ND	0.2
135-98-8	sec-Butylbenzene	ND	0.1
99-87-6	4-iso-Propyltoluene	ND	0.1
541-73-1	1,3-Dichlorobenzene	ND	0.1
106-46-7	1,4-Dichlorobenzene	ND	0.1
104-51-8	n-Butylbenzene	ND	0.1
95-50-1	1,2-Dichlorobenzene	ND	0.1
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.6
120-82-1	1,2,4-Trichlorobenzene	ND	1
87-68-3	Hexachlorobutadiene	ND	0.3
91-20-3	Naphthalene	ND	0.2
87-61-6	1,2,3-Trichlorobenzene	ND	1
67-64-1	Acetone	ND	1

Surrogate Recovery

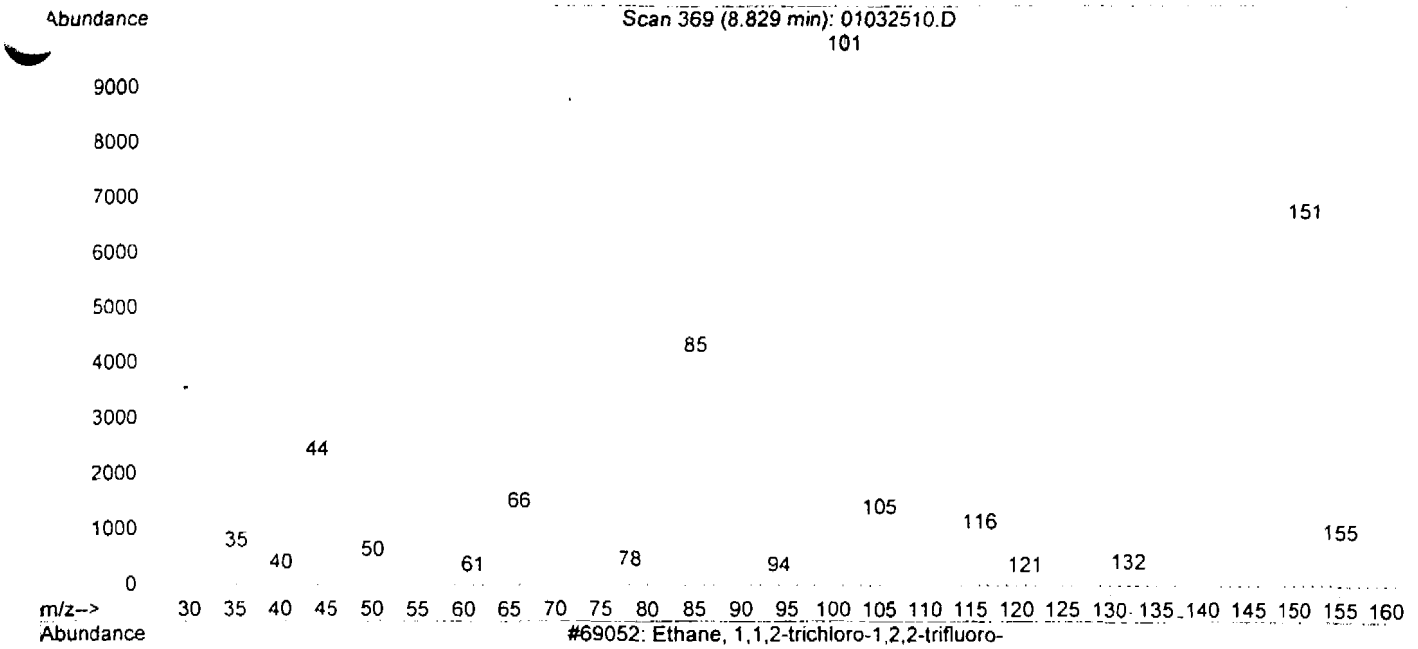
Compound	Recovery (%)	Limit (%)	Condition
Dibromofluoromethane(surr1)	100	80-116	Pass
1,2-dichloroethane-d4(surr2)	107	80-116	Pass
toluene-d8(surr3)	100	80-116	Pass
4-bromofluorobenzene(surr4)	102	80-120	Pass

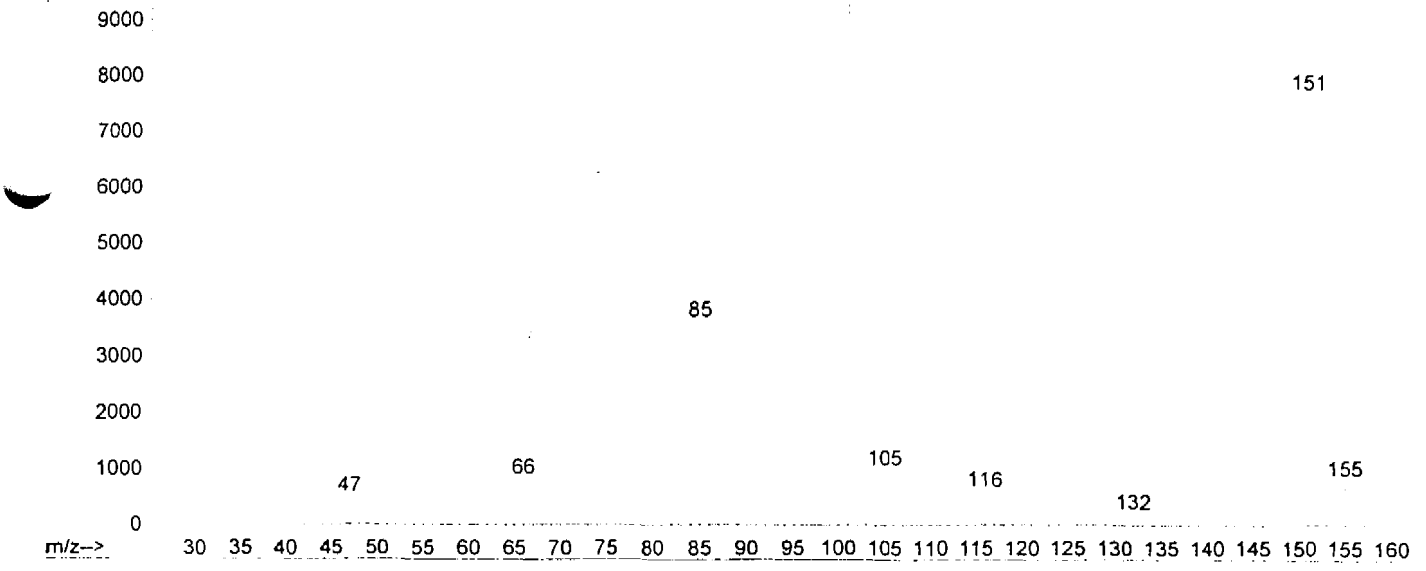
ND = Not Detected

Library Searched : C:\DATABASE\NBS75K.L
Quality : 96
ID : Ethene, chlorotrifluoro-



Library Searched : C:\DATABASE\NBS75K.L
Quality : 91
ID : Ethane, 1,1,2-trichloro-1,2,2-trifluoro-





C: 01040915.D

'0104012-001 ,10403-1B1-0h

eak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.429	VV	0.110	9995793	4.167	4.503
2	4.539	VV	0.057	4324026	4.503	4.771
3	5.530	VV	0.057	633095	5.419	5.665
4	7.597	VV	0.113	662243	7.434	7.663
5	7.770	VV	0.157	1110342	7.663	7.905
6	8.331	VV	0.078	2089180	8.222	8.441
7	8.900	VV	0.078	6388887	8.715	9.097
8	9.628	VV	0.171	507159	9.491	9.771
9	10.031	VV	0.070	1007282	9.912	10.152
10	10.316	VV	0.115	623864	10.152	10.398
11	11.604	VV	0.075	546698	11.500	11.711
12	12.832	VV	0.059	19405374	12.722	13.052
13	13.795	VV	0.060	16042668	13.654	14.154
14	14.491	VV	0.058	15220706	14.350	14.604
15	14.649	VV	0.068	587952	14.604	14.771
16	15.177	VV	0.059	33186276	15.069	15.554
17	15.915	VV	0.056	5213701	15.829	16.046
18	18.320	VV	0.061	40140349	18.191	18.610
19	19.586	VV	0.064	889009	19.493	19.698
20	21.254	VV	0.062	37149030	21.148	21.427
21	21.716	VV	0.066	603044	21.627	21.826
22	23.657	VV	0.065	25030284	23.530	23.841
23	26.408	VV	0.075	31257237	26.277	26.604
24	28.861	VV	0.092	536307	28.647	28.887
25	28.961	VV	0.161	1104637	28.887	29.226

TIC: 01040916.D

'0104012-002 ,10403-1B1-0(D)

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.427	VV	0.109	11490020	4.188	4.500
	4.536	VV	0.052	4703048	4.500	4.672
3	4.691	VB	0.143	513459	4.672	4.938
4	5.526	VV	0.079	705061	5.387	5.655
5	7.765	VV	0.095	616906	7.698	7.822
6	7.914	VV	0.092	519618	7.872	7.992
7	8.322	VV	0.081	2384212	8.203	8.467
8	8.892	VV	0.077	7020095	8.761	9.227
9	10.022	VV	0.065	952975	9.895	10.101
10	12.819	VV	0.059	20976576	12.697	13.199
11	13.783	VV	0.058	16217722	13.687	14.014
12	14.479	VV	0.058	15471768	14.358	14.589
13	14.635	VV	0.068	568802	14.589	14.751
14	15.164	VV	0.059	34002964	15.059	15.479
15	15.903	VV	0.058	5807903	15.726	16.064
16	18.307	VV	0.061	41153020	18.170	18.611
17	19.575	VV	0.059	919253	19.492	19.651
18	21.240	VV	0.062	38128137	21.119	21.416
19	21.700	VV	0.062	617120	21.630	21.791
20	23.643	VV	0.064	25934637	23.505	23.835
21	26.392	VV	0.074	32427137	26.264	26.652

IC: 01040917.D

'0104012-003 ,10403-1B2-0h

'eak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.425	VV	0.109	10002891	4.174	4.498
	4.534	VV	0.053	4280061	4.498	4.693
3	5.523	VV	0.084	668949	5.377	5.661
4	7.600	VV	0.138	823849	7.409	7.697
5	7.759	VV	0.102	551166	7.697	7.812
6	8.005	VV	0.138	613081	7.979	8.132
7	8.322	VV	0.076	2102389	8.244	8.470
8	8.892	VV	0.076	6267509	8.751	9.155
9	10.023	VV	0.065	888840	9.946	10.111
10	10.308	VV	0.120	641301	10.182	10.436
11	11.594	VV	0.068	512192	11.522	11.695
12	12.823	VV	0.060	19798583	12.706	13.207
13	13.786	VV	0.059	16474171	13.680	14.097
14	14.483	VV	0.058	15608709	14.378	14.593
15	14.642	VV	0.071	602492	14.593	14.759
16	15.168	VV	0.059	34037644	15.032	15.489
17	15.907	VV	0.058	5282321	15.780	16.025
18	18.311	VV	0.060	41137464	18.209	18.553
19	19.579	VV	0.061	845117	19.515	19.708
20	21.247	VV	0.061	38198622	21.125	21.425
21	21.706	VV	0.063	606817	21.624	21.825
22	23.651	VV	0.065	25956291	23.539	23.817
23	26.403	VV	0.075	32252627	26.204	26.577

'IC: 01040917.D

'0104012-003 ,10403-1B2-0h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.425	VV	0.109	10002891	4.174	4.498
	4.534	VV	0.053	4280061	4.498	4.693
	5.523	VV	0.084	668949	5.377	5.661
4	7.600	VV	0.138	823849	7.409	7.697
5	7.759	VV	0.102	551166	7.697	7.812
6	8.005	VV	0.138	613081	7.979	8.132
7	8.322	VV	0.076	2102389	8.244	8.470
8	8.892	VV	0.076	6267509	8.751	9.155
9	10.023	VV	0.065	888840	9.946	10.111
10	10.308	VV	0.120	641301	10.182	10.436
11	11.594	VV	0.068	512192	11.522	11.695
12	12.823	VV	0.060	19798583	12.706	13.207
13	13.786	VV	0.059	16474171	13.680	14.097
14	14.483	VV	0.058	15608709	14.378	14.593
15	14.642	VV	0.071	602492	14.593	14.759
16	15.168	VV	0.059	34037644	15.032	15.489
17	15.907	VV	0.058	5282321	15.780	16.025
18	18.311	VV	0.060	41137464	18.209	18.553
19	19.579	VV	0.061	845117	19.515	19.708
20	21.247	VV	0.061	38198622	21.125	21.425
21	21.706	VV	0.063	606817	21.624	21.825
22	23.651	VV	0.065	25956291	23.539	23.817
23	26.403	VV	0.075	32252627	26.204	26.577

FIC: 01040918.D

'0104012-004 ,10403-1B2-0(D)

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.431	VV	0.107	10427729	4.204	4.502
	4.537	VB	0.059	4816218	4.502	4.938
	5.527	VV	0.058	654082	5.357	5.652
4	7.630	VV	0.116	658643	7.455	7.660
5	7.751	VV	0.149	1041906	7.660	7.881
6	8.326	VV	0.081	2267799	8.231	8.485
7	8.575	VV	0.132	657242	8.485	8.659
8	8.894	VV	0.077	6662109	8.749	9.209
9	10.024	VV	0.069	972089	9.937	10.161
10	10.313	VV	0.117	620689	10.161	10.396
11	11.594	VV	0.073	525634	11.482	11.672
12	12.823	VV	0.060	19960983	12.701	13.101
13	13.787	VV	0.058	16319976	13.686	14.100
14	14.483	VV	0.058	15499913	14.377	14.592
15	14.642	VV	0.066	562431	14.592	14.735
16	15.169	VV	0.059	33834588	15.072	15.460
17	15.908	VV	0.058	5324660	15.790	16.026
18	18.313	VV	0.061	40841691	18.204	18.580
19	19.583	VV	0.061	848076	19.492	19.660
20	21.249	VV	0.063	37866114	21.083	21.426
21	21.709	VV	0.066	610333	21.609	21.801
22	23.655	VV	0.064	25619394	23.503	23.849
23	26.407	VV	0.074	31910826	26.253	26.597

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'0104012-005 ,10403-1B3-0h

ak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.424	VV	0.109	10603560	4.193	4.501
2	4.538	VV	0.055	4672783	4.501	4.753
3	5.528	VV	0.074	686276	5.380	5.643
4	7.604	PV	0.103	603159	7.481	7.646
5	7.758	VV	0.118	796406	7.706	7.870
6	8.330	VV	0.072	2021423	8.235	8.427
7	8.532	VV	0.107	504661	8.479	8.608
8	8.895	VV	0.076	6187291	8.787	9.115
9	10.027	VV	0.076	1075124	9.917	10.185
10	11.597	VV	0.082	583762	11.454	11.694
11	12.826	VV	0.059	19687424	12.716	13.168
12	13.789	VV	0.059	16410507	13.670	14.096
13	14.485	VV	0.058	15514720	14.364	14.595
14	14.645	VV	0.067	576505	14.595	14.761
15	15.170	VV	0.059	34065011	15.000	15.487
16	15.910	VV	0.057	5251456	15.819	16.082
17	18.313	VV	0.061	40918131	18.205	18.657
18	19.582	VV	0.061	867895	19.483	19.665
19	21.249	VV	0.062	37815636	21.126	21.426
20	21.710	VV	0.065	597705	21.632	21.801
21	23.653	VV	0.065	25736937	23.535	23.848
22	26.403	VV	0.074	32231695	26.257	26.571

IC: 01040920.D

'0104012-006 ,10403-1B1-2h

eak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.751	VV	0.115	711310	7.697	7.852
	8.007	VV	0.189	1287907	7.852	8.153
	8.324	VV	0.081	1801131	8.228	8.405
4	8.461	VV	0.124	516026	8.405	8.535
5	8.718	VV	0.110	588866	8.648	8.798
6	8.892	VV	0.078	5278016	8.798	9.140
7	10.021	VV	0.068	1131546	9.915	10.135
8	10.314	VV	0.109	537582	10.184	10.393
9	13.785	VV	0.059	16407819	13.623	13.990
10	14.481	VV	0.059	15587531	14.267	14.592
11	14.639	VV	0.076	608932	14.592	14.799
12	15.167	VV	0.059	33774212	15.049	15.475
13	15.905	VV	0.065	545803	15.836	16.056
14	18.311	VV	0.060	40610609	18.209	18.548
15	19.580	VV	0.064	708475	19.516	19.742
16	21.247	VV	0.061	37687307	21.123	21.437
17	23.651	VV	0.065	25542432	23.493	23.870
18	26.403	VV	0.075	31789951	26.210	26.571

C: 01040921.D

'0104012-007 ,10403-1B2-2h

eak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.664	VV	0.125	587519	7.577	7.712
2	7.763	VV	0.076	504919	7.712	7.815
3	7.941	VV	0.145	691588	7.815	7.972
4	8.034	VV	0.113	632765	7.972	8.121
5	8.324	VV	0.085	2184196	8.199	8.462
6	8.892	VV	0.080	5711259	8.749	9.193
7	9.626	VV	0.162	630994	9.564	9.896
8	10.022	VV	0.067	1326650	9.896	10.125
9	11.598	VV	0.101	540822	11.472	11.681
10	13.785	VV	0.059	16598889	13.685	14.214
11	14.481	VV	0.059	15476282	14.379	14.589
12	14.641	VV	0.071	599307	14.589	14.748
13	15.166	VV	0.059	33822587	15.060	15.536
14	18.310	VV	0.061	40450385	18.196	18.538
15	21.245	VV	0.062	37694259	21.097	21.412
16	21.704	VV	0.066	582166	21.596	21.847
17	23.647	VV	0.064	25619162	23.533	23.831
18	26.397	VV	0.074	31835917	26.242	26.567

