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Soil Vapor Extraction Treatability Study

American Chemical Services NPL Site

Prepared for:

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TABLE OF CONTENTS

Executive Summary 1

Introduction and Background 2

1.0 TREATABILITY ANALYSIS AND DESIGN 2

Results and Summary 3

2.0 TASK 1 - SAMPLE ANALYSIS 3

3.0 Task 2 - Laboratory Soil Columns 5

4.0 Correlation Between Results of SVE and Bioventing Bench Scale Tests 18

5.0 Summary 21

Appendix A: Analytical Procedures

Appendix B: Vapor Phase Tables

Appendix C: Analytical Report from National Environmental Testing Laboratory

Executive Summary

The soil vapor extraction/bioventing treatability study for the American Chemical Services NPL Site produced evidence that a bioventing approach to the site may provide a mechanism for the removal and destruction of the majority of the contaminants present in the Off-Site Containment Area (OSCA) soils. In the experimental soil column amended with nutrients, the contaminants observed in the soil and vapor phase were consistently lower than the concentrations observed in either the non-nutrient amended soil or azide treated soil. Contaminant concentrations in the soil and vapor phase in the non-amended soils were substantially lower than the concentrations observed in soils which had been treated with azide to limit the biological activity. The azide treated soils simulated the physical process of vapor extraction (i.e. volatilization), while minimizing biological activity.

There was significant reductions in the contaminant concentrations in the nutrient amended and non-amended columns as compared to the azide treated column. The nutrient amended column demonstrated the greatest reduction in organic contamination. The concentrations of toluene, ethyl benzene, m- and p-xylene, phthalate esters, and 2,4-dimethylphenol were reduced by 77-99% when compared to the azide treated column. Naphthalene levels were reduced 40% in the amended column where compared to the levels in the azide treated. In addition, the non-amended column showed significant reductions when compared to the azide control. Moreover, the removal of semi-volatile contaminants, such as several of the phthalate esters present in the soils, occurred in the active soil columns.

The soil and vapor analysis indicated that greater removal of volatile and semi-volatile compounds can be accomplished through utilization of bioventing technology with nutrient amendment to enhance the biological activity. For the OSCA soils utilized in this study the concentrations of the majority of the organic compounds present were reduced more under either of the active columns. Within the active conditions, the nutrient amended soils demonstrated the greatest reduction in organic contamination. Analysis of the effluent streams from the vapor extraction systems indicated that biological activity within the soils can reduce the amount of material removed through vapor extraction due to biological removal prior to volatilization.

In addition, the only removal of semi-volatile contaminants, such as several of the phthalate esters present in the soils, occurred in the active soil columns. As stated previously, the extent of removal increased as the levels of available nutrients increased.

The clean-up criteria for all of the contaminants present were not met during the short duration of the treatability study. For biological systems dealing with complex mixtures of contaminants, six weeks is not sufficient time to provide complete mineralization of all of the organics. In several instances the biological systems reduced the contaminants to concentrations below the method detection limit without necessarily meeting the clean-up criteria. As illustrated with the American Chemical Services NPL OSCA soils, significant reductions in volatile and semi-volatile contaminants were accomplished in only six weeks with the minimal addition of nutrients and air. More complete control of nutrients, some of which were exhausted during the treatability study (i.e. orthophosphate), and pH could result in even greater efficiencies for the OSCA soils.

Introduction and Background

1.0 TREATABILITY ANALYSIS AND DESIGN

The treatability study, utilizing soils from American Chemical Services NPL Site, evaluated the microbiological, chemical, and physical site characteristics that are critical to successful bioremediation. One soil sample from the OSCA location was provided by Warzyn personnel. The sample was assumed to be representative of a zone with substantial volatile organic compounds (VOC) and semi-volatile organic compounds (SVOC) contamination. The testing plan included the following tasks: Sample Analysis (Task 1), operation of soil columns to model the *in-situ* bioremediation process (Task 2) and completion of a Final Report (Task 3). The six week time period for the soil column study provided a minimum duration required by the client and may not have been sufficient to provide completion of the biodegradation of the higher molecular weight contaminants present on the site. It is difficult to determine a precise time period which would be suitable for complete degradation of the higher weight contaminants. During the six week treatability period, a significant portion of the available time involved the acclimation and growth of the bacteria to an active (i.e. biodedradation) population. This also involves the microbial population's availability of oxygen due to relatively low air flow rates through the soil columns. In addition, optimization of the bioventing process (nutrient loading, air flows, etc.) would extend the levels of removal. Vapor phase analysis was conducted during the initial twenty-nine days of the study.