TIC: 01040922.D

'0104012-008 ,10403-1B3-2h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.425	VV	0.106	9731519	4.189	4.496
2	4.532	VV	0.049	4145646	4.496	4.694
3	5.520	VV	0.059	639218	5.403	5.661
4	7.599	VV	0.108	509973	7.462	7.631
5	7.770	VV	0.093	586637	7.699	7.821
6	7.998	VV	0.140	675694	7.898	8.052
7	8.074	VV	0.115	503717	8.052	8.178
8	8.318	VV	0.090	2435122	8.178	8.493
9	8.887	VV	0.080	6103484	8.717	9.177
10	9.622	VV	0.144	563690	9.458	9.725
11	10.017	VV	0.066	1140747	9.931	10.153
12	12:816	VV	0.059	19346667	12.705	13.164
13	13.780	VV	0.059	16173745	13.678	14.020
14	14.475	VV	0.058	15341205	14.360	14.588
15	14.630	VV	0.087	628254	14.588	14.812
16	15.160	VV	0.058	33670362	15.031	15.434
17	15.900	VV	0.057	5386993	15.804	16.025
18	18.304	VV	0.062	40899701	18.197	18.760
19	19.572	VV	0.062	998761	19.488	19.649
20	21.239	VV	0.061	37590260	21.114	21.416
21	21.700	VV	0.088	593828	21.631	21.826
22	23.643	VV	0.064	25619392	23.518	23.805
23	26.391	VV	0.075	31961879	26.263	26.618

TIC: 01040923.D

'0104012-009 ,10403-1B1-8h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.748	VV	0.176	1158980	7.670	7.930
2	8.002	VV	0.120	694852	7.930	8.091
3	8.319	VV	0.078	2100762	8.198	8.425
4	8.887	VV	0.078	5479577	8.748	9.086
5	9.625	VV	0.122	502227	9.543	9.782
6	10.017	VV	0.071	1248633	9.866	10.161
7	13.780	VV	0.060	16461533	13.671	14.124
8	14.475	VV	0.058	15681744	14.202	14.586
9	14.632	VV	0.072	606978	14.586	14.768
10	15.160	VV	0.059	33764737	15.036	15.477
11	18.304	VV	0.062	40612214	18.188	18.580
12	21:239	VV	0.062	37821366	21.070	21.425
13	23.644	VV	0.064	25354355	23.531	23.813
14	26.394	VV	0.075	31705773	26.218	26.571

IC: 01040924.D

'0104012-010 ,10403-1B2-8h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.747	VV	0.111	690261	7.694	7.845
2	8.060	VV	0.147	675342	8.030	8.194
3	8.317	VV	0.079	2062784	8.194	8.421
4	8.564	VV	0.144	601435	8.533	8.683
5	8.885	VV	0.083	5996317	8.683	9.170
6	10.015	VV	0.063	1596376	9.933	10.145
7	11.587	VV	0.085	608574	11.419	11.681
8	13.778	VV	0.060	16336956	13.671	14.139
9	14.473	VV	0.058	15346422	14.364	14.584
10	14.634	VV	0.065	671466	14.584	14.755
11	15.159	VV	0.058	33523667	15.015	15.491
12	18.302	VV	0.061	40142001	18.192	18.532
13	21.237	VV	0.062	37381524	21.109	21.421
14	21.700	VV	0.075	508377	21.578	21.823
15	23.641	VV	0.064	25482990	23.531	23.840
16	26.389	VV	0.074	31623435	26.264	26.571

IC: 01040925.D

'0104012-011 ,10403-1B3-8h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.426	VV	0.105	9170606	4.188	4.496
2	4.532	VV	0.075	3561250	4.496	4.668
3	5.520	VV	0.063	640457	5.397	5.659
4	7.607	VV	0.120	681803	7.451	7.669
5	7.739	VV	0.133	915917	7.669	7.866
6	7.969	VV	0.176	793859	7.866	8.059
7	8.318	VV	0.078	2066458	8.232	8.450
8	8.885	VV	0.076	5235183	8.785	9.094
9	10.014	VV	0.068	1166383	9.938	10.175
10	10.306	VV	0.127	650019	10.175	10.462
11	11.583	VV	0.087	615662	11.426	11.672
12	12.814	VV	0.058	18837851	12.707	13.141
13	13.777	VV	0.060	16143715	13.593	14.071
14	14.473	VV	0.058	15364157	14.311	14.585
15	14.629	VV	0.080	659059	14.585	14.838
16	15.158	VV	0.058	33287605	15.025	15.515
17	15.898	VV	0.058	5550143	15.726	16.023
18	18.301	VV	0.061	40257037	18.150	18.522
19	19.571	VV	0.063	1204656	19.464	19.697
20	21.237	VV	0.061	37333707	21.133	21.394
21	21.698	VV	0.086	560207	21.585	21.797
22	23.640	VV	0.064	25415113	23.531	23.897
23	26.389	VV	0.074	31577283	26.264	26.599

'IC: 01040926.D

'0104012-012 ,10404-1B1-22h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.749	VV	0.125	630753	7.709	7.856
2	7.978	VV	0.183	1004881	7.856	8.094
3	8.317	VV	0.083	2341136	8.164	8.449
4	8.689	VV	0.116	502725	8.650	8.778
5	8.885	VV	0.077	5415269	8.778	9.082
6	9.618	VV	0.106	506403	9.527	9.734
7	10.013	VV	0.069	1308671	9.894	10.166
8	10.305	VV	0.113	573993	10.248	10.512
9	11.584	VV	0.086	657876	11.394	11.678
10	12.823	VV	0.172	512569	12.740	13.119
11	13.777	VV	0.059	16320308	13.647	14.175
12	14.474	VV	0.058	15336471	14.354	14.580
13	14.631	VV	0.067	693611	14.580	14.739
14	15.160	VV	0.058	33410644	15.052	15.480
15	18.303	VV	0.060	40259837	18.156	18.601
16	21.240	VV	0.062	37118060	21.123	21.439
17	23.647	VV	0.065	24395468	23.528	23.790
18	26.398	VV	0.076	30751392	26.258	26.582

IC: 01040927.D

'0104012-013 ,10404-1B2-22h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.754	VV	0.089	523409	7.681	7.808
2	7.922	VV	0.136	582848	7.808	7.954
3	8.325	VV	0.086	2246339	8.145	8.441
4	8.590	VV	0.130	520903	8.555	8.697
5	8.892	VV	0.080	5050802	8.797	9.187
6	9.626	VV	0.113	610202	9.542	9.807
7	10.021	VV	0.065	2396613	9.879	10.176
8	10.300	VV	0.114	529881	10.176	10.395
9	13.784	VV	0.058	16441647	13.685	14.040
10	14.480	VV	0.059	15602453	14.366	14.589
11	14.640	VV	0.067	840608	14.589	14.819
12	15.166	VV	0.059	33958724	15.034	15.474
13	18.309	VV	0.060	40951185	18.199	18.559
14	21.245	VV	0.061	38047042	21.124	21.585
15	23.650	VV	0.064	25367571	23.519	23.808
16	26.402	VV	0.075	31556965	26.213	26.576

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'0104012-014 ,10404-1B3-22h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.422	VV	0.124	9553554	4.200	4.502
	4.539	VV	0.051	3366811	4.502	4.839
3	5.528	VV	0.056	626548	5.420	5.669
4	7.771	VV	0.102	575758	7.708	7.847
5	7.995	VV	0.182	738906	7.955	8.155
6	8.327	VV	0.078	1987285	8.250	8.461
7	8.895	VV	0.078	4938447	8.788	9.157
8	9.629	VV	0.108	562186	9.557	9.790
9	10.023	VV	0.066	1137654	9.927	10.146
10	11.594	VV	0.075	511449	11.499	11.677
11	12.823	VV	0.057	19259772	12.697	13.141
12	13:786	VV	0.060	16411687	13.687	14.076
13	14.481	VV	0.058	15683803	14.349	14.596
14	14.638	VV	0.088	744525	14.596	14.963
15	15.168	VV	0.058	34049814	15.064	15.431
16	15.907	VV	0.059	5494698	15.818	16.082
17	18.311	VV	0.061	41200878	18.175	18.522
18	19.579	VV	0.063	1339245	19.424	19.680
19	21.248	VV	0.061	38316566	21.114	21.420
20	21.708	VV	0.068	515278	21.625	21.816
21	23.651	VV	0.065	25934172	23.480	23.825
22	26.403	VV	0.075	31841773	26.278	26.663

IC: 01040929.D

'0104012-015 ,10404-1B1-32h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.619	VV	0.105	574766	7.438	7.664
2	8.325	VV	0.081	2130664	8.175	8.435
3	8.896	VV	0.079	5334386	8.768	9.187
4	9.628	VV	0.117	623961	9.536	9.789
5	10.023	VV	0.075	1297328	9.851	10.167
6	10.299	VV	0.138	655657	10.167	10.471
7	13.784	VV	0.060	16623946	13.628	14.010
8	14.479	VV	0.058	15860385	14.332	14.587
9	14.638	VV	0.067	712874	14.587	14.735
10	15.165	VV	0.057	34491827	15.020	15.584
11	18.308	VV	0.061	41665566	18.196	18.599
12	21.245	VV	0.062	38595656	21.133	21.448
13	23.650	VV	0.065	25466628	23.547	23.881
14	26.403	VV	0.075	31781502	26.225	26.590

TIC: 01040930.D

'0104012-016 ,10404-1B1-32(D)

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.585	VV	0.125	624856	7.487	7.680
	7.750	VV	0.123	694427	7.680	7.850
	7.998	VV	0.198	805146	7.850	8.065
4	8.324	VV	0.086	2348688	8.117	8.429
5	8.894	VV	0.079	5381360	8.787	9.221
6	9.630	VV	0.144	806193	9.546	9.928
7	10.022	VV	0.066	1183850	9.928	10.142
8	10.308	VV	0.137	668976	10.142	10.463
9	11.594	VV	0.074	546113	11.465	11.675
10	13.783	VV	0.059	16690647	13.668	14.035
11	14.478	VV	0.059	15851213	14.323	14.588
12	14.638	VV	0.066	741849	14.588	14.755
13	15.164	VV	0.059	34622565	15.016	15.435
14	18.308	VV	0.061	41632805	18.152	18.594
15	21.243	VV	0.063	38389675	21.094	21.451
16	23.648	VV	0.065	25071077	23.520	23.821
17	26.400	VV	0.076	31482813	26.276	26.617

TIC: 01040940.D

'0104012-017,10404-1B2-32h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.641	VV	0.125	633274	7.419	7.679
2	7.715	VV	0.137	827621	7.679	7.891
3	7.981	VV	0.201	784248	7.956	8.182
4	8.307	VV	0.078	1935077	8.182	8.418
5	8.657	VV	0.146	563289	8.517	8.684
6	8.875	VV	0.086	5324219	8.684	9.203
7	9.611	VV	0.099	685467	9.531	9.773
8	10.002	VV	0.060	2604489	9.920	10.116
9	10.290	VV	0.136	679359	10.116	10.429
10	11.572	VV	0.077	529139	11.451	11.657
11	13.763	VV	0.059	16293271	13.650	14.066
12	14.459	VV	0.057	15471806	14.363	14.562
13	14.618	VV	0.066	975870	14.562	14.775
14	15.145	VV	0.058	33542219	15.002	15.372
15	18.287	VV	0.059	40955219	18.178	18.616
16	21.223	VV	0.062	37925047	21.112	21.481
17	23.625	VV	0.066	25538525	23.461	23.801
18	26.372	VV	0.076	31767394	26.171	26.546

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'0104012-018,10404-1B2-32(D)

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.734	VV	0.168	897683	7.596	7.813
2	7.903	VV	0.150	627075	7.813	7.975
3	8.303	VV	0.083	2188456	8.181	8.474
4	8.538	VV	0.117	611403	8.474	8.647
5	8.874	VV	0.079	4935797	8.779	9.121
6	9.609	VV	0.117	760952	9.512	9.765
7	10.002	VV	0.062	2618967	9.868	10.155
8	10.288	VV	0.129	595313	10.155	10.413
9	13.763	VV	0.058	16289007	13.624	14.024
10	14.458	VV	0.058	15483259	14.328	14.566
11	14.617	VV	0.063	880571	14.566	14.736
12	15.144	VV	0.058	33567878	15.039	15.433
13	18.287	VV	0.059	40496140	18.153	18.563
14	21.223	VV	0.061	37487409	21.100	21.384
15	23.624	VV	0.065	25222470	23.484	23.797
16	26.370	VV	0.075	31548269	26.181	26.535

IC: 01040942.D

'0104012-019,10404-1B3-32h

eak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.408	VV	0.115	8727769	4.182	4.486
2	4.522	VB	0.060	2985448	4.486	4.899
3	5.510	VV	0.064	598175	5.393	5.654
4	7.611	VV	0.105	503337	7.466	7.647
5	7.750	VV	0.196	1169890	7.647	7.939
6	8.184	VV	0.133	501282	8.067	8.214
7	8.304	VV	0.077	1933088	8.214	8.440
8	8.497	VV	0.147	501414	8.440	8.591
9	8.872	VV	0.081	4669095	8.784	9.230
10	9.606	VV	0.121	823879	9.470	9.803
11	9.999	VV	0.064	1284659	9.907	10.125
12	10.284	VV	0.119	553539	10.125	10.377
13	11.571	VV	0.096	521659	11.468	11.681
14	12.799	VV	0.058	18203234	12.683	13.093
15	13.761	VV	0.059	15836174	13.642	13.995
16	14.457	VV	0.058	15148103	14.334	14.566
17	14.613	VV	0.074	626446	14.566	14.782
18	15.143	VV	0.057	33334884	14.978	15.457
19	15.881	VV	0.059	5171970	15.753	16.025
20	18.285	VV	0.060	40449765	18.100	18.649
21	19.552	VV	0.062	1283469	19.478	19.699
22	21.220	VV	0.060	37404199	20.950	21.398
23	21.679	VV	0.070	554263	21.546	21.791
24	23.623	VV	0.065	25107293	23.516	23.791
25	26.370	VV	0.075	31222022	26.189	26.658

IC: 01040943.D

'0104012-020,10405-1B1-48h

eak#	Ret Time	Type	Width	Area	Start Time	End Time
	7.743	VV	0.161	700572	7.686	7.863
	7.917	VV	0.141	777151	7.863	8.071
3	8.303	VV	0.087	2162557	8.150	8.450
4	8.873	VV	0.079	4691252	8.757	9.088
5	9.609	VV	0.101	637951	9.539	9.771
6	10.000	VV	0.065	1387111	9.914	10.146
7	13.762	VV	0.060	16106928	13.603	14.022
8	14.458	VV	0.058	15286838	14.361	14.563
9	14.617	VV	0.067	940160	14.563	14.823
10	15.144	VV	0.057	33527247	14.926	15.365
11	18.286	VV	0.060	40654884	18.141	18.772
12	21.222	VV	0.061	37640234	21.110	21.528
13	23.624	VV	0.065	25374214	23.487	23.794
14	26.369	VV	0.075	31514111	26.240	26.565

C: 01040944.D

'0104012-021,10405-1B2-48h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.922	VV	0.132	708544	7.772	7.956
2	8.300	VV	0.094	2426163	8.174	8.539
3	8.868	VV	0.084	4819501	8.717	9.070
4	9.609	VV	0.096	550572	9.545	9.744
5	9.996	VV	0.061	3605013	9.909	10.154
6	13.758	VV	0.058	15966519	13.630	13.999
7	14.453	VV	0.057	15196620	14.307	14.555
8	14.614	VV	0.066	1087387	14.555	14.747
9	15.139	VV	0.057	33278724	15.036	15.422
10	18.281	VV	0.060	40488544	18.147	18.566
11	21.216	VV	0.062	37522401	21.112	21.445
12	23.619	VV	0.064	25262319	23.509	23.849
13	26.363	VV	0.074	31275649	26.243	26.561

IC: 01040945.D

'0104012-022,10405-1B3-48h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.403	PV	0.113	7997135	4.183	4.480
2	4.517	VV	0.074	2304398	4.480	4.610
3	5.502	VV	0.055	512203	5.447	5.630
4	8.296	VV	0.088	2112155	8.144	8.432
5	8.554	VV	0.149	740810	8.511	8.723
6	8.866	VV	0.081	4215716	8.723	9.101
7	9.600	VV	0.133	824040	9.432	9.785
8	9.993	VV	0.063	1306895	9.915	10.114
9	10.282	VV	0.119	575390	10.114	10.370
10	11.562	VV	0.076	524177	11.461	11.659
11	12.792	VV	0.057	18408654	12.600	13.142
12	13.754	VV	0.059	15888999	13.652	13.993
13	14.449	VV	0.057	15247146	14.347	14.561
14	14.608	VV	0.069	517814	14.561	14.706
15	15.135	VV	0.056	33207123	15.024	15.396
16	15.874	VV	0.057	5232130	15.772	16.009
17	18.276	VV	0.060	40134124	18.135	18.529
18	19.545	VV	0.062	1225073	19.466	19.636
19	21.213	VV	0.061	37067047	21.106	21.393
20	21.673	VV	0.070	506681	21.587	21.800
21	23.614	VV	0.065	24984555	23.473	23.770
22	26.359	VV	0.074	31040997	26.136	26.531