The focus of the testing plan was on the reduction of VOC and SVOC compounds under simulated soil vapor extraction (SVE) treatment conditions. The column effluent vapor streams were monitored to determine the amount of contamination removed by the SVE process. In addition to SVOC and VOC monitoring, the nutrient profiles for nitrogen and phosphorous were determined for the initial site samples and at the conclusion of the treatability study.

The treatment columns consisted of one control and two active conditions. Within the active columns one column received no additional ammonia (Non-amended) beyond the background concentration and the second active column was adjusted to provide approximately 300 mg NH_4/kg soil (Nutrient Amended). The amount of ammonia added to the column was based upon a carbon to nitrogen ratio of 100:10

with the carbon concentration determined during the initial Total Carbon analysis of the soil. The control column received only sodium azide, to limit bacterial growth, with no nutrient amendment (Azide Control). Each of the active and control columns utilized a humidified air delivery system.

The column soils were analyzed at time zero and at the final time point (February 25, 1993). The column soils were analyzed for bacterial cell counts, nutrients (ammonia and orthophosphate), and VOC and SVOC compounds.

Results and Summary

2.0 TASK 1 - INITIAL SAMPLE ANALYSIS

Site samples were shipped from the site by Warzyn to the VAPEX test laboratory, the Environmental Research Institute, in Connecticut. The OSCA sample was then subsampled and two one liter samples were transported to Envirogen on ice. Upon arrival, the samples were immediately refrigerated at 4°C until analyzed. Subsamples were removed and analyzed for nutrients and microbial cell counts. The remaining samples were maintained at 4°C until the soil column experiment was initiated.

Limited amounts of nutrients were observed in the soils. Ammonia concentrations averaged 62 mg/kg soil and orthophosphate concentrations were below the detection limit of 7 mg/kg soil. Microbial cell counts ranged between 1.4×10^5 - 3.0×10^6 colony forming units (CFU)/g soil. Soil pH was 6.8 which was acceptable for biological activity. The nutrient analysis indicated that the soils were amenable to biological activity if additional nutrients were supplied.

Total Carbon data was obtained from the American Chemical Services Site soils utilized by VAPEX and ENVIROGEN to conduct the vapor extraction and bioventing treatability tests for Warzyn. The method is based upon the standard soil analysis

technique defined in Methods of Soil Analysis[1]. The analysis was conducted utilizing a Dohrmann Model DC-190 Total Carbon Analyzer with the boat sampler option for solids. Manufacturer recommendations limit sample size to less than 40 mg. ENVIROGEN personnel utilized 20 mg samples for generation of the data included in Table 2.1. The amount of carbon dioxide released during combustion of the samples was considerably beyond the linear range of the instrument. Reductions in sample size to 10 and 5 mg did not bring the response within the linear range. We were unable to reduce the sample size below 5 mg because of the grain size of the material. We provide the data for your information but are unable to verify its accuracy.

Initial nutrient amendment calculations were based upon the data listed in the table. These values were used only for the expeditious determination of nutrient loading for the soil columns, and does not reflect contaminant removal efficiencies. Ammonia concentrations were increased by the addition of diammonium phosphate to provide a carbon to nitrogen ratio of 100:10 for the nutrient amended column. No nutrient amendments were made to the non-amended or azide control soils.

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[1]Methods of Soil Analysis, A. Page, ed.,Part 2, Chemical and Microbiological Properties, 2nd Edition, American Society of Agronomy, Inc. and Soil Science Society of America, Inc., 552-553, 1982.

Table 2.1 Total Carbon Analysis of Site Soils

SAMPLE	TOTAL CARBON (mg/kg)	STANDARD DEVIATION
ENVIROGEN SAMPLES		
Azide: Time 0	3088	875
Non-amended: Time 0	2254	790
Nutrient: Time 0	2377	241
Azide: Final	3802	602
Non-amended: Final	2877	1108
Nutrient: Final	2766	240
VAPEX SAMPLES		
Column I: Time 0	3495	875
Column II: Time 0	3930	145
Column III: Time 0	2896	600
Column I: Time Final	4926	587
Column II: Time Final	4593	225
Column III: Time Final	2442	496

3.0 TASK 2 - LABORATORY SOIL COLUMNS

Based on the positive indicators for biological activity observed during the Task 1 screening, three soil columns were designed and fabricated. The columns were designed to simulate the *in-situ* treatment proposed for full scale remediation. The azide control condition, minimizing biological activity was provided to simulate physical removal by volatilization.

Materials and Methods

The three soil columns were fabricated for continuous operation over the six week interval utilizing soil from the OSCA location. These columns consisted of one azide control column, one active column without nutrient amendment and one active column with additional nutrients (Table 3.1). The azide control column defined the

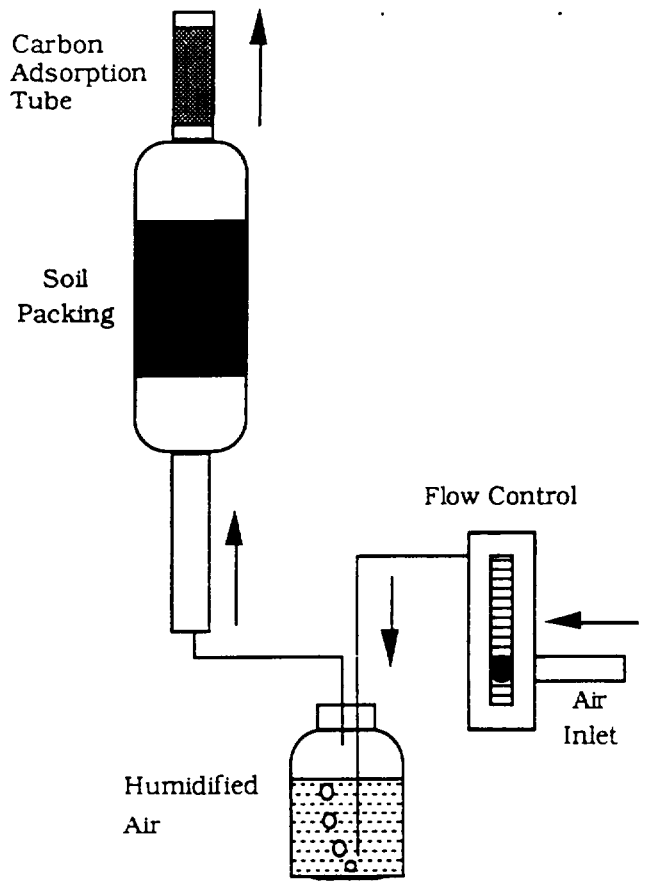
baseline contaminant removal accomplished by advection (physical stripping) alone. The differences observed between the control and the active columns defined the amount of biological activity which can be expected at the site. The efficacy of nutrient addition was determined through comparisons between active soil columns with and without nutrient addition. Initial total carbon analysis provided guidelines for biological degradation. Nutrients were amended to the soil to achieve a carbon to nitrogen to phosphorous ratio of 100:10:3. TOC analysis was utilized to provide general guidelines through analysis which could be completed within the first day and allow time assembly of the soil columns. All time zero samples were removed from the samples during column assembly to account for any volatile losses during handling.