IC: 01040946.D

'0104012-023,10405-1B1-56h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.720	PV	0.210	1052420	7.441	7.783
2	7.919	VV	0.156	685382	7.783	7.960
3	8.297	VV	0.078	1865567	8.202	8.416
4	8.864	VV	0.080	4477806	8.767	9.087
5	9.602	VV	0.188	553115	9.444	9.755
6	9.991	VV	0.064	973179	9.921	10.136
7	11.561	VV	0.075	550391	11.421	11.648
8	13.752	VV	0.059	16065985	13.653	14.011
9	14.447	VV	0.057	15251307	14.324	14.552
10	14.607	VV	0.069	997444	14.552	14.802
11	15.133	VV	0.057	33505532	15.000	15.526
12	18.275	VV	0.059	40423467	18.141	18.491
13	21.211	VV	0.062	37379871	21.066	21.403
14	23.612	VV	0.065	25337997	23.486	23.769
15	26.357	VV	0.075	31631251	26.211	26.550

IC: 01040947.D

'0104012-024,10405-1B1-56(D)

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.965	VV	0.178	726655	7.839	8.030
2	8.298	VV	0.076	1872212	8.212	8.431
3	8.866	VV	0.080	4738308	8.698	9.077
4	9.993	VV	0.064	903827	9.887	10.086
5	10.283	VV	0.111	507833	10.231	10.489
6	13.752	VV	0.058	16069422	13.639	14.078
7	14.448	VV	0.057	15281595	14.256	14.556
8	14.609	VV	0.065	885031	14.556	14.719
9	15.134	VV	0.058	33202869	15.029	15.409
10	18.275	VV	0.060	40299633	18.123	18.611
11	21.209	VV	0.061	37426378	21.079	21.402
12	23.610	VV	0.063	25186320	23.463	23.868
13	26.355	VV	0.075	31340065	26.194	26.596

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'0104012-025,10405-1B2-56h

?ak#	Ret Time	Type	Width	Area	Start Time	End Time
-	8.293	VV	0.081	2022986	8.212	8.481
2	8.861	VV	0.079	4459962	8.762	9.090
3	9.989	VV	0.062	3452042	9.899	10.154
4	11.557	VV	0.074	551498	11.460	11.675
5	13.749	VV	0.058	16216297	13.651	14.004
6	14.444	VV	0.058	15377076	14.290	14.547
7	14.604	VV	0.065	1112717	14.547	14.725
8	15.129	VV	0.058	33420751	14.972	15.345
9	18.271	VV	0.060	40468227	18.165	18.548
10	21.204	VV	0.062	37497932	21.049	21.418
11	23.606	VV	0.064	25087020	23.405	23.789
12	26.348	VV	0.074	31179820	26.152	26.548

IC: 01040949.D

'0104012-026,10405-1B2-56(D)

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.781	VV	0.119	513483	7.755	7.888
2	8.287	VV	0.074	1796241	8.199	8.379
3	8.481	VV	0.139	601088	8.379	8.555
4	8.591	VV	0.135	509317	8.555	8.699
5	8.854	VV	0.081	4623419	8.759	9.086
6	9.981	VV	0.060	3422745	9.892	10.144
7	10.269	VV	0.102	511456	10.144	10.346
8	13.742	VV	0.059	16099845	13.622	14.108
9	14.438	VV	0.057	15282876	14.335	14.539
10	14.597	VV	0.065	1101509	14.539	14.719
11	15.123	VV	0.057	33083245	15.020	15.354
12	18.264	VV	0.060	40678436	18.158	18.645
13	21.200	VV	0.062	37693438	21.079	21.451
14	23.602	VV	0.063	24968266	23.484	23.784
15	26.345	VV	0.075	30913344	26.223	26.507

TIC: 01040950.D

'0104012-027,10405-1B3-56h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.402	VV	0.115	8017873	4.171	4.477
2	4.513	VV	0.047	2267097	4.477	4.598
3	5.497	VV	0.058	566684	5.326	5.614
4	7.719	VV	0.233	1270063	7.590	7.930
5	8.289	VV	0.082	2002056	8.136	8.397
6	8.857	VV	0.079	3968629	8.759	9.095
7	9.985	VV	0.066	863072	9.908	10.086
8	10.272	VV	0.112	514371	10.148	10.359
9	11.556	VV	0.071	500589	11.477	11.658
10	12.782	VV	0.058	17967652	12.684	13.065
11	13.746	VV	0.059	15942885	13.635	14.018
12	14.440	VV	0.057	15232743	14.271	14.549
13	14.597	VV	0.082	615220	14.549	14.791
14	15.126	VV	0.058	33439189	15.024	15.504
15	15.865	VV	0.057	5078212	15.767	16.028
16	18.268	VV	0.061	40377134	18.154	18.562
17	19.536	VV	0.060	1207101	19.455	19.624
18	21.202	VV	0.061	37340936	21.072	21.387
19	23.605	VV	0.064	25113196	23.413	23.788
20	26.348	VV	0.074	31049424	26.228	26.605

TIC: 01040951.D

'0104012-028,10406-1B1-72h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.723	VV	0.095	502664	7.661	7.787
2	7.940	VV	0.143	650323	7.853	8.027
3	8.292	VV	0.074	1919894	8.163	8.382
4	8.859	VV	0.080	4537252	8.761	9.110
5	9.988	VV	0.064	924610	9.912	10.099
6	10.271	VV	0.126	585508	10.099	10.369
7	11.557	VV	0.074	521250	11.472	11.661
8	13.747	VV	0.058	16080484	13.639	14.038
9	14.441	VV	0.058	15426643	14.262	14.545
10	14.602	VV	0.063	979242	14.545	14.685
11	15.127	VV	0.058	33352699	14.943	15.356
12	18.270	VV	0.061	39926383	18.141	18.542
13	21.203	VV	0.062	37297542	21.045	21.484
14	23.606	VV	0.064	24898452	23.495	23.779
15	26.349	VV	0.075	31093864	26.227	26.533

TIC: 01040952.D

'0104012-029,10406-1B1-72(D)

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.960	VV	0.143	729576	7.900	8.093
2	8.288	VV	0.075	1864001	8.194	8.399
3	8.476	VV	0.135	542801	8.399	8.550
4	8.855	VV	0.081	4337281	8.744	9.091
5	9.983	VV	0.062	871923	9.914	10.074
6	10.276	VV	0.118	520609	10.129	10.357
7	13.743	VV	0.059	16056563	13.643	13.990
8	14.437	VV	0.057	15183285	14.321	14.542
9	14.597	VV	0.063	1002657	14.542	14.711
10	15.124	VV	0.058	33067533	15.008	15.312
11	18.265	VV	0.060	39951105	18.145	18.486
12	21.201	VV	0.062	37127916	21.088	21.469
13	23.601	VV	0.065	25123402	23.430	23.766
14	26.343	VV	0.074	31385773	26.170	26.575

TIC: 01040953.D

'0104012-030,10406-1B2-72h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.584	VV	0.136	659529	7.451	7.683
2	8.288	VV	0.078	1871306	8.200	8.412
3	8.855	VV	0.087	4681394	8.757	9.225
4	9.982	VV	0.060	4486572	9.891	10.136
5	11.551	VV	0.075	539148	11.431	11.636
6	13.742	VV	0.059	16048009	13.638	14.086
7	14.436	VV	0.057	15106902	14.297	14.538
8	14.597	VV	0.063	1315547	14.538	14.733
9	15.123	VV	0.057	33036332	15.009	15.383
10	18.264	VV	0.061	39646480	18.119	18.474
11	21.200	VV	0.062	37068302	21.091	21.438
12	23.600	VV	0.065	24727154	23.439	23.807
13	26.343	VV	0.075	30698888	26.202	26.569

"IC: 01040954.D

'0104012-031,10406-1B2-72(D)

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	7.697	VV	0.116	675922	7.637	7.808
	7.981	VV	0.147	598190	7.937	8.096
3	8.286	VV	0.081	1966790	8.193	8.415
4	8.547	VV	0.113	577932	8.415	8.580
5	8.854	VV	0.083	4582789	8.743	9.076
6	9.980	VV	0.059	4500747	9.888	10.143
7	10.270	VV	0.118	560294	10.143	10.380
8	13.740	VV	0.058	15931965	13.582	14.000
9	14.435	VV	0.057	15211616	14.301	14.536
10	14.595	VV	0.066	1477844	14.536	14.840
11	15.121	VV	0.057	33179983	15.010	15.617
12	18.261	VV	0.060	39919683	18.122	18.600
13	21.196	VV	0.062	37311359	21.042	21.520
14	23.596	VV	0.064	25079442	23.446	23.769
15	26.337	VV	0.074	31449495	26.189	26.591

TIC: 01040955.D

'0104012-032,10403-1B3-72h

Peak#	Ret Time	Type	Width	Area	Start Time	End Time
1	4.407	VV	0.105	7552125	4.173	4.477
	4.508	VV	0.054	2272239	4.477	4.625
	5.492	VV	0.062	612626	5.277	5.634
4	8.018	VV	0.142	542893	7.992	8.144
5	8.282	VV	0.085	2036226	8.144	8.428
6	8.850	VV	0.078	3738290	8.756	9.075
7	9.978	VV	0.064	842320	9.897	10.058
8	12.773	VV	0.057	17791472	12.636	13.010
9	13.735	VV	0.058	15777001	13.592	14.054
10	14.430	VV	0.057	14945928	14.322	14.540
11	14.587	VV	0.066	522160	14.540	14.688
12	15.117	VV	0.057	32761741	15.008	15.433
13	15.854	VV	0.058	5102039	15.753	16.007
14	18.257	VV	0.059	39559572	18.133	18.596
15	19.523	VV	0.060	1184021	19.449	19.617
16	21.191	VV	0.061	36495249	21.089	21.361
17	21.652	VV	0.077	512762	21.503	21.780
18	23.591	VV	0.064	24786681	23.478	23.830
19	26.332	VV	0.074	30840658	26.208	26.528

APPENDIX C:
Raw data of $KMnO_4$ consumption versus time during the oxidant demand tests

	Time, hr						
	0		120	168			
ES-0.25	238.41	80.27	11.28	5.18	15.98	6.59	15.04
ES-0.25D	237.00	76.51	8.94	2.84	16.92	9.88	12.69
ES-0.5	481.97	263.28	196.65	162.86	149.25	111.24	107.49
ES-0.5D	487.60	289.56	208.38	189.61	177.88	136.58	131.89
ES-1	971.46	699.75	625.14	595.57	574.46	528.00	523.77
ES-1D	958.79	695.53	601.20	577.27	556.15	498.43	494.21
ES-2	1865.43	1600.76	1464.20	1434.63	1433.23	1390.99	1375.51
ES-2D	1911.88	1572.60	1510.66	1481.09	1452.94	1372.69	1358.61
ES-4	4001.94	3602.46	3534.75	3446.73	3419.64	3331.62	3291.00
ES-4D	4022.26	3595.69	3561.83	3439.96	3412.87	3263.91	3236.83
ES-10	10025.91	9513.87	9392.60	9271.32	9244.37	9190.47	9123.10
ES-10D	10066.34	9608.19	9365.65	9244.37	9203.95	9136.58	9069.20
	Time, hr						
	0		120	168			
C-0.25	252.00	250.00	249.00	253.00	253.00	253.00	256.00
C-1	988.89	974.14	956.45	1025.03	1003.64	989.63	978.57
C-2	1936.49	1889.09	1997.43	1936.49	2017.74	1990.66	1997.43
C-4	4055.93	4015.50	3988.55	4015.50	3921.18	4096.35	3948.13
C-10	10092.65	10079.18	10052.23	9957.91	9904.01	9971.38	9917.48

Note: ES-0.25 = ESI sample soil in a $KMnO_4$ solution of initial concentration ~0.25 g/L; C-0.25 = the control with a KMnO4 solution of initial concentration 0.25 g/L

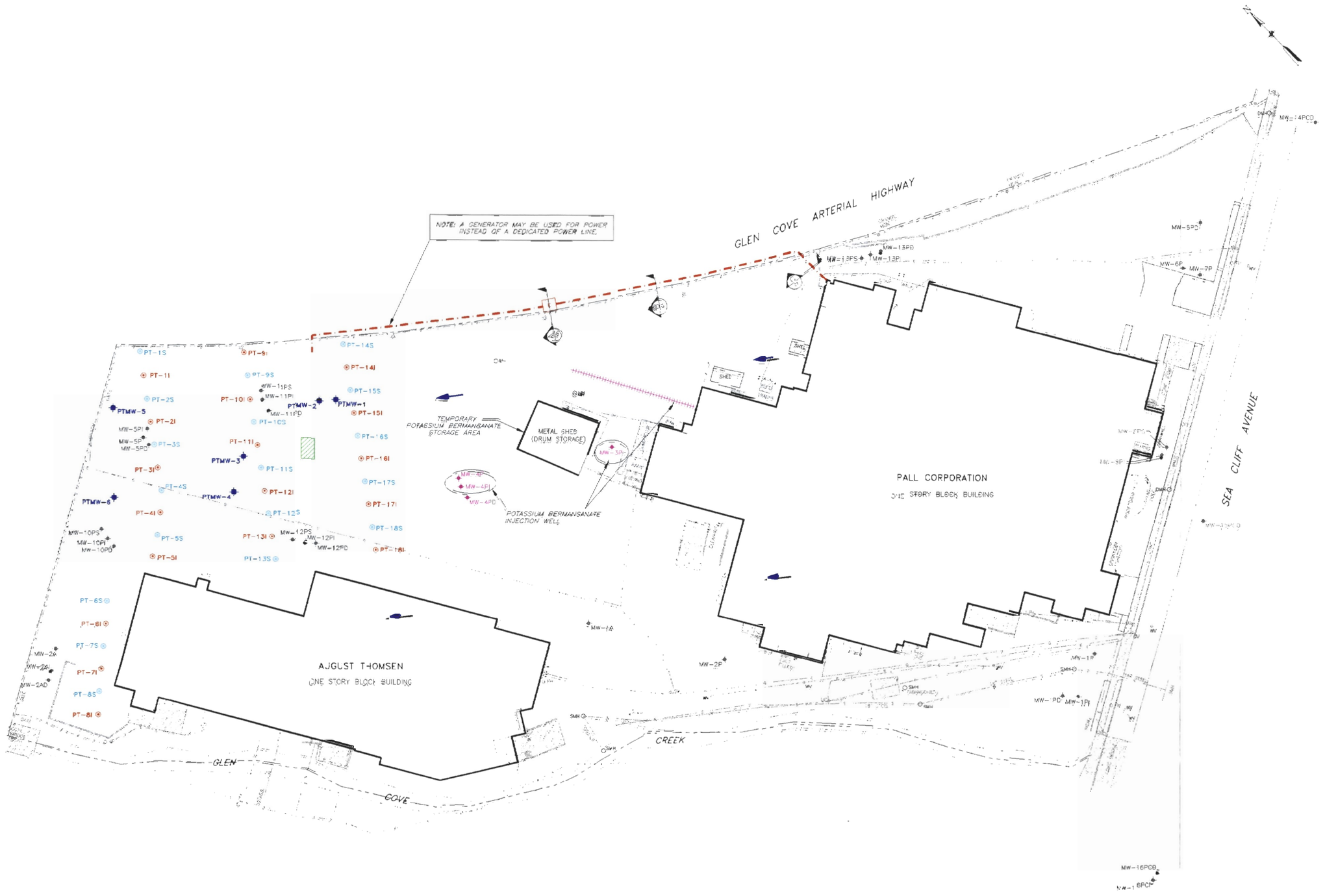
APPENDIX D:

Raw data of the oxidant demand of the GCNY soil, determined in a reaction period of 14 days.

	0	0.64	0.91	0.94	0.89	0.93	0.90
	0	0.65	0.92	0.94	0.89	0.91	0.90
	0	0.88	1.15	1.28	1.34	1.49	1.51
	0	0.80	1.12	1.20	1.25	1.41	1.43
	0	1.09	1.39	1.51	1.60	1.78	1.80
	0	1.06	1.44	1.53	1.62	1.85	1.87
	0	1.06	1.61	1.73	1.74	1.91	1.97
	0	1.36	1.61	1.73	1.85	2.17	2.23
	0	1.61	1.88	2.23	2.34	2.70	2.86
	0	1.72	1.85	2.34	2.45	3.05	3.16
	0	2.06	2.55	3.03	3.14	3.36	3.63
	0	1.84	2.82	3.31	3.47	3.74	4.01

Note:

1. SOD = $V(C_0-C_s)/m_{soil}$, g-$KMnO_4$/kg dry doil
   V = total volume of $KMnO_4$ solution in the vials; C_0 = initial $KMnO_4$ concentration; C_s = $KMnO_4$ concentration at 14 days reaction period; m_{soil} = the mass of dry soil in reactors = ~ 9.2 g



NO.	DATE	BY	REVISION

LEGEND

- NEW SHALLOW POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 5'-25' BGS)
- NEW INTERMEDIATE POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 35'-55' BGS)
- NEW MONITORING PROBE COUPLET (SCREEN: 3'-13' BGS; SCREEN: 45'-55' BGS)
- INJECTION SYSTEM SKID (PORTABLE, ASSUME 1 SKID TO BE RELOCATED AS NEEDED)
- GROUNDWATER FLOW DIRECTION
- E — NEW ELECTRIC HANDHOLE
- NEW UNDERGROUND ELECTRIC AND DOMESTIC WATER SERVICE
- EXISTING HORIZONTAL SVE WELL TO BE USED FOR PERMANGANATE INJECTION (PHASE V)
- EXISTING MONITORING WELL TO BE USED FOR PERMANGANATE INJECTION (PHASE V)
- EXISTING MONITORING WELL
- UTILITY POLE
- FIRE HYDRANT
- CATCH BASIN
- WV — WATER VALVE
- GV — GAS VALVE
- SMHS — SEWER MANHOLE
- MHS — MANHOLE
- E — UNDERGROUND ELECTRIC LINE
- T — UNDERGROUND TELEPHONE LINE
- S — SANITARY SEWER
- G — UNDERGROUND GAS LINE
- W — UNDERGROUND WATER LINE
- OW — OVERHEAD WIRE
- PROPERTY LINE

NOTES

1) INJECTION WELL SPACING APPROX. 30 FEET (TOTAL OF 36 WELLS).
2) EXISTING MONITORING WELLS AVAILABLE FOR INJECTION MONITORING.
3) ACCESS TO AUGUST THOMSEN PROPERTY IS POSSIBLE.
4) UPGRADIENT REMEDIATION (OFF-SITE) BY OTHERS TO ADDRESS SOURCES.
5) LOCATE UNDERGROUND UTILITIES PRIOR TO DRILLING AND EXCAVATING.