Table 3.1 Soil Column Configurations

Configuration	Column additives
Nutrient Amended	Includes addition of ammonia and phosphate
No Nutrient Amendments	Air flow only - no nutrient addition
Control	Air flow - biological activity reduced by addition of sodium azide

Each column consisted of a 250 ml cylindrical glass separatory funnel which was adapted to hold soil without clogging the lower valve (Figure 3.1). A glass wool filter was fitted into the bottom of each column and the homogenized soil was packed above the glass wool to fill approximately 75% of the column volume. Air flow was upflow through the column and the flow rate was controlled at 5 ml/minute by a variable area flowmeter. The air was then bubbled through deionized water to humidify the air before entering the column. Carbon sorption tubes were fitted periodically to the outlet of the columns to quantify VOC and SVOC compounds in the off-gas.

Figure 3.1 Soil Column Schematic



Each soil was homogenized at a reduced temperature, to minimize volatile losses, prior to addition to the soil columns. The homogenization procedure consisted of handling the site soils in a stainless steel mixing bowl which was suspended above a bed of dry ice. The bowl had been pre-cooled and the samples were transferred directly from the 4°C storage area to the bowl. The soils for each treatment condition were handled individually in the following order to prevent cross-contamination:

1. Active - no additional nutrients;
2. Active - nutrient amended;
3. Control - azide treated.

Analytical samples were removed from the homogenized soil immediately before the addition of soil to each column. The soil samples were analyzed for VOC and SVOC content (EPA methods 8240 and 8270) by a certified laboratory, National Environmental Testing, Inc. In addition, biochemical parameters, including ammonia, orthophosphate, pH and bacterial enumerations were conducted on the initial soil samples by ENVIROGEN personnel. Soils from the three columns and the three vapor extraction columns operated by VAPEX were analyzed for total carbon by the combustion method.

During operation of the columns, the carbon adsorption tubes were connected and removed according to a predetermined schedule (Table 3.2). The off-gas was sample three times the first day, twice on the second day, and once on the third day. In addition, the column off-gas was analyzed at day 7, 14 and 29. The high concentration of volatile components in the soils required short collection periods before removal of the adsorbent tubes. Volatile organic compounds trapped on the adsorption tube packing were analyzed by GC-MS (Method detailed in Appendix A). The compounds were transferred to the GC-MS by utilization of Short Path Thermal Desorption. The technique passes carrier gas through the tube while rapidly heating the tube to elevated temperatures. Vinyl chloride and chloroethane were not included in the analysis due to instrument limitations-they eluted as part of the air peak and could not be detected or quantified.

The number of vapor samples provided a qualitative picture of the volatile contamination which could be removed utilizing the SVE technology. However, the limited number of time points collected during the study does not allow for precise integration of mass removal through volatilization. However, analysis of the

headspace samples provides a clear indication of vapor extractability and a rough order of magnitude for quantity removed by the SVE process.

Table 3.2 Soil Column Off-gas Collection Schedule

Day	Elapsed Time (Hr)	Collection Interval (Minutes)
1	0:15-0:30	15
1	1:45-2:00	15
1	5:00-5:30	30
2	24:00-25:00	60
2	31:00-32:00	60
3	50:00-51:00	60
5	96:15-98:15	120
14	218:00-220:00	120
29	580:00-582:00	120

The soil columns were weighed weekly, throughout the study, to determine if any moisture loss had occurred in the soil. Distilled water was added, using a fine mist sprayer, to the columns that showed evidence of moisture loss (Table 3.3).

Following the six weeks of operation, each column was disassembled, the soil homogenized, and samples removed for analysis. The homogenization step minimized the effects of uneven biological activity within various areas of the columns. The soil samples were analyzed for total carbon, VOC and SVOC content. In addition, biochemical parameters, including ammonia, orthophosphate, pH and bacterial enumerations were conducted on the final soil samples.

Results and Discussion - Biological Degradation within Soil Columns

The initial chemical and biochemical evaluation of the soil columns indicated that elevated VOC and SVOC levels were present in the OSCA soil. The VOC and SVOC compounds, detected in the pre-test column soil samples, are detailed in Tables 3.4 and 3.5. The major contaminants were from the BTEX series with >2,000

mg/kg soil of p- and m-xylene and approximately 1,000 mg/kg soil of o-xylene and toluene. Ethylbenzene concentrations ranged from 480-590 mg/kg soil. Additional contaminants, present at more than 100 mg/kg soil were tetrachloroethene, di-n-butylphthalate, bis(2-ethylhexyl)phthalate, isophorone and naphthalene.

Time zero VOC and SVOC analysis conducted by National Environmental Testing Laboratory (NET) contained inconsistencies in the results of the non-amended active column soil. The semi-volatile levels in this sample were significantly less than the other two samples. Due to this discrepancy, NET re-analyzed the initial non-amended sample. The second analysis of this sample revealed values more in line with that of the other initial samples. The VOC and SVOC results supplied by NET are included in this report (Appendix C). In addition, both the analytical results for the non-amended soil sample included in Appendix C.

The nutrient levels within the soils were not highly favorable to microbial activity without nutrient or oxygen amendments (Table 3.9). Ammonia concentrations in the non-amended and azide control columns varied from 47-81 mg/kg soil. In addition, nitrate and orthophosphate concentrations were below method detection limits of 4 and 7 mg/kg soil, respectively. Optimal phosphorous content for biological activity should be between 1 and 3% of the total carbon content present. The soil pH values varied from 6.7 to 6.9 which is favorable for biological activity. The soils contained 10^5-10^6 colony forming units (CFU)/g soil. The microbial population is typical for soils with significant contamination and indicates some level of current microbiological activity. To supplement the existing nutrient levels, the ammonia, nitrate, and orthophosphate levels were increased to 250 mg/kg, 9 mg/kg, and 55 mg/kg, respectively.

The chemical and biochemical evaluation of column soil samples obtained following six weeks of constant air flow through the soil columns from the OSCA location indicated that significant reduction of the chemical contamination had occurred. The volatile components in each of the soils were reduced significantly as expected after the vapor extraction process was utilized. However, the nutrient amended column indicated sharply reduced concentrations of most of the compounds of interest when compared to the azide-treated control column (Tables 3.6 and 3.7). Moreover, many of the compounds were reduced to below detection limits in the biologically active columns. Ethylbenzene, m- and p-xylene, toluene, naphthalene, di-

n-butyl phthalate and bis(2-ethylhexyl) phthalate were all reduced substantially more in the nutrient amended column.

Relative removal efficiencies, detailed in Table 3.8, confirm the greater removal rates in the nutrient amended soil sample. For each compound detected, except for tetrachloroethene and 4-methylphenol, the concentration reductions were greater in the nutrient amended sample than in the azide control sample. When comparing nutrient amended soil sample to the non-amended soil sample, the removal efficiencies for the nutrient amended sample were higher for all but two compounds, toluene and 4-methylphenol, the removal efficiencies were equivalent.

Each of the detected SVOC concentrations were reduced more in the nutrient amended soils. For example, there was 89% removal of bis(2-ethylhexyl) phthalate and 84% removal of di-n-butylphthalate in the nutreint amended soil compared to 0% removal and 13% removal in the azide control, respectively. Similar comparisons can be made for dichlorobenzene, naphthalene, butylbenzylphthalate, and isophorone. Also, within the six=week study period, the levels of bis(2-ethylhexyl) phthalate and isophorone remained above remediation levels.

Nutrient evaluation of the soil columns corroborates the presence of biological activity (Table 3.9). Ammonia concentrations declined in each of the active columns with the nutrient amended columns declining from 249 to 164 mg/kg soil and the non-amended soils declining from 81 to 26 mg/kg soil. Only the nutrient amended columns contained any detectable nitrate or orthophosphate at the initial sampling point. No detectable nitrate or orthophosphate was determined in any of the soil columns at the final sample period.

In each active column, soil pH values declined during the experiment with the nutrient amended columns declining most from 7.0 to 6.4 and the non-amended soils declining slightly from 6.7 to 6.6. The azide treated control column was unchanged throughout the experiment at a pH of 6.9. In aerobic biological systems the degradation of organic compounds is an oxidative process which leads to the formation of short chain fatty acids. The increase in fatty acid content results in declines in the pH of the overall system.