GRAPHIC SCALE
0 30 60
1"=30'

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

STATE OF NEW YORK
DANIEL G. STEPS
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PALL CORPORATION PILOT TEST

30 SEA CLIFF AVENUE
GLEN COVE, NEW YORK

SITE PLAN

DESIGNED BY:	DETAILED BY:	CHECKED BY:
SEE SOURCE	TRS	
DRAWING DATE: 8/6/02	ACAD FILE: PALLY1	
PROJECT NO.: PALL-GLENCOVE	CONTRACT:	
DRAWING: Y1	REVISION:	

PHASE I			
PHASE	INJECTION WELLS	$KMNO_4$ (LBS)	WATER (GALS)
IA	PT-14S, 15S, 16S, 17S, 18S	20,500	132,000
IB	PT-14I, 15I, 16I, 17I, 18I	20,500	132,000

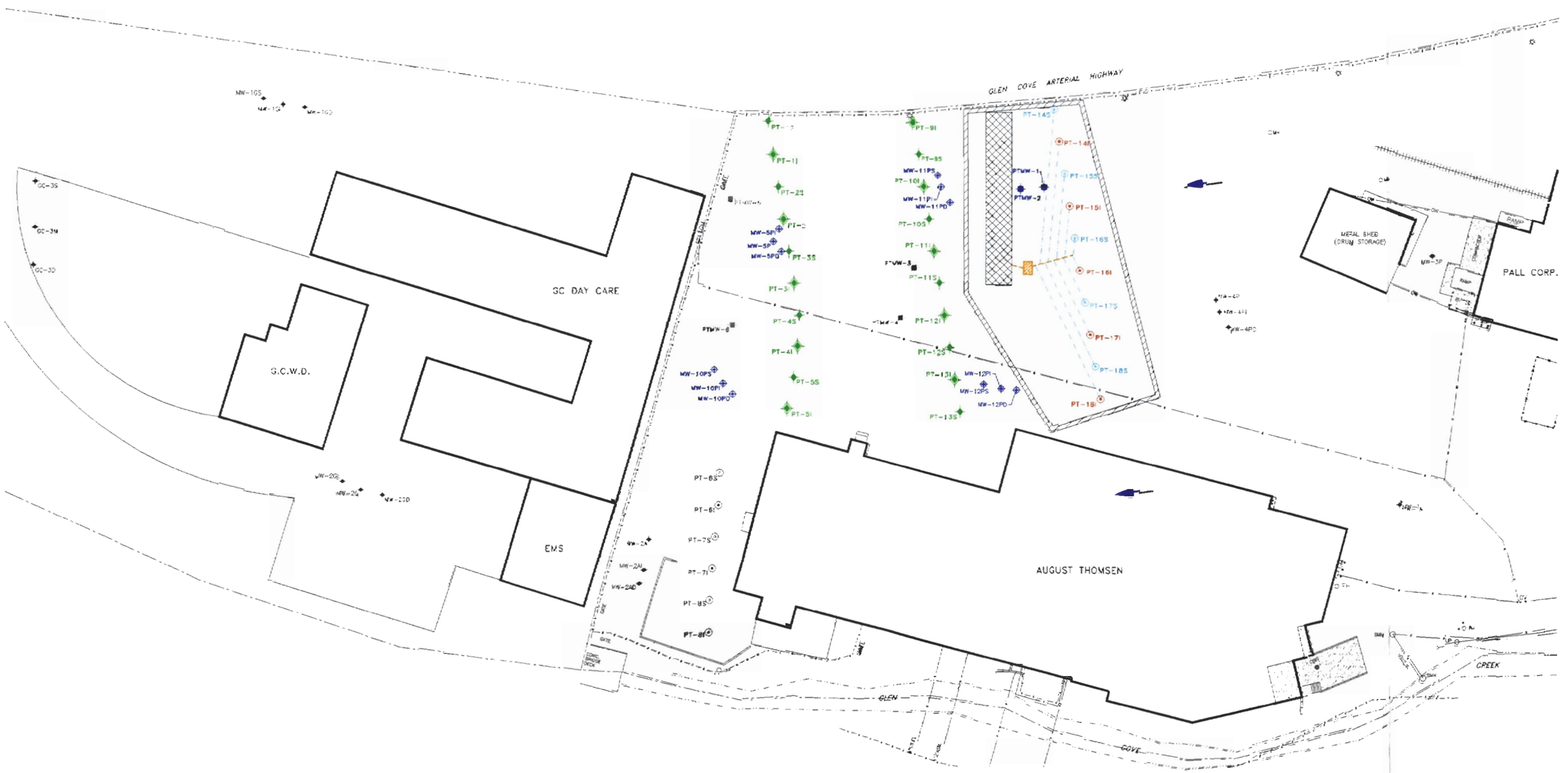
NOTE

A) INJECTION RATE: 10 GPM (PER WELL) OF 2% $KMNO_4$ SOLUTION

B) PROJECTED DURATION OF PHASE I INJECTION EVENT IS ONE WEEK.

C) SEE TABLE 2 OF IN-SITU CHEMICAL OXIDATION PILOT TEST DESIGN REPORT FOR COMPLETE DESCRIPTION OF INJECTION WELLS, MONITORING WELLS, AND FIELD SCREENING LOCATIONS.

D) SEE TABLE 3 OF IN-SITU CHEMICAL OXIDATION PILOT TEST DESIGN REPORT FOR FREQUENCY, DURATION, AND DETAILS OF MONITORING PROGRAM.



NO.	DATE	BY	REVISION

LEGEND

- NEW SHALLOW POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 5'-25' BGS)
- NEW INTERMEDIATE POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 35'-55' BGS)
- NEW MONITORING WELL COUPLET USED FOR MONITORING INJECTION EVENT (SCREEN: 3'-13' BGS; SCREEN: 45'-55' BGS)
- EXISTING MONITORING WELL GROUP USED FOR MONITORING INJECTION EVENT (SHALLOW/INTERMEDIATE/DEEP)
- NEW SHALLOW INJECTION WELL USED FOR MONITORING INJECTION EVENT DURING PHASE I
- NEW INTERMEDIATE INJECTION WELL USED FOR MONITORING INJECTION EVENT DURING PHASE I
- NEW INJECTIONS WELLS NOT USED DURING PHASE I
- NEW MONITORING WELL COUPLET NOT USED DURING PHASE I
- INJECTION SYSTEM SKID (PORTABLE)
- PERMANGANATE SOLUTION MIXING EQUIPMENT AREA
- CONSTRUCTION AREA
- SCH 40 PVC PIPE
- FLEXIBLE HOSE
- PROPERTY LINE
- GROUNDWATER FLOW DIRECTION
- EXISTING MONITORING WELL
- UTILITY POLE
- FIRE HYDRANT
- CATCH BASIN
- WATER VALVE
- GAS VALVE
- SEWER MANHOLE
- MANHOLE
- UNDERGROUND ELECTRIC LINE
- UNDERGROUND TELEPHONE LINE
- SANITARY SEWER
- UNDERGROUND GAS LINE
- UNDERGROUND WATER LINE
- OVERHEAD WIRE
- HORIZONTAL EXTRACTION WELL

GRAPHIC SCALE

0 25 50

1"=25'

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

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PALL CORPORATION PILOT TEST

30 SEA CLIFF AVENUE
GLEN COVE, NEW YORK

PHASE I CONSTRUCTION STAGING

DESIGNED BY:	DETAILED BY:	CHECKED BY:
BF	TS	

DRAWING DATE:	ACAD FILE:
8/6/02	PALLY2A

PROJECT NO.:	CONTRACT:
PALL-GLENCOVE	

DRAWING: Y2A REVISION:

PHASE II			
PHASE	INJECTION WELLS	$KMNO_4$ (LBS)	WATER (GALS)
IA	PT-9S, 10S, 11S, 12S, 13S	20,500	132,000
IIB	PT-9I, 10I, 11I, 12I, 13I	20,500	132,000

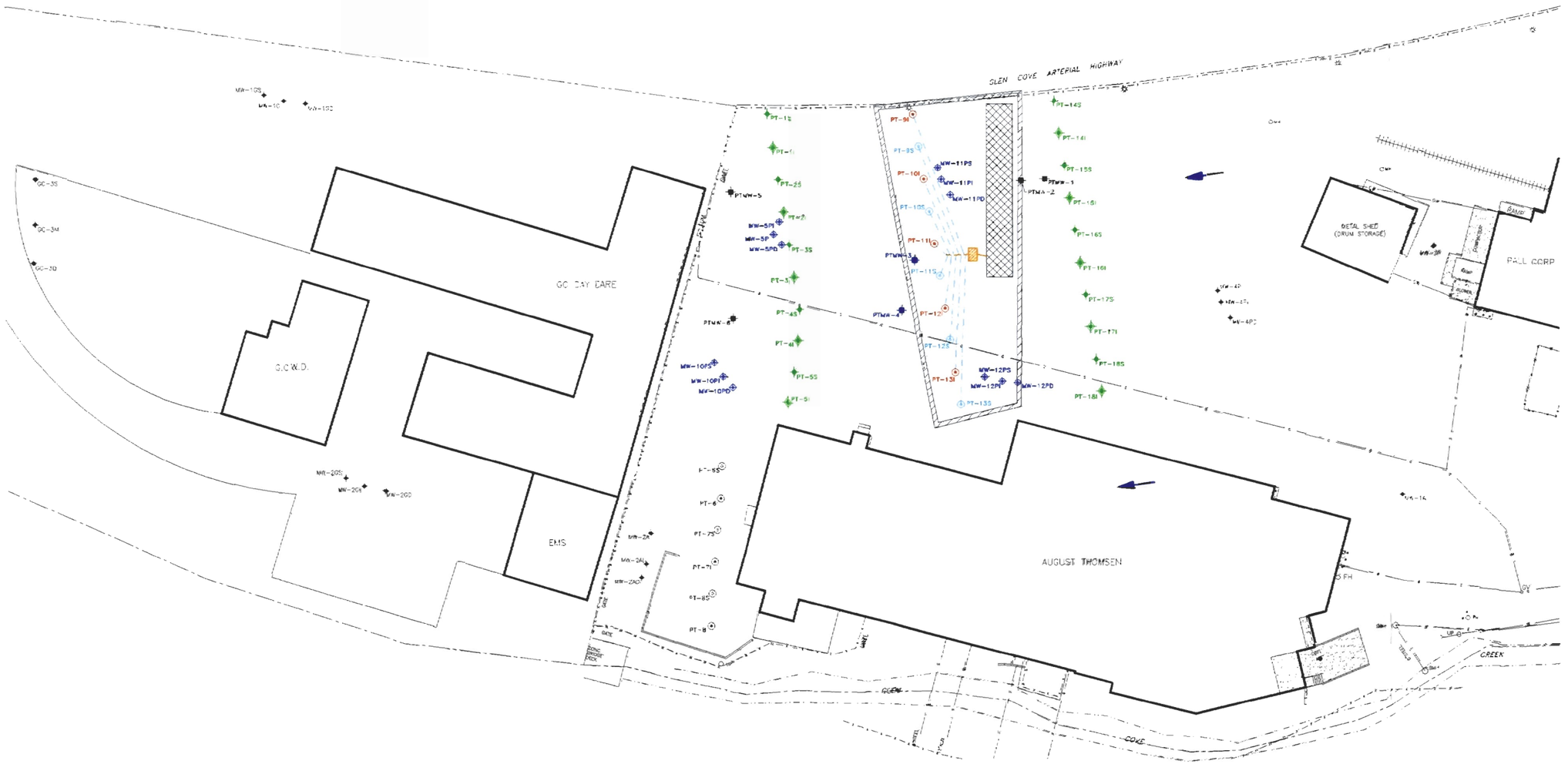
NOTE

A) INJECTION RATE: 10 GPM (PER WELL) OF 2% KMNO SOLUTION

B) PROJECTED DURATION OF PHASE I INJECTION EVENT IS ONE WEEK.

C) SEE TABLE 2 OF IN-SITU CHEMICAL OXIDATION PILOT TEST DESIGN REPORT FOR COMPLETE DESCRIPTION OF INJECTION WELLS, MONITORING WELLS, AND FIELD SCREENING LOCATIONS.

D) SEE TABLE 3 OF IN-SITU CHEMICAL OXIDATION PILOT TEST DESIGN REPORT FOR FREQUENCY, DURATION, AND DETAILS OF MONITORING PROGRAM.



NO.	DATE	BY	REVISION

LEGEND

- NEW SHALLOW POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 5'-25' BGS)
- NEW INTERMEDIATE POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 35'-55' BGS)
- NEW MONITORING WELL COUPLET USED FOR MONITORING INJECTION EVENT (SCREEN: 3'-13' BGS, SCREEN: 45'-55' BGS)
- EXISTING MONITORING WELL GROUP USED FOR MONITORING INJECTION EVENT (SHALLOW/INTERMEDIATE/DEEP)
- NEW SHALLOW INJECTION WELL USED FOR MONITORING INJECTION EVENT DURING PHASE II
- NEW INTERMEDIATE INJECTION WELL USED FOR MONITORING INJECTION EVENT DURING PHASE II
- NEW INJECTIONS WELLS NOT USED DURING PHASE II
- NEW MONITORING WELL COUPLET NOT USED DURING PHASE II
- INJECTION SYSTEM SKID (PORTABLE)
- PERMANGANATE SOLUTION MIXING EQUIPMENT AREA
- CONSTRUCTION AREA
- SCH 40 PVC PIPE
- FLEXIBLE HOSE
- PROPERTY LINE
- GROUNDWATER FLOW DIRECTION
- EXISTING MONITORING WELL
- UTILITY POLE
- FIRE HYDRANT
- CATCH BASIN
- WATER VALVE
- GAS VALVE
- SEWER MANHOLE
- MANHOLE
- UNDERGROUND ELECTRIC LINE
- UNDERGROUND TELEPHONE LINE
- SANITARY SEWER
- UNDERGROUND GAS LINE
- UNDERGROUND WATER LINE
- OVERHEAD WIRE
- HORIZONTAL EXTRACTION WELL

GRAPHIC SCALE

0 25 50

1"=25'

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

STATE OF NEW YORK DANIEL J. SANTORO 073173 LICENSED PROFESSIONAL ENGINEER

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PALL CORPORATION PILOT TEST

30 SEA CLIFF AVENUE
GLEN COVE, NEW YORK

PHASE II CONSTRUCTION STAGING

DESIGNED BY:	DETAILED BY:	CHECKED BY:
BF	TS	

DRAWING DATE:	ACAD FILE:
8/6/02	PA_LY2B1
PROJECT NO.: PALL-GLENCOVE	CONTRACT:
DRAWING: Y2B	REVISION:

PHASE I			
PHASE	INJECTION WELLS	$KMNO_4$ (LBS)	WATER (GALS)
IIIA	PT-1S, 2S, 3S, 4S, 5S	20,500	132,000
IIIB	PT-1I, 2I, 3I, 4I, 5I	20,500	132,000

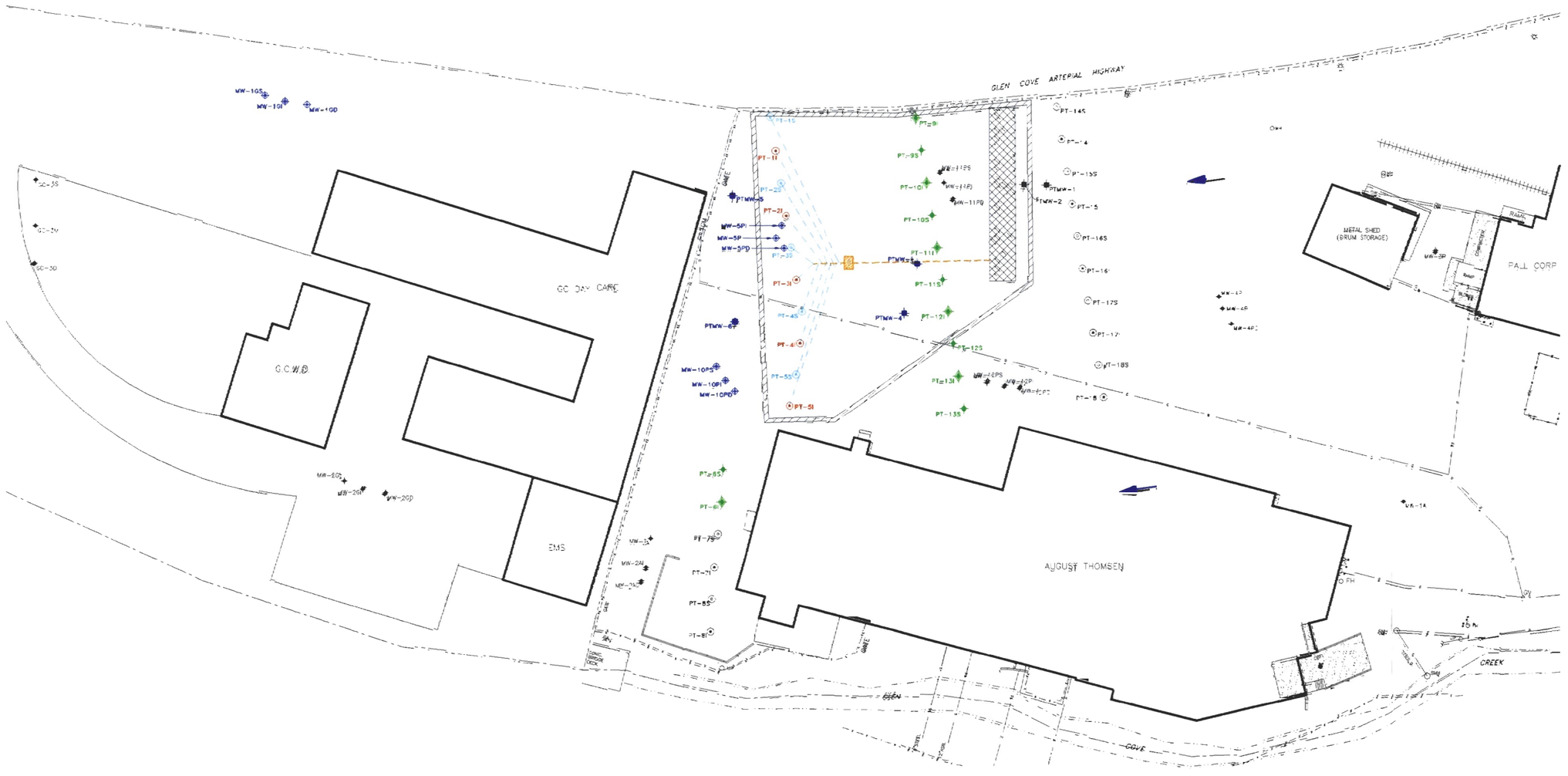
NOTE

A) INJECTION RATE: 10 GPM (PER WELL) OF 2% $KMNO_4$ SOLUTION

B) PROJECTED DURATION OF PHASE I INJECTION EVENT IS ONE WEEK.

C) SEE TABLE 2 OF IN-SITU CHEMICAL OXIDATION PILOT TEST DESIGN REPORT FOR COMPLETE DESCRIPTION OF INJECTION WELLS, MONITORING WELLS, AND FIELD SCREENING LOCATIONS.

D) SEE TABLE 3 OF IN-SITU CHEMICAL OXIDATION PILOT TEST DESIGN REPORT FOR FREQUENCY, DURATION, AND DETAILS OF MONITORING PROGRAM.



NO.	DATE	BY	REVISION

LEGEND

- NEW SHALLOW POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 5'-25' BGS)
- NEW INTERMEDIATE POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 35'-55' BGS)
- NEW MONITORING WELL COUPLET USED FOR MONITORING INJECTION EVENT (SCREEN: 3'-13' BGS; SCREEN: 45'-55' BGS)
- EXISTING MONITORING WELL GROUP USED FOR MONITORING INJECTION EVENT (SHALLOW/INTERMEDIATE/DEEP)
- NEW SHALLOW INJECTION WELL USED FOR MONITORING INJECTION EVENT DURING PHASE III
- NEW INTERMEDIATE INJECTION WELL USED FOR MONITORING INJECTION EVENT DURING PHASE III
- NEW INJECTIONS WELLS NOT USED DURING PHASE III
- NEW MONITORING WELL COUPLET NOT USED DURING PHASE III
- INJECTION SYSTEM SKID (PORTABLE)
- PERMANGANATE SOLUTION MIXING EQUIPMENT AREA
- CONSTRUCTION AREA
- SCH 40 PVC PIPE
- FLEXIBLE HOSE
- PROPERTY LINE
- GROUNDWATER FLOW DIRECTION
- EXISTING MONITORING WELL
- UTILITY POLE
- FIRE HYDRANT
- CATCH BASIN
- WATER VALVE
- GAS VALVE
- SEWER MANHOLE
- MANHOLE
- E — UNDERGROUND ELECTRIC LINE
- T — UNDERGROUND TELEPHONE LINE
- S — SANITARY SEWER
- G — UNDERGROUND GAS LINE
- W — UNDERGROUND WATER LINE
- OW — OVERHEAD WIRE
- H — HORIZONTAL EXTRACTION WELL

GRAPHIC SCALE

0 25 50

1"=25'

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

STATE OF NEW YORK · DANIEL J. SMITH · 073173 · LICENSED PROFESSIONAL ENGINEER

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PALL CORPORATION PILOT TEST

30 SEA CLIFF AVENUE
GLEN COVE, NEW YORK

PHASE III CONSTRUCTION STAGING

DESIGNED BY:	DETAILED BY:	CHECKED BY:
BF	TS	

DRAWING DATE:	ACAD FILE:
6/25/02	PALLY2C1
PROJECT NO.:	CONTRACT:
PALL-GLENCOVE	
DRAWING:	REVISION:
Y2C	

PHASE IV			
PHASE	INJECTION WELLS	$KMNO_4$ (LBS)	WATER (GAL)
IVA	PT-6S, 7S, 8S	12,300	79,200
IVB	PT-6I, 7I, 8I	12,300	79,200

NOTE

A) INJECTION RATE: 10 GPM (PER WELL) OF 2% $KMNO_4$ SOLUTION

B) PROJECTED DURATION OF PHASE I INJECTION EVENT IS ONE WEEK.

C) SEE TABLE 2 OF IN-SITU CHEMICAL OXIDATION PILOT TEST DESIGN REPORT FOR COMPLETE DESCRIPTION OF INJECTION WELLS, MONITORING WELLS, AND FIELD SCREENING LOCATIONS.

D) SEE TABLE 3 OF IN-SITU CHEMICAL OXIDATION PILOT TEST DESIGN REPORT FOR FREQUENCY, DURATION, AND DETAILS OF MONITORING PROGRAM.

NO.	DATE	BY	REVISION

LEGEND

- NEW SHALLOW POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 5'-25' BGS)
- NEW INTERMEDIATE POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 35'-55' BGS)
- NEW MONITORING WELL COUPLET USED FOR MONITORING INJECTION EVENT (SCREEN: 3'-13' BGS, SCREEN: 45'-55' BGS)
- EXISTING MONITORING WELL GROUP USED FOR MONITORING INJECTION EVENT (SHALLOW/INTERMEDIATE/DEEP)
- NEW SHALLOW INJECTION WELL USED FOR MONITORING INJECTION EVENT DURING PHASE IV
- NEW INTERMEDIATE INJECTION WELL USED FOR MONITORING INJECTION EVENT DURING PHASE IV
- NOT USED DURING PHASE IV
- NEW MONITORING WELL COUPLET NOT USED DURING PHASE IV
- INJECTION SYSTEM SKID (PORTABLE)
- PERMANGANATE SOLUTION MIXING EQUIPMENT AREA
- CONSTRUCTION AREA
- SCH 40 PVC PIPE
- FLEXIBLE HOSE
- PROPERTY LINE
- GROUNDWATER FLOW DIRECTION
- EXISTING MONITORING WELL
- UTILITY POLE
- FIRE HYDRANT
- CATCH BASIN
- WATER VALVE
- GAS VALVE
- SEWER MANHOLE
- MANHOLE
- UNDERGROUND ELECTRIC LINE
- UNDERGROUND TELEPHONE LINE
- SANITARY SEWER
- UNDERGROUND GAS LINE
- UNDERGROUND WATER LINE
- OVERHEAD WIRE
- HORIZONTAL EXTRACTION WELL

GRAPHIC SCALE

0 25 50

1"=25'

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

STATE OF NEW YORK
DANIEL J. SMITH
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PALL CORPORATION PILOT TEST

30 SEA CLIFF AVENUE
GLEN COVE, NEW YORK

PHASE IV CONSTRUCTION STAGING

DESIGNED BY:	DETAILED BY:	CHECKED BY:
BF	TS	

DRAWING DATE:	ACAD FILE:
8/6/02	PALLY2D1
PROJECT NO.:	CONTRACT:
PALL-GLENCOVE	

DRAWING: Y2D REVISION:

PHASE V			
PHASE	INJECTION WELLS	$KMNO_4$ (LBS)	WATER (GALS)
V	MW-3P, 4P, 4PI, HORIZONTAL WELL	16,400	132,000

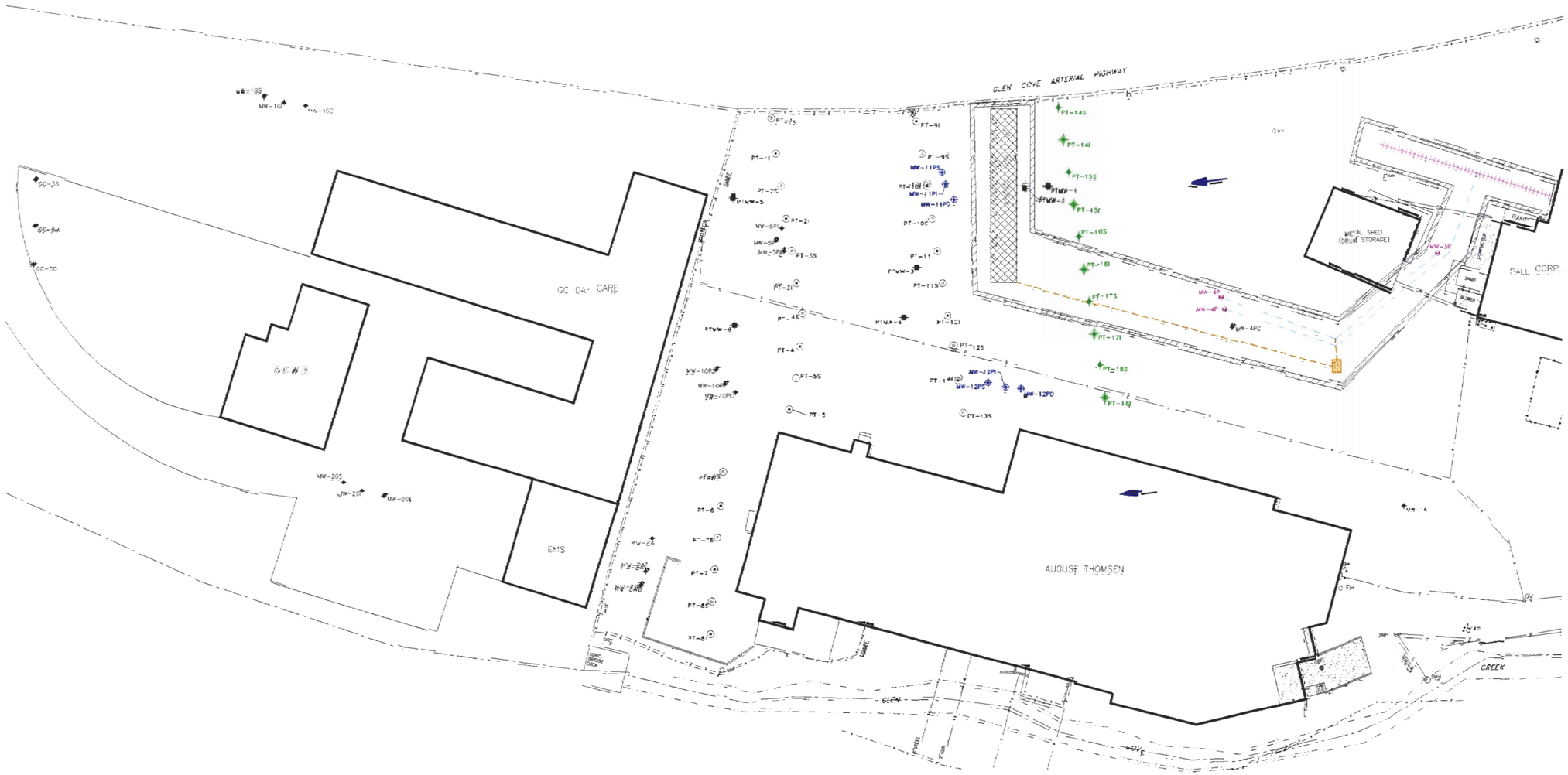
NOTE

A) INJECTION RATE: 10 GPM (PER WELL) OF 2% $KMNO_4$ SOLUTION

B) PROJECTED DURATION OF PHASE I INJECTION EVENT IS ONE WEEK.

C) SEE TABLE 2 OF IN-SITU CHEMICAL OXIDATION PILOT TEST DESIGN REPORT FOR COMPLETE DESCRIPTION OF INJECTION WELLS, MONITORING WELLS, AND FIELD SCREENING LOCATIONS.

D) SEE TABLE 3 OF IN-SITU CHEMICAL OXIDATION PILOT TEST DESIGN REPORT FOR FREQUENCY, DURATION, AND DETAILS OF MONITORING PROGRAM.



NO.	DATE	BY	REVISION

LEGEND

- NEW SHALLOW POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 5'-25' BGS)
- NEW INTERMEDIATE POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 35'-55' BGS)
- NEW MONITORING WELL COUPLET USED FOR MONITORING INJECTION EVENT (SCREEN: 3'-13' BGS, SCREEN: 45'-55' BGS)
- EXISTING MONITORING WELL GROUP USED FOR MONITORING INJECTION EVENT (SHALLOW/INTERMEDIATE/DEEP)
- NEW SHALLOW INJECTION WELL USED FOR MONITORING INJECTION EVENT DURING PHASE V
- NEW INTERMEDIATE INJECTION WELL USED FOR MONITORING INJECTION EVENT DURING PHASE V
- EXISTING HORIZONTAL WELL TO BE USED AS INJECTION WELL (PHASE V)
- EXISTING MONITORING WELL TO BE USED AS INJECTION WELL (PHASE V)
- NEW INJECTIONS WELLS NOT USED DURING PHASE V
- NEW MONITORING WELL COUPLET NOT USED DURING PHASE V
- INJECTION SYSTEM SKID (PORTABLE)
- PERMANGANATE SOLUTION MIXING EQUIPMENT AREA
- CONSTRUCTION AREA
- SCH 40 PVC PIPE
- FLEXIBLE HOSE
- PROPERTY LINE
- GROUNDWATER FLOW DIRECTION
- EXISTING MONITORING WELL
- UTILITY POLE
- FIRE HYDRANT
- CATCH BASIN
- WATER VALVE
- GAS VALVE
- SEWER MANHOLE
- MANHOLE
- UNDERGROUND ELECTRIC LINE
- UNDERGROUND TELEPHONE LINE
- SANITARY SEWER
- UNDERGROUND GAS LINE
- UNDERGROUND WATER LINE
- OVERHEAD WIRE

GRAPHIC SCALE
0 25 50
1"=25'

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

STATE OF NEW YORK DANIEL J. SZYMANSKI 073173 LICENSED PROFESSIONAL ENGINEER 8/9/02

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PALL CORPORATION PILOT TEST

30 SEA CLIFF AVENUE
GLEN COVE, NEW YORK

PHASE V CONSTRUCTION STAGING

DESIGNED BY:	DETAILED BY:	CHECKED BY:
BF	TS	
DRAWING DATE: 8/6/02		ACAD FILE: PALLY2E1
PROJECT NO.: PALL-GLENCOVE		CONTRACT:
DRAWING: Y2E		REVISION:

ONE-LINE DIAGRAM SYMBOLS

- CIRCUIT AND EQUIPMENT INSTALLED BY THIS CONTRACT
- EQUIPMENT ENCLOSURE
- CONTROL OR INTERLOCK CIRCUIT
- CONNECTION
- MOLDED CASE CIRCUIT BREAKER
- FUSE
- FUSED DISCONNECT SWITCH
- FULL VOLTAGE, NON-REVERSING (FVNR) MAGNETIC MOTOR STARTER
- MANUAL MOTOR STARTER
- AMMETER SWITCH (AS)
- VOLTMETER SWITCH (VS)
- AMMETER (A)
- VOLTMETER (V)
- RECEPTACLE-CLASS I, DIVISION 1, GROUPS C, D
- FUSED POTENTIAL TRANSFORMERS
- CURRENT TRANSFORMER
- POWER TRANSFORMER
- LIGHTNING OR SURGE ARRESTER
- GROUND CONNECTION
- WATT-HOUR METER SOCKET. METER FURNISHED BY UTILITY. (WHM)
- MOTOR - NUMBER INDICATES HP (5)

PLAN SYMBOLS

- NEW CONSTRUCTION
- EXISTING CONSTRUCTION
- EXISTING CONSTRUCTION TO BE REMOVED
- CONDUIT EXPOSED
- CONDUIT CONCEALED IN WALL CEILING OR HIDDEN FROM VIEW
- CONDUIT CONCEALED IN FLOOR OR UNDERGROUND
- FLEXIBLE CONDUIT (LIQUIDTIGHT)
- GROUND CABLE
- BOLTED GROUND CONNECTION
- WELDED GROUND CONNECTION
- GROUND ROD (G)
- HOMERUN. ARROWHEADS INDICATE NUMBER OF CIRCUITS
- CONDUIT TURNING UP
- CONDUIT TURNING DOWN
- CONDUIT WITH BUSHING
- CONDUIT TERMINATED OR CAPPED
- POWER PANEL-480V, 3ø
- LIGHTING PANEL-120/240V, 1ø OR 208/120V, 3ø
- DISCONNECT (SAFETY) SWITCH
- MANUAL MOTOR STARTER (MS)
- MAGNETIC MOTOR STARTER
- COMBINATION MAGNETIC MOTOR STARTER
- MOTOR-NUMBER INDICATES HP (5)
- PULLBOX (P)
- JUNCTION BOX (J)
- EXIT LIGHT
- L-1 FLUORESCENT LUMINAIRE TYPE L-1
- L-1 INCANDESCENT OR H.I.D. LUMINAIRE TYPE L-1
- EMERGENCY LIGHTING UNIT
- EMERGENCY FLUORESCENT LIGHTING FIXTURE
- DUPLEX RECEPTACLE WP-WEATHERPROOF GFCI-GROUND FAULT CIRCUIT INTERRUPTER
- RECEPTACLE-CLASS I, DIVISION 1, GROUPS C, D
- THERMOSTAT (T)
- S SINGLE POLE SWITCH
- S3 THREE-WAY SWITCH
- S4 FOUR-WAY SWITCH

NO.	DATE	BY	REVISION

NOTES:

1) REFER TO THE PIPING & INSTRUMENTATION DIAGRAM LEGEND, DRAWING P1, FOR RELATED SYMBOLS AND DESIGNATIONS.