Microbial evaluations of the soil columns provided additional evidence of biological activity (Table 3.9 and 3.10). Initial bacterial cell counts ranged from 4.8 x 10^4 CFU/g soil for the azide treated soil column to 6.0 x 10^6 CFU/g soil in the non-

amended columns. After six weeks of operation the bacterial cell counts in the azide treated soils were slightly changed at 5.3 x 10^5 CFU/g soil. The azide amendment, in the control column, did not result in total suppression of the indigenous bacteria. However, the azide did limit the bacterial growth in the control column when compared to the increases noted in the active columns. The bacterial cell counts in each active soil increased substantially with the non-amended increasing two orders of magnitude to 1.1 x 10^8 CFU/g soil. Increases in bacterial cell populations are indicative of favorable conditions where nutrients, oxygen, and a carbon source are present. An increase of more than three orders of magnitude was observed in the nutrient amended soil with a final value of 6.1 x 10^8 CFU/g soil. The increases in bacterial cell populations occurred in each of the active soil columns with concurrent declines in nutrients, soil pH and organic compound concentrations in excess of the reductions observed with only vapor extraction.

Table 3.3 Mass of soils for column studies

Column Description	Mass (g)
No Nutrient Amendments	258.4
Nutrient Amended	271.2
Azide Control	266.1

Table 3.4 Results of Initial Soil Sample VOC Analysis for OSCA Soils (mg/kg)

	Active		Control
Compound	**Nutrient Amended**	**Non-amended**	**Azide Control**
Vinyl Chloride	<39	<38	<38
Chloroethane	<39	<38	<38
Dichloromethane	<39	<38	<38
Acetone	<39	<38	<38
1,1-Dichloroethene	<39	<38	<38
1,2-Dichloroethene (cis)	<39	<38	<38
Chloroform	<39	<38	<38
1,2-Dichloroethane	<39	<38	<38
2-Butanone	<39	<38	<38
1,1,1-Trichloroethane	<39	<38	<38
Carbon Tetrachloride	<39	<38	<38
1,2-Dichloropropane	<39	<38	<38
Trichloroethene	<39	<38	<38
1,1,2-Trichloroethane	<39	<38	<38
Benzene	<39	<38	<38
4-Methyl-2-pentanone	71	58	78
Tetrachloroethene	210	170	210
Toluene	990	830	.1000
Chlorobenzene	<39	<38	<38
Ethylbenzene	580	480	590
Styrene	<39	<38	<38
Xylenes (mixed)	3280	2710	3280

Table 3.5 Results of Initial Soil Sample SVOC Analysis for OSCA Soils (mg/kg)

	Active			Control
Compound	**Nutrient Amended**	**Non-amended**		**Azide Control**
		Primary Analysis[1]	**Secondary Analysis[2]**	
bis (2-chloroethyl) ether	<9	<3	<9	<9
1,4-Dichlorobenzene	<9	<3	<9	<9
Isophorone	130	20	160	130
1,2,4-Trichlorobenzene	<9	<3	<9	<9
Naphthalene	230	25	260	250
Hexachlorobutadiene	<9	<3	<9	<9
2,6-Dinitrotoluene	<9	<3	<9	<9
2,4-Dinitrotoluene	<9	<3	<9	<9
n-Nitrosodiphenylamine	<9	<3	<9	<9
Hexachlorobenzene	<9	<3	<9	<9
Pentachlorophenol	<9	<3	<9	<9
bis (2-ethylhexyl) Phthalate	610	110	910	690
di-n-butylphthalate	350	56	480	400
cPAHs	<63	<21	<63	<63

[1]Primary Analysis - the initial analysis of the non-amended soil sample.
[2]Secondary Analysis - the confirmation analysis of the non-amended soil sample.