SCHEMATIC DIAGRAM SYMBOLS

- TERMINAL
- CONDUCTOR CONNECTION
- NO CONNECTION
- GROUND
- CONTACT NORMALLY OPEN (NO)
- CONTACT NORMALLY CLOSED (NC)
- SWITCH
- SELECTOR SWITCH
- PUSHBUTTON-NORMALLY OPEN MOMENTARY
- PUSHBUTTON-NORMALLY CLOSED MOMENTARY
- PRESSURE OR VACUUM SWITCH-CLOSES WITH INCREASING PRESSURE OR DECREASING VACUUM
- PRESSURE OR VACUUM SWITCH-OPENS WITH INCREASING PRESSURE OR DECREASING VACUUM
- LIMIT SWITCH NO
- LIMIT SWITCH NO-HELD CLOSED
- LIMIT SWITCH NC
- LIMIT SWITCH NC-HELD OPEN
- NO TIME DELAY CONTACT. TIME DELAY CLOSING AFTER ENERGIZATION
- NC TIME DELAY CONTACT. TIME DELAY OPENING AFTER ENERGIZATION
- NO TIME DELAY CONTACT. TIME DELAY OPENING AFTER DE-ENERGIZATION
- NC TIME DELAY CONTACT. TIME DELAY CLOSING AFTER DE-ENERGIZATION
- MOTOR STARTER COIL (M)
- RELAY COIL
- INDICATING LIGHT-COLOR INDICATED (G)
  - A-AMBER
  - BL-BLUE
  - G-GREEN
  - R-RED
  - Y-YELLOW
  - W-WHITE
- FLOW SWITCH-OPENS WITH INCREASING FLOW
- FLOW SWITCH-CLOSES WITH INCREASING FLOW
- LIQUID LEVEL SWITCH-CLOSES ON RISING LEVEL
- LIQUID LEVEL SWITCH-OPENS ON RISING LEVEL
- TEMPERATURE SWITCH-CLOSES ON RISING TEMPERATURES
- TEMPERATURE SWITCH-OPENS ON RISING TEMPERATURES
- SOLENOID VALVE COIL
- 3 OL THERMAL OVERLOAD RELAY CONTACT NUMBER INDICATES NUMBER OF CONTACTS
- FUSE
- CONTROL POWER TRANSFORMER (CPT)
- H HORN
- B BELL

GENERAL ABBREVIATIONS

A, AUTO	AUTOMATIC	H	HAND	PLC	PROGRAMMABLE LOGIC CONTROLLER
ACK	ACKNOWLEDGE	HI	HIGH	REM	REMOTE
AFF	ABOVE FINISH FLOOR	HS	HIGH SPEED	REV	REVERSE
AFG	ABOVE FINISH GRADE	IL	INDICATING LIGHT	SOL	SOLENOID (OTHER THAN VALVE)
BC	BARE COPPER	INST	INSTANTANEOUS	SP	SPARE
C	CONDUIT	L	LOW	SS	SELECTOR SWITCH
CB	CIRCUIT BREAKER	LOC	LOCAL	SV	SOLENOID VALVE
CL	CLOSE	LS	LOW SPEED	T, T-STAT	THERMOSTAT
CPT	CONTROL POWER TRANSFORMER	MAN	MANUAL	TDAE	TIME DELAY AFTER ENERGIZATION
CR	CONTROL RELAY	MCC	MOTOR CONTROL CENTER	TDAD	TIME DELAY AFTER DE-ENERGIZATION
CS	CONTROL SWITCH	NC	NORMALLY CLOSED	TDR	TIME DELAY RELAY
CT	CURRENT TRANSFORMER	NL	NIGHT LIGHT (UNSWITCHED FIXTURE)	TEMP	TEMPERATURE
DWG	DRAWING	NO	NORMALLY OPEN	TMR	TIMER
ETM	ELAPSED TIME METER	O	OFF	WP	WEATHERPROOF
FU	FUSE	OL	THERMAL OVERLOAD RELAY	XFMR	TRANSFORMER
FWD	FORWARD	OP	OPEN	XP	EXPLOSIONPROOF-CLASS I, DIVISION I, GROUPS C, D
GND	GROUND	PB	PUSHBUTTON		

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

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PALL CORPORATION PILOT TEST

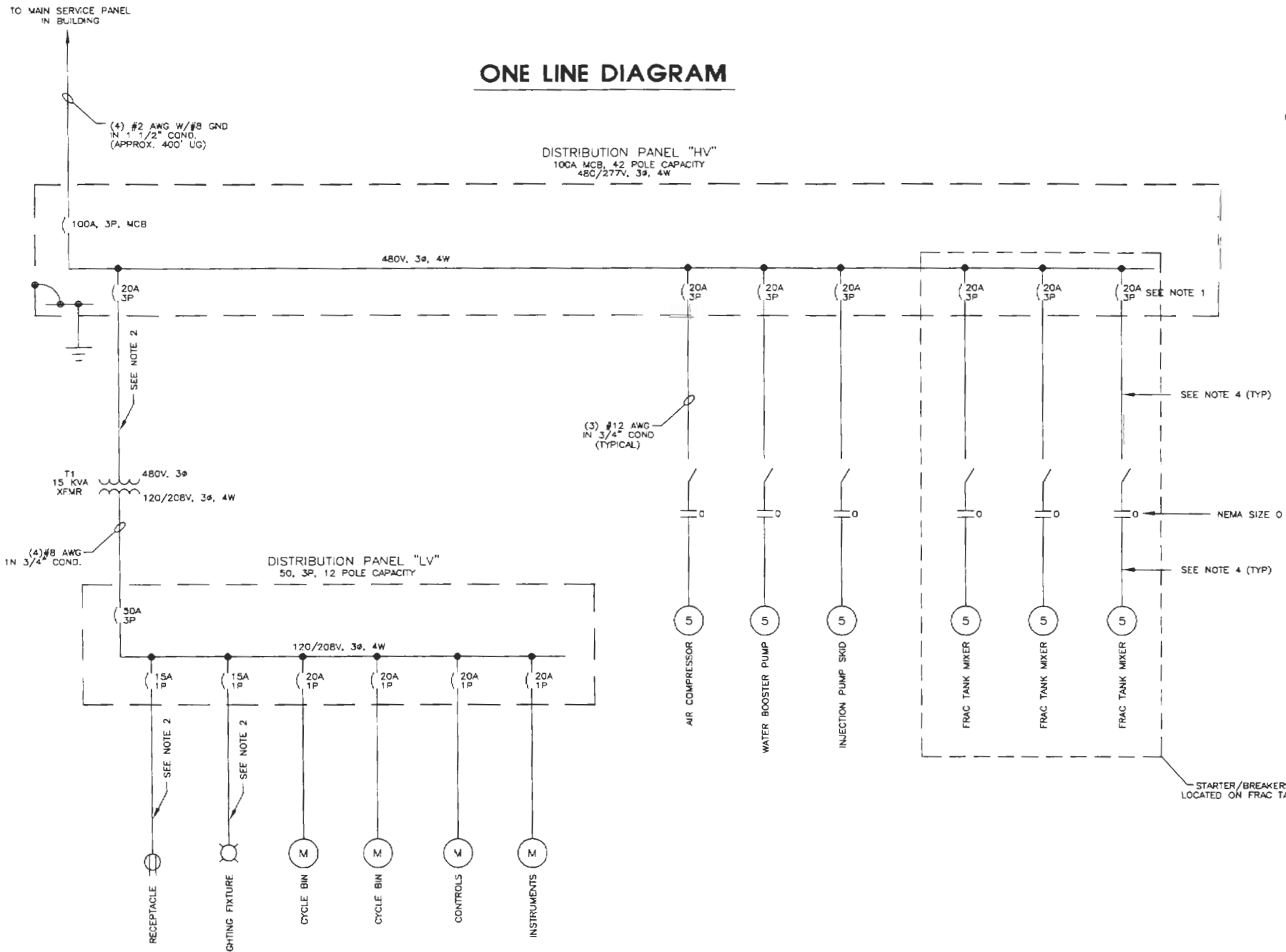
30 SEA CLIFF AVENUE
GLEN COVE, NEW YORK

ELECTRICAL LEGEND

DESIGNED BY:	DETAILED BY:	CHECKED BY:
DJS	TRS	

DATE: 3/13/02	FILE: PALL-E0
PROJECT NO.: PALL-GLENCOVE	CONTRACT:
DRAWING: E0	REVISION:

ONE LINE DIAGRAM



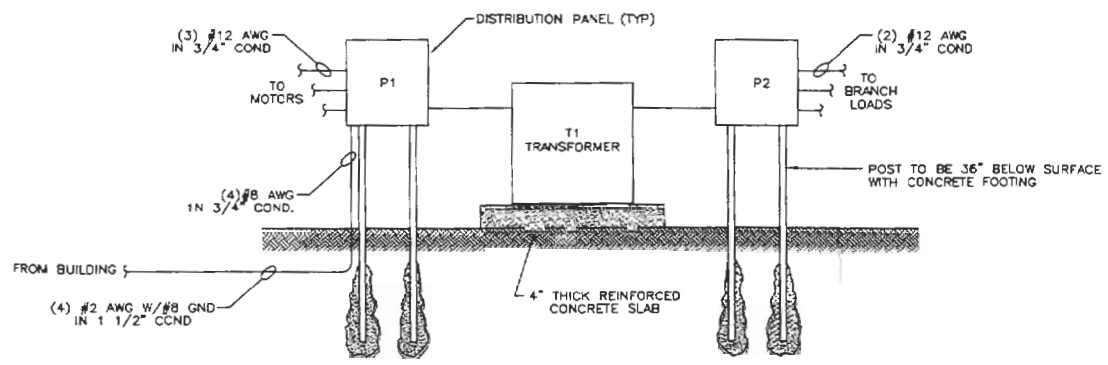
NOTES:

1) SIZE OF CIRCUIT BREAKER CHANGES WITH MOTOR HORSEPOWER, AND SERVICE FACTOR.
2) REFER TO ARTICLE 430 OF THE NEC FOR MOTOR CONDUCTIVE SIZING.
3) REFER TO THE MOTOR WIRING SCHEMATICS. SELECT OVERLOAD DEVICES FROM THE MOTOR NAMEPLATE FULL LOAD CURRENT AND SERVICE FACTOR. REFERT TO THE MOTOR STARTER MANUFACTURER'S CATALOG.
4) HARDWIRE TO THE MOTOR TERMINAL BOX. WIRING TO MOTOR TERMINAL BOX MUST INCLUDE GROUNDING CONDUCTER.
5) GROUND PER SECTION 250-24-A OF THE NEC, IN ADDITION TO THE GROUNDING CONDUCTOR FROM THE MAIN SERVICE PANEL.
6) INSTALL (1) 120V GFCI RECEPTACLE NEAR THE SERVICE PANEL.
7) THE SUBPANEL, ITS MAIN CIRCUIT BREAKER AND THE MAIN SERVICE PANEL MUST HAVE THE SAME SHORT CIRCUIT CURRENT INTERRUPTING CAPACITY.

NOTE:
ELECTRICAL GENERATOR MAY BE USED INSTEAD OF HARD WIRED POWER SUPPLY FROM BUILDING.

ELECTRICAL EQUIPMENT ELEVATION

(NOT TO SCALE)



NO.	DATE	BY	REVISION

TRANSFORMER
NORMALLY OPEN CONTACT
SWITCH
(5) MOTOR (# INDICATES HORSEPOWER)
RECEPTACLE
LIGHT
GROUND

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

ENVIRO-SCIENCES, INC.
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PALL CORPORATION PILOT TEST

30 SEA CLIFF AVENUE GLEN COVE, NEW YORK

ONE LINE DIAGRAM

DESIGNED BY:	DETAILED BY:	CHECKED BY:
BF	TS	

DRAWING DATE: 8/6/02	ACAD FILE: PALLE1
PROJECT NO.: MT&E - PALL	CONTRACT:
DRAWING:	REVISION:

E1

VALVE AND PIPING SYMBOLS

- GLOBE VALVE
- GATE VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- PLUG VALVE
- 3-WAY VALVE
- ANGLE VALVE
- RELIEF OR SAFETY VALVE
- DIAPHRAGM VALVE
- BALL VALVE
- GLOBE VALVE
- SELF-CONTAINED PRESSURE REGULATING VALVE W/RELIEF
- KNIFE GATE VALVE
- BP BACKFLOW PREVENTER
- NO NORMALLY OPEN
- NC NORMALLY CLOSED
- SP SAMPLE PORT
- FLEXIBLE HOSE
- BASKET TYPE STRAINER
- Y-TYPE STRAINER
- DUPLEX STRAINER
- SLEEVE COUPLING (SC)
- FLOOR DRAIN
- EQUIPMENT DRAIN
- CLEANOUT (CO)
- REMOVABLE PLUG
- REMOVABLE CAP
- BF BLIND FLANGE
- EXHAUST TO ATMOSPHERE (INSIDE)
- EXHAUST TO ATMOSPHERE (OUTSIDE)
- REDUCER
- UNION
- QUICK DISCONNECT COUPLING
- GAUGE SEAL
- DAMPER

VALVE OPERATOR SYMBOLS

- S SOLENOID
- M MOTOR, ELECTRIC
- DIAPHRAGM
- DIAPHRAGM WITH POSITIONER
- HANDWHEEL OR LEVER
- CHAINWHEEL

PRIMARY ELEMENT SYMBOLS - FLOW

- ORIFICE PLATE
- PITOT TUBE
- AVERAGING PITOT TUBE
- VENTURI OR FLOW TUBE
- TOTALIZING FLOWMETER
- FLUME
- WEIR
- TURBINE OR PROPELLOR TYPE METER
- MAGNETIC FLOW METER
- ROTAMETER

EQUIPMENT SYMBOLS

- SUBMERSIBLE PUMP
- PUMP
- PNEUMATIC DIAPHRAGM PUMP
- BLOWER
- AIR COMPRESSOR

GENERAL INSTRUMENT SYMBOLS

ONE VARIABLE	TWO VARIABLES	
○	○○	LOCALLY MOUNTED
⊖	⊖⊖	PANEL MOUNTED
⊖	⊖⊖	REAR-OF-PANEL MOUNTED
I		INTERLOCK
P		PURGE

LINE SYMBOLS

- PROCESS PIPES OR CHANNELS
- CONNECTION TO PROCESS, MECHANICAL LINK OR INSTRUMENT SUPPLY
- PNEUMATIC SIGNAL
- ELECTRIC SIGNAL
- CAPILLARY TUBING (FILLED SYSTEM)
- HYDRAULIC SIGNAL
- ELECTROMAGNETIC OR SONIC SIGNAL NO WIRING OR TUBING

INSTRUMENT IDENTIFICATION TABLE

	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER FLAME				
C	CONDUCTIVITY			CONTROL	
D	DENSITY (SP. GR.)	DIFFERENTIAL			
E	VOLTAGE		PRIMARY ELEMENT		
F	FLOW RATE	RATIO			
G	GAUGING (DIMENSIONAL)		GLASS		
H	HAND (MANUAL)				HIGH
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME OR SCHEDULE			CONTROL STATION	
L	LEVEL		LIGHT (PILOT)		LOW
M	MOISTURE OR HUMIDITY				MIDDLE
N					
O			ORIFICE		
P	PRESSURE OR VACUUM		POINT (TEST)		
Q	QUANT. OR EVENT	INTEGRATE			
R	RADIOACTIVITY		RECORD OR PRINT		
S	SPEED OR FREQ.	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMIT	
U	MULTIVARIABLE		MULTIFUNCTION		
V	VISCOSITY			VALVE OR DAMPER	
W	WEIGHT OR FORCE		WELL		
X	UNCLASSIFIED		UNCLASSIFIED		
Y				RELAY OR COMPUTE	
Z	POSITION			DRIVE, ACTUATE	

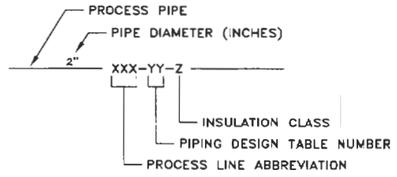
PROCESS LINE ABBREVIATIONS

AIR	AIR, ATMOSPHERIC PRESSURE
BW	BACKWASH
CA	COMPRESSED AIR
CGW	CONTAMINATED GROUNDWATER
D	DRAIN
EFF	EFFLUENT
EXH	EXHAUST
GW	GROUNDWATER
NPW	NON-POTABLE WATER
P	PRODUCT
PW	POTABLE WATER
S	SANITARY
SL	SLUDGE
SP	SAMPLE PORT
SS	STORM SEWER
TF	TOTAL FLUIDS
V	VENT
VAP	VAPOR

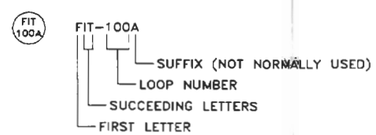
PIPING MATERIAL IDENTIFICATION

CPVC	CHLORINATED POLYVINYL CHLORIDE
CSP	CARBON STEEL PIPE
COP	COPPER
CMP	CORRUGATED METAL PIPE
CIP	CAST IRON PIPE
DIP	DUCTILE IRON PIPE
GAL	GALVANIZED STEEL PIPE
PE	POLYETHYLENE PIPE
PP	POLYPROPYLENE PIPE
PVC	POLYVINYL CHLORIDE PIPE
RCP	REINFORCED CONCRETE PIPE
RUB	RUBBER HOSE
SS	STAINLESS STEEL PIPE
VCP	VITRIFIED CLAY PIPE

PROCESS PIPING IDENTIFICATION



INSTRUMENT IDENTIFICATION



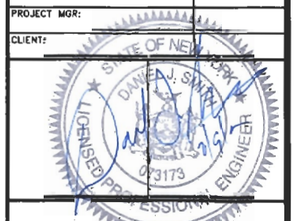
FUNCTION ABBREVIATIONS

DO	DISSOLVED OXYGEN	OC	OPEN-CLOSE
FC	FAIL CLOSED	OO	ON-OFF (MAINTAINED)
FI	FAIL INDETERMINATE	ORP	OXIDATION REDUCTION POTENTIAL
FL	FAIL LOCKED	OSC	OPEN-STOP-CLOSE (MOMENTARY)
FO	FAIL OPEN	SS	START-STOP (MOMENTARY)
HOA	HAND-OFF-AUTOMATIC	>	HIGH SELECT
I/I	CURRENT-TO-CURRENT	<	LOW SELECT
I/P	CURRENT-TO-PNEUMATIC	√	SQUARE ROOT
LEL	LOWER EXPLOSIVE LIMIT	Σ	ADD OR TOTALIZE
LR	LOCAL-REMOTE		

NO.	DATE	BY	REVISION

APPROVALS

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	



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PALL CORPORATION PILOT TEST

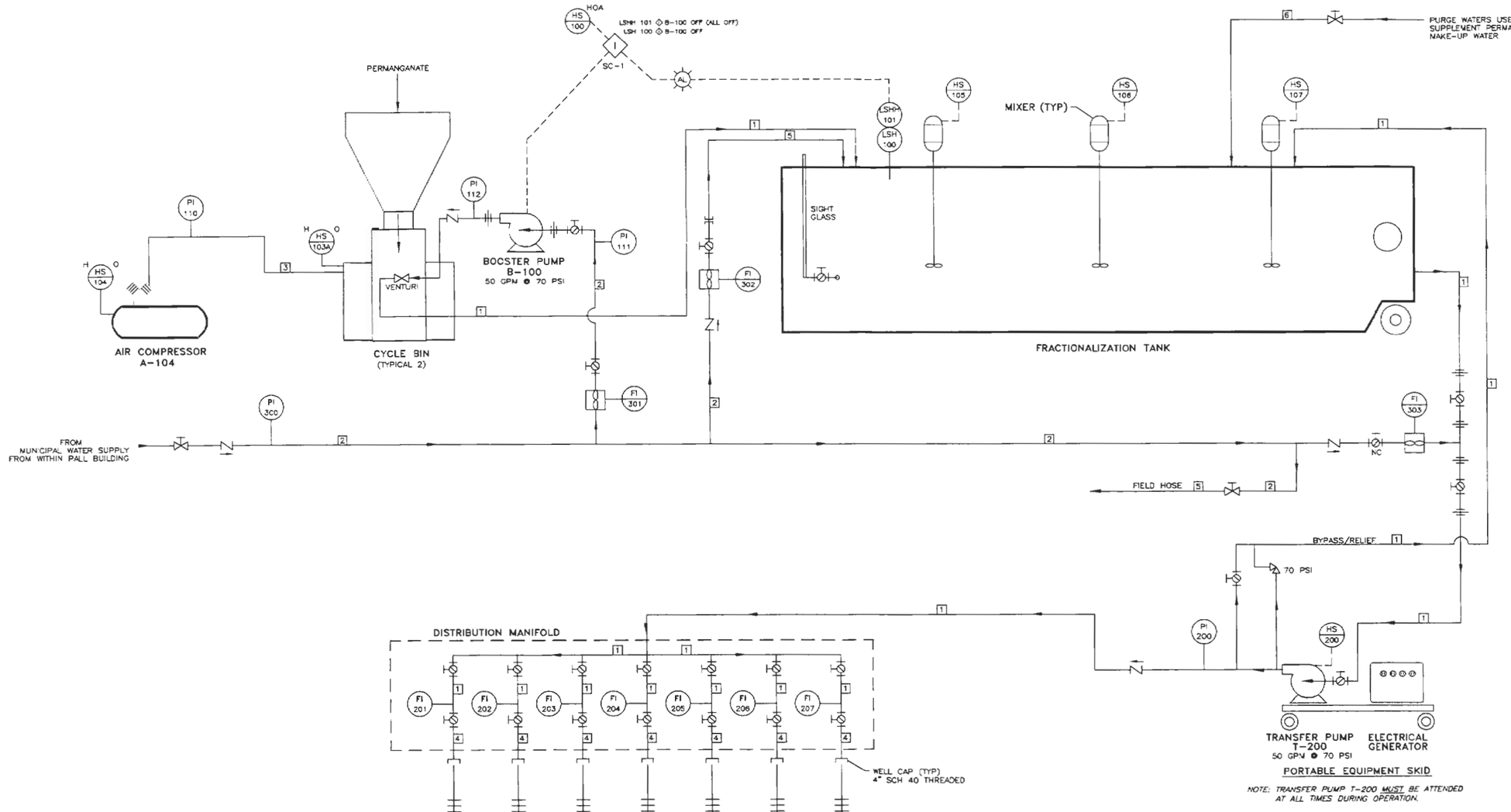
30 SEA CLIFF AVENUE
GLEN COVE, NEW YORK

PIPING & INSTRUMENTATION DIAGRAM LEGEND

DESIGNED BY:	DETAILED BY:	CHECKED BY:
DJS	TRS	

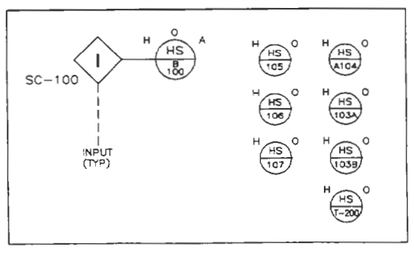
DATE: 3/13/02	FILE: PALL-P0
PROJECT NO.: PALL-GLENCOVE	CONTRACT: ????
DRAWING:	REVISION:

P0



NOTE: TRANSFER PUMP T-200 MUST BE ATTENDED AT ALL TIMES DURING OPERATION.

SC-100
SYSTEM CONTROL PANEL



TAG	DESCRIPTION	SIZE	MATERIAL
1	PERMANGANATE SOLUTION	2"	PVC SCH 40
2	DOMESTIC WATER	2"	PVC SCH 40
3	COMPRESSED AIR		FLEX HOSE
4	PERMANGANATE SOLUTION	1"	FLEX HOSE
5	DOMESTIC WATER	1"	FLEX HOSE
6	PURGE WATER	1"	FLEX HOSE

NO.	DATE	BY	REVISION

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

STATE OF NEW YORK
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PALL CORPORATION PILOT TEST

30 SEA CLIFF AVENUE
GLEN COVE, NEW YORK

PIPING & INSTRUMENTATION DIAGRAM

DESIGNED BY:	DETAILED BY:	CHECKED BY:
BF	TS	

DRAWING DATE:	ACAD FILE:
8/6/02	PALLPMD1
PROJECT NO.: PALL-GLEN COVE	CONTRACT:
DRAWING:	REVISION:
P1	

Permanganate Injection Design Calculations for Pilot Test

1 Permanganate Demand for Full-Scale Remediation:

Calculation Basis:	Length (L):	225 ft.	Soil Bulk Density (ρ):		1.35 kg/l
	Width (W):	160 ft.	Porosity (P_e):		0.30
	Depth (D):	40 ft.	Clean SOD for KMnO4 (SOD_s):		4.00 g/kg
			Density of Water (ρ_w):		62.40 #/ft^3
			Desired Makeup Solution (wt %):		2.0%

Volume of Soil (V) = L x W x D
= 225 x 160 x 40 Metric Conversion
= 1,440,000 Cu. Ft. = 40,450 M^3
= 40,449,600 L

Pore Volume = V x P_e
= 1,440,000 x 0.3 Metric Conversion
= 432,000 Cu. Ft. = 12,135 M^3
= 26,956,800 lbs water = 12,134,880 L

Weight of Soil (WS) = ρ x V
= 1.35 x 40,449,600
= 54,606,960 kg

Mass (M_P) of KMnO4 Required = SOD_s x WS x / 1000 g/kg
= 4.00 x 54,606,960 / 1,000
= 218,428 kg KMnO4
= 481,119 lbs. KMnO4

Makeup Water for 2% Soln (M_W) = M_P / %Desired
= 481,119 / 2%
= 24,055,930 lbs water required.
= 2,898,305 gallons water

Effective in-situ Dosage = M_P / (M_{GW} + M_W)
= 481,119 / 26,956,800 + 24,055,930
= 0.94%
= Approximately 1%

Note: Groundwater demand is negligible because 4 g/kg SOD used in calculations is highly conservative.

2 Pilot Test Permanganate Demand (1 g KMnO4 / kg Soil Basis)

Calculation Basis:	Length (L):	225 ft.	Soil Bulk Density (ρ):	1.35	kg/l
	Width (W):	160 ft.	Porosity (P_e):	0.30	
	Depth (D):	40 ft.	Clean SOD for KMnO4 (SOD_s):	1.00	g/kg
			Density of Water (ρ_w):	62.40	#/ft^3
			Desired Makeup Solution (%):	2.00%	

Volume of Soil (V) = L x W x D
= 225 x 160 x 40 Metric Conversion
= 1,440,000 Cu. Ft. = 40,450 M^3
= 40,449,600 L

Pore Volume = V x P_e
= 1,440,000 x 0.3 Metric Conversion
= 432,000 Cu. Ft. = 12,135 M^3
= 26,956,800 lbs water = 12,134,880 L

Weight of Soil (WS) = ρ x V
= 1.35 x 40,449,600
= 54,606,960 kg

Mass (M_P) of KMnO4 Req'd - soil = SOD_s x WS x / 1000 g/kg
= 1.00 x 54,606,960 / 1,000
= 54,607 kg KMnO4
= 120,280 lbs. KMnO4

Mass (M_{PS}) of KMnO4 Req'd - gw = Pore Volume x SODs / 1000 g/kg
= 12,134,880 x 1.00 / 1,000
= 12,135 kg KMnO4
= 26,729 lbs. KMnO4

Total Mass of KMnO4 Req'd (M_{PT})= M_{PS} + M_P
= 120,280 + 26,729
= 147,008 lbs. KMnO4

Makeup Water for 2% Soln (M_W) = M_{PT} / %Desired
= 147,008 / 2%
= 7,350,423 lbs water required.
= 885,593 gallons water

3 Individual Injection Well Calculations

Calculation Basis:	Length (L):	225 ft.	Soil Bulk Density (ρ):	1.35	kg/l
	Width (W):	160 ft.	Porosity (P_e):	0.30	
	Depth (D):	40 ft.	Clean SOD for KMnO4 (SOD_s):	1.00	g/kg
	No. Wells:	36	Density of Water (ρ_w):	62.40	#/ft^3
	GPM	10	Desired Makeup Solution (%):	2.00%	

Mass of KMnO4 Per Well (M_{PW}) = M_{PT} / No. Wells
= 147,008 / 36
= 4,084 lbs KMnO4 per well (assumes same screened length)

Gallons of Water per Well (V_W) = M_W / No. Wells
= 7,350,423 / 36
= 204,178 lbs water per well (assumes same screened length)
= 24,600 gallons of water per well

Effective in-situ Dosage = M_{PT} / (M_{GW} + M_W)
= 147,008 / 26,956,800 + 7,350,423
= 0.43%

Duration of Injection Events = Gallons Soln. / Injection rate
= 24,600 / 10
= 2,460 minutes
= 5 days (at 8 hours per day)
per phase (approximate for 5 wells)

Add.Locations (MW-3,4, 4PI, & SVE) - Approximate Requirements:

Pounds of KMnO4 per well:	4,084	lbs KMnO4 per well
No Add'l Wells:	4	
Pounds of KMnO4 Req'd:	16,334	lbs KMnO4
Pounds of Water per well:	204,178	lbs water per well
No Add'l Wells:	4	
Pounds of KMnO4 Req'd:	816,714	lbs water

OVERVIEW OF MODEL

A generalized flow model was developed for the Pall site to aid in the design of a $KMnO_4$ injection scheme. The model allows for optimization of a well layout and subsequent injection rates. Additional information was needed to evaluate the placement of monitoring wells during the injection process. As a result, transport simulations were conducted using this "Box Model" to determine the extent of $KMnO_4$ travel in the subsurface before completely reacting with the native organic material and contaminates present in the ground. A decay rate (half-life) was calculated for $KMnO_4$ using field measurements and literature values. Simulations were conducted assuming the $KMnO_4$ would be injected into the ground at a maximum rate of 15 gpm for 5 days at each well during each injection phase. During the 5 day period the in-situ concentration at any well location was assumed to equal 1 g/L after ideal mixing based upon the amount of $KMnO_4$ injected. Results of this transport modeling were then plotted at 1, 5, and 20 days in order to see both the extent of movement during injection and the decline of the $KMnO_4$ (i.e., amount of reactant consumed) after the injection was ended. It should be noted, only one of the four clusters of wells (Phase I injection) were simulated to better understand the movement without the complexity of multiple injection lines. Similar reaction rates and flow patterns are likely for the remaining injection events.

MODEL SELECTION

Modeling was completed using MS-VMS, a well-documented MODFLOW (McDonald and Harbaugh, 1988) based model. This computer model is an enhanced version of MODFLOW developed by HydroGeologic, Inc. which couples groundwater flow and transport simulations into a single code. MS-VMS simulates groundwater flow in three dimensions using a block-centered, finite-difference approach. MS-VMS was selected for this job because of its ease of use, robust matrix solves, and its ability to couple the groundwater flow simulations with contaminant fate and transport.

MODEL SETUP

The model inputs can be broken down into two sections, groundwater flow and transport of $KMnO_4$. The following summarizes both sections.

Groundwater Flow Parameters:

1) Horizontal grid dimensions = 80 columns by 69 rows with 5 foot spacing.
2) Vertical Grid dimensions = 10 layer with 5 foot spacing.
3) Horizontal conductivity = 113 ft/day average for site and consistent with medium to fine sand (Freeze and Cherry, 1979).
4) Streams were simulated using standard MODFLOW river cells, and varied in stage consistent with topography.
5) Recharge was input as approximately 1 ft/yr.

6) Shallow well screens were placed in layers equal to 5 to 25 feet below ground surfaces. Each well pumping at 15 gpm maximum.
7) Intermediate well screens were placed in layers equal to 35 to 55 feet below ground surfaces. Each well pumping at 15 gpm maximum.

Transport Parameters:

1) Several studies have summarized the scaling of longitudinal dispersion with the distance of the contaminant transport (Gelhar and Collins, 1971). A value of 120 feet was maintained throughout the model as a reasonable assumption for the longitudinal dispersivity, based on the horizontal extent of the plume.
2) Transverse dispersivity was set equal to $1/10^{th}$ the longitudinal dispersivity.
3) Vertical dispersivity was set equal to $1/100^{th}$ the longitudinal dispersivity.
4) K_d, The chemical partition coefficient for $KMnO_4$ was set to 0 since $KMnO_4$ is not an organic compound and is presumed to stay in the liquid phase.

Injection Design Basis / Parameters:

$KMnO_4$ Makeup Soln. (injected into well): soln (wt%)	2% *$KMnO_4$* feed
$KMnO_4$ In-situ Conc. Pre-Reax. (Assuming "perfect" mixing):	1 g/L in-situ
Injection Rate of *KMnO4* Makeup Solution:	15 gpm / well
Total Pounds of *KMnO4* (solid – not solution) Injected at Each Well:	Approx. 4,100 lbs. pure *$KMnO_4$*

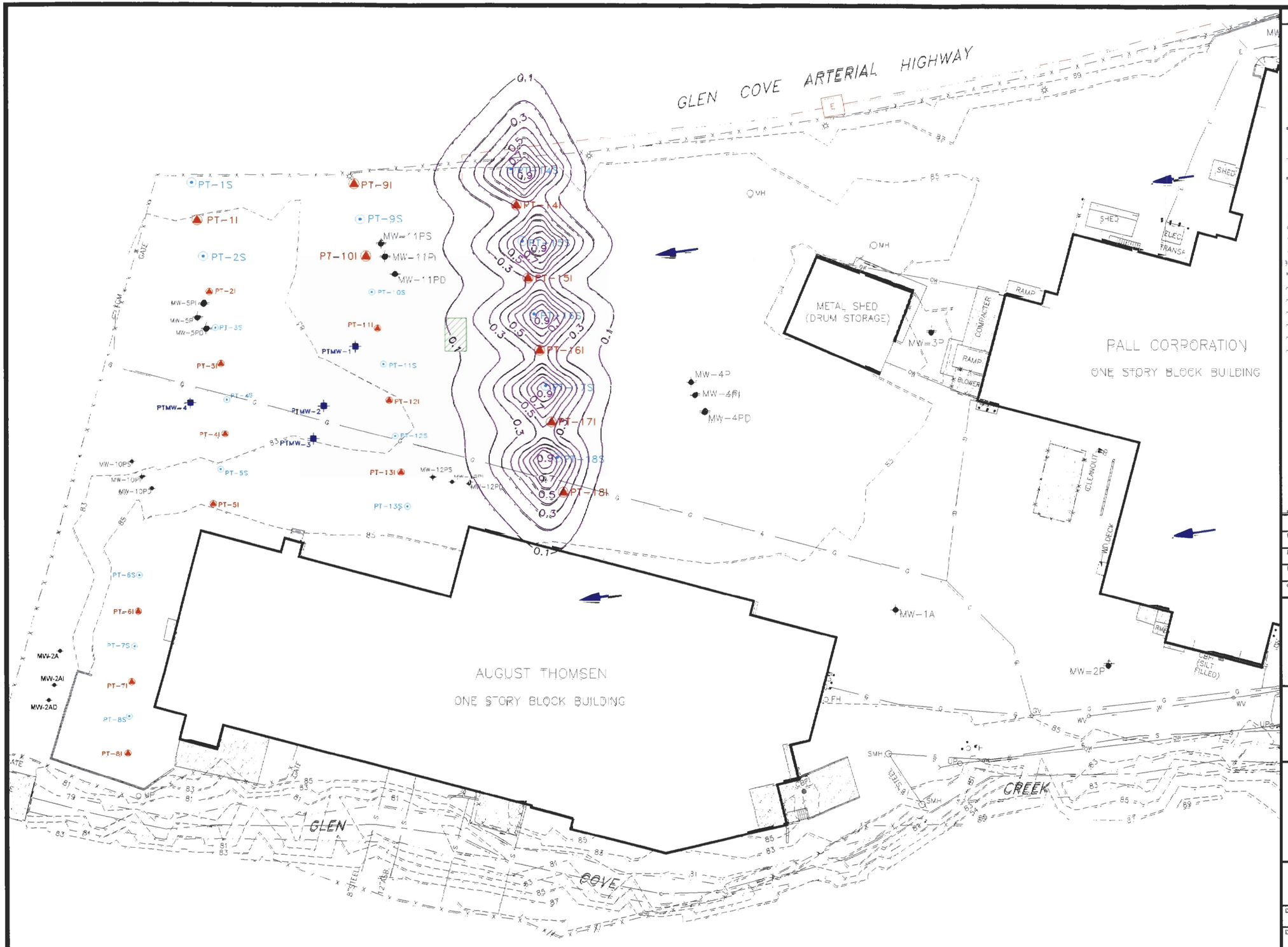
Chemical Reaction Stoichiometry:

$$4KMnO_4 + 3C_2Cl_4 + 4H_2O \rightarrow 6CO_2 + 4MnO_2 + 4K^+ + 12Cl^- + 8H^+$$

Rate Constant (from UCONN Literature):	$k_2=0.035 \pm 0.003 \frac{1}{M \cdot s}$ assumes pseudo first order
PCE Half-Life with *$KMnO_4$* Reax: (from UCONN):	202 minutes
Rate Equation (Pseudo First Order – from UCONN):	$-r_{PCE} = k_2$ [KMnO4] [PCE] Where [x] = *Molarity* of reactants
Rate Constant (from Carus Literature):	$k = 0.045 \frac{1}{M \cdot s}$ (assumes true first order)
PCE Half-Life with *$KMnO_4$* Reax. (from Carus):	257 minutes

MODELING RESULTS:

The modeling results are indicated in figures D-1 (1 days), D-2 (5 days), and D-3 (20 days). As indicated in the figures, the KMnO4 in solution in the aquifer decreases as both a function of time in the aquifer (i.e., dispersion) and the extent of reaction. Within 1 day, chlorinated organic concentrations within the immediate vicinity of the injection wells should begin to decline. By day 20, only a small residual of KMnO4 should remain and the reaction will have essentially gone to completion. The effective radius of influence of the injection well (i.e., the radial distance from the point of injection wherein the KMnO4 and chlorinated organic reactions are expected to go to completion) is expected to be approximately 30 to 40 feet in the center of the area of contamination.



NO.	DATE	BY	REVISION

LEGEND

- SHALLOW POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 5'-25' BGS)
- INTERMEDIATE POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 35'-55' BGS)
- MONITORING PROBE COUPLET (SCREEN: 3'-13' BGS; SCREEN: 45'-55' BGS)
- INJECTION SYSTEM SKID (PORTABLE, ASSUME 1 SKID TO BE RELOCATED AS NEEDED)
- GROUNDWATER FLOW DIRECTION
- NEW ELECTRIC/WATER HANDHOLE
- NEW UNDERGROUND ELECTRIC AND DOMESTIC WATER SERVICE
- KMnO4 CONCENTRATION LINE (g/l)
- EXISTING MONITORING WELL
- UP UTILITY POLE
- FH FIRE HYDRANT
- CB CATCH BASIN
- WV WATER VALVE
- GV GAS VALVE
- SMH SEWER MANHOLE
- MH MANHOLE
- —E— UNDERGROUND ELECTRIC LINE
- —T— UNDERGROUND TELEPHONE LINE
- —S— SANITARY SEWER
- —G— UNDERGROUND GAS LINE
- —W— UNDERGROUND WATER LINE
- —OW— OVERHEAD WIRE

NOTES

1) INJECTION WELL SPACING APPROX. 10 FEET (TOTAL OF 38 WELLS).
2) EXISTING MONITORING WELLS AVAILABLE FOR INJECTION MONITORING.
3) ACCESS TO AUGUST THOMSEN PRIPERTY IS POSSIBLE.

GRAPHIC SCALE
0 20 40
1" = 40'

SOURCE: FOCUSED REMEDIAL INVESTIGATION REPORT TAMS & GZA DATE: 4/98

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

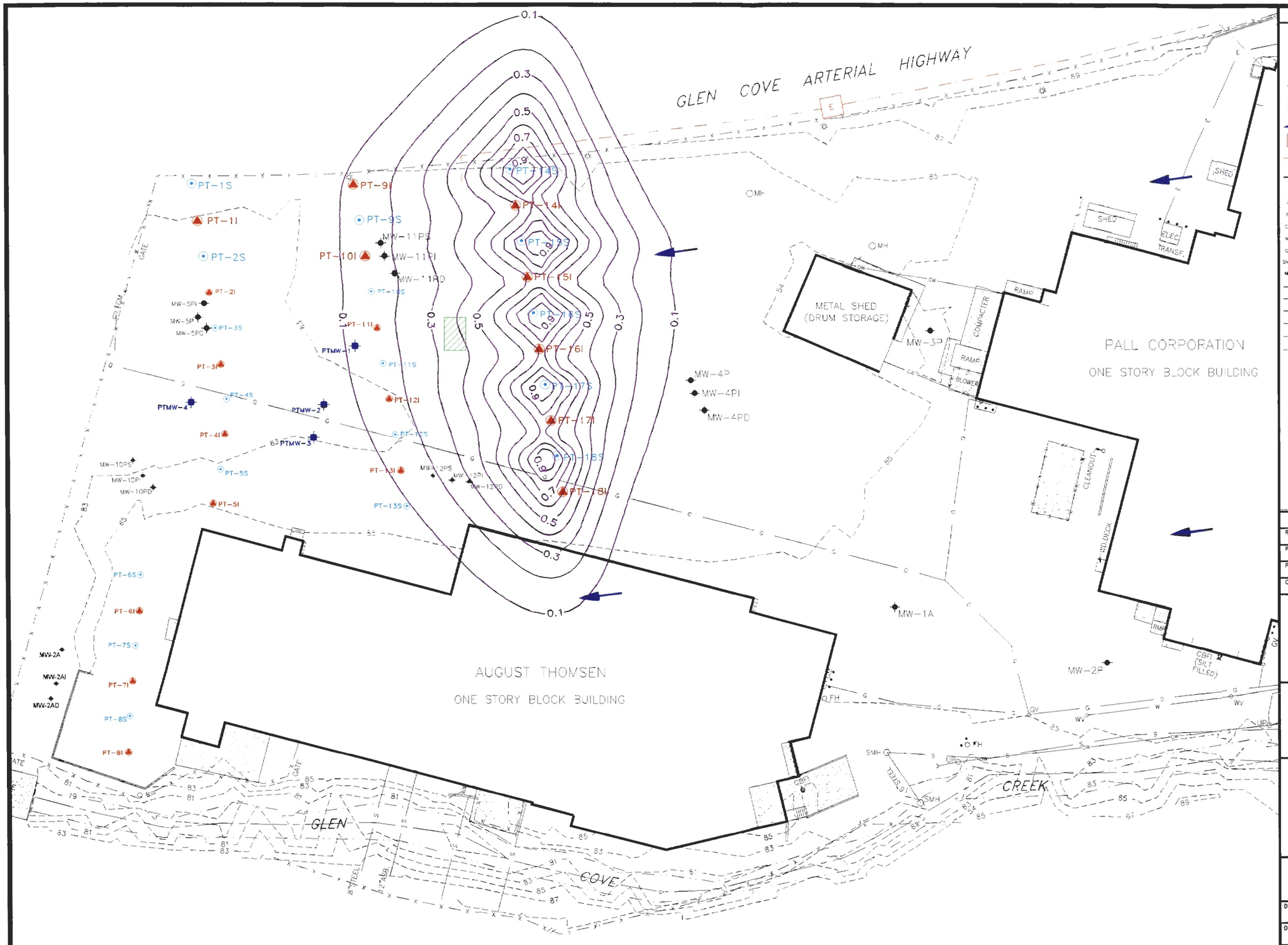
ENVIRO-SCIENCES, INC.
312 E. MAIN STREET
PATCHOGUE, N.Y. 11772
PHONE: (631) 207-9005

PALL CORPORATION

30 SEA CLIFF AVENUE
GLEN COVE, NEW YORK

SITE PLAN
KMnO4 LOCATION/CONCENTRATION AFTER
DAY 1 OF INJECTION • 15 gpm

DESIGNED BY:	DETAILED BY:	CHECKED BY:
SEE SOURCE	TS/DB	
DRAWING DATE: 8/8/02		ACAD FILE: Day1.dwg
PROJECT NO.: MT&E/PALL		CONTRACT:
DRAWING:		REVISION:



NO.	DATE	BY	REVISION

LEGEND

- SHALLOW POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 5'-25' BGS)
- INTERMEDIATE POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 35'-55' BGS)
- MONITORING PROBE COUPLET (SCREEN: 5'-13' BGS, SCREEN: 45'-55' BGS)
- INJECTION SYSTEM SKID (PORTABLE, ASSUME 1 SKID TO BE RELOCATED AS NEEDED)
- GROUNDWATER FLOW DIRECTION
- NEW ELECTRIC/WATER HANDHOLE
- NEW UNDERGROUND ELECTRIC AND DOMESTIC WATER SERVICE
- KMnO4 CONCENTRATION LINE (g/l)
- EXISTING MONITORING WELL
- UTILITY POLE
- FIRE HYDRANT
- CATCH BASIN
- WATER VALVE
- GAS VALVE
- SEWER MANHOLE
- MANHOLE
- —E— UNDERGROUND ELECTRIC LINE
- —T— UNDERGROUND TELEPHONE LINE
- —S— SANITARY SEWER
- —G— UNDERGROUND GAS LINE
- —W— UNDERGROUND WATER LINE
- —OW— OVERHEAD WIRE

NOTES

1) INJECTION WELL SPACING APPROX. 30 FEET (TOTAL OF 36 WELLS).
2) EXISTING MONITORING WELLS AVAILABLE FOR INJECTION MONITORING.
3) ACCESS TO AUGUST THOMSEN PRIPERTY IS POSSIBLE.

GRAPHIC SCALE
0 40 80
1"=40'

SOURCE: FOCUSED REMEDIAL INVESTIGATION REPORT TAMS & GZA DATE: 4/99

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

ENVIRO-SCIENCES, INC.
312 E. MAIN STREET
PATCHOGUE, N.Y. 11772
PHONE: (631) 207-9005

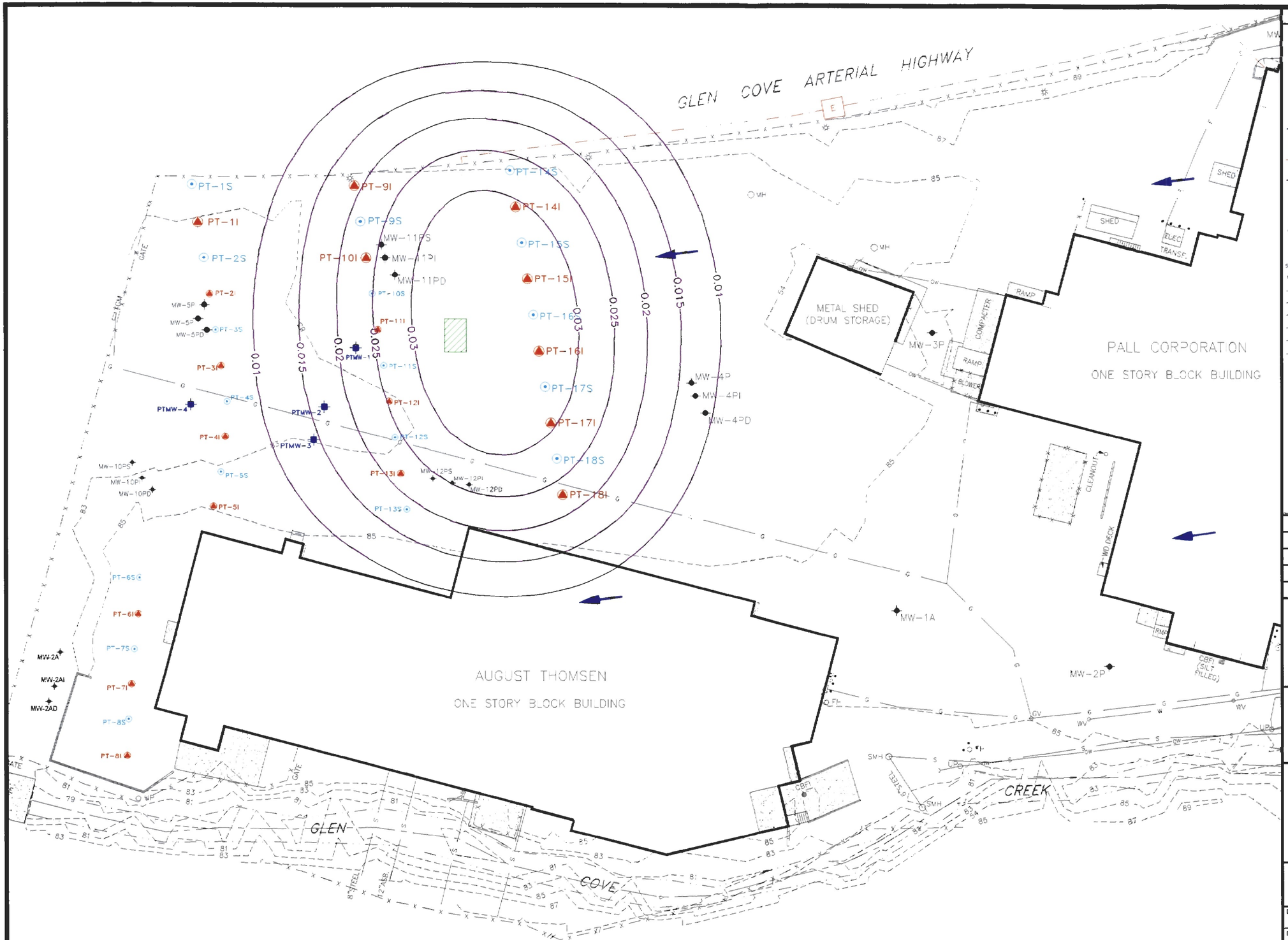
PALL CORPORATION

30 SEA CLIFF AVENUE
GLEN COVE, NEW YORK

SITE PLAN
KMnO4 LOCATION/CONCENTRATION AFTER DAY 5 OF INJECTION • 15 gpm

DESIGNED BY:	DETAILED BY:	CHECKED BY:
SEE SOURCE	TS/DB	

DRAWING DATE:	ACAD FILE:
8/8/02	Day5.dwg
PROJECT NO.:	CONTRACT:
MT&E/PALL	
DRAWING:	REVISION:



NO.	DATE	BY	REVISION

LEGEND

- SHALLOW POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 5'–25' BGS)
- INTERMEDIATE POTASSIUM PERMANGANATE INJECTION WELL (SCREEN: 35'–55' BGS)
- MONITORING PROBE COUPLET (SCREEN: 3'–13' BGS, SCREEN: 45'–55' BGS)
- INJECTION SYSTEM SKID (PORTABLE, ASSUME 1 SKID TO BE RELOCATED AS NEEDED)
- GROUNDWATER FLOW DIRECTION
- E — NEW ELECTRIC/WATER HANDHOLE
- NEW UNDERGROUND ELECTRIC AND DOMESTIC WATER SERVICE
- KMnO4 CONCENTRATION LINE (g/l)
- EXISTING MONITORING WELL
- UPO UTILITY POLE
- FHO FIRE HYDRANT
- CB CATCH BASIN
- WVO WATER VALVE
- GVO GAS VALVE
- SMHO SEWER MANHOLE
- MHO MANHOLE
- —E— UNDERGROUND ELECTRIC LINE
- —T— UNDERGROUND TELEPHONE LINE
- —S— SANITARY SEWER
- —G— UNDERGROUND GAS LINE
- —W— UNDERGROUND WATER LINE
- —OW— OVERHEAD WIRE

NOTES

1) *INJECTION WELL SPACING APPROX. 30 FEET (TOTAL OF 36 WELLS)*
2) *EXISTING MONITORING WELLS AVAILABLE FOR INJECTION MONITORING.*
3) *ACCESS TO AUGUST THOMSEN PRIPERTY IS POSSIBLE.*

GRAPHIC SCALE
0 40 80
1"=40'

SOURCE: FOCUSED REMEDIAL INVESTIGATION REPORT
TAMS & GZA
DATE: 4/99

SIGNATURE	DATE
REVIEW ENGR:	
PROJECT ENGR:	
PROJECT MGR:	
CLIENT:	

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PALL CORPORATION

30 SEA CLIFF AVENUE
GLEN COVE, NEW YORK

SITE PLAN
KMnO4 LOCATION/CONCENTRATION AFTER
DAY 20 (15 DAYS AFTER INJECTION)

DESIGNED BY:	DETAILED BY:	CHECKED BY:
SEE SOURCE	TS/DB	
DRAWING DATE: 8/8/02	ACAD FILE: Day20.dwg	
PROJECT NO.: MT&E/PALL	CONTRACT:	
DRAWING:	REVISION:	