Table 3.6 Results of Final Soil Sample VOC Analysis for OSCA Soils (mg/kg)

	Active		Control
Compound	**Nutrient Amended**	**Non-amended**	**Azide Control**
Vinyl Chloride	<9	<18	<17
Chloroethane	<9	<18	<17
Dichloromethane	<9	<18	<17
Acetone	<9	<18	<17
1,1-Dichloroethene	<9	<18	<17
1,2-Dichloroethene (cis)			<17
Chloroform	<9	<18	<17
1,2-Dichloroethane	<9	<18	<17
2-Butanone	<9	<18	<17
1,1,1-Trichloroethane	<9	<18	<17
Carbon Tetrachloride	<9	<18	<17
1,2-Dichloropropane	<9	<18	<17
Trichloroethene	<9	<18	<17
1,1,2-Trichloroethane	<9	<18	<17
Benzene	<9	<18	<17
4-Methyl-2-pentanone	<9	<18	19
Tetrachloroethene	26	110	<17
Toluene	<9	<18	370
Chlorobenzene	<9	<18	<17
Ethylbenzene	<9	160	360
Styrene	<9	<18	<17
Xylenes (mixed)	328	768	1930

Table 3.7 Results of Final Soil Sample SVOC Analysis for OSCA Soils (mg/kg)

	Active		Control
Compound	**Nutrient Amended**	**Non-amended**	**Azide Control**
bis (2-chloroethyl) ether	<7	<7	<7
1,4-Dichlorobenzene	<7	<7	<7
Isophorone	50	120	130
1,2,4-Trichlorobenzene	<7	<7	<7
Naphthalene	140	210	230
Hexachlorobutadiene	<7	<7	<7
2,6-Dinitrotoluene	<7	<7	<7
2,4-Dinitrotoluene	<7	<7	<7
n-Nitrosodiphenylamine	<7	<7	<7
Hexachlorobenzene	<7	<7	<7
Pentachlorophenol	<7	<7	<7
bis (2-ethylhexyl) Phthalate	70	670	760
di-n-butylphthalate	55	240	350
cPAHs	<49	<49	<49

Table 3.8 Percent Removal of Volatile and Semi-Volatile Organic Compounds

COMPOUND	Non-amended	Nutrient Amended	Azide Control
Ethylbenzene	67	≥98	39
4-Methyl-2-pentanone	≥69	87	76
Tetrachloroethane	35	88	≥92
Toluene	≥98	≥99	63
m-Xylene & p-Xylene	95	99	43
o-Xylene	16	68	36
Butylbenzylphthalate	33	75	12
Di-n-butylphthalate	46	84	13
1,2-Dichlorobenzene	N/A	30	≥15
Dimethyl Phthalate	60	≥83	20
bis(2-Ethylhexyl)Phthalate	26	89	*
Isophorone	25	62	0
2-Methylnaphthalene	24	29	5
4-Methylphenol	24	≥83	≥86
Napthalene	19	39	8

≥ values indicate final compound concentrations based upon lower analytical detection limits.
N/A=Not Applicable (Initial and final concentrations were both below detection limits.)
*Final concentration higher than initial concentration.

Table 3.9 Nutrient Analysis for Soil Columns

Sample	pH	Ammonia	Nitrate	Orthophosphate	Microbial
		Conc. (mg/kg soil)	Conc. (mg/kg soil)	Conc. (mg/kg soil)	CFU/g soil
Initial Results					
Nutrient Amended	7.0	249	9	55	1.4×10^5
Non-Amended	6.7	81	<4	<7	6.1×10^6
Azide Control	6.9	47	<4	<7	4.8×10^4
Final Results					
Nutrient Amended	6.4	164	<4	<7	6.1×10^8
Non-Amended	6.6	26	<4	<7	1.1×10^8
Azide Control	6.9	24	<4	<7	5.3×10^5

Table 3.10 Microbiological Profile for Soil Columns

Sample	Initial	Final
	CFU/g soil	CFU/g soil
Nutrient Amended	1.4×10^5	6.1×10^8
Non-Amended	6.1×10^6	1.1×10^8
Azide Control	4.8×10^4	5.3×10^5

Results and Discussion - Headspace Analysis of Vapor Extraction

The evaluation of volatile organic compound (VOC) removal via vapor extraction was performed by determining the mass of VOC's removed during nine intervals throughout the six week operation of the soil columns. The sampling intervals were

weighted in favor of the initial experimental period due to anticipated elevated rates of VOC removal. Three samples were obtained during the first day, two on the second day and one on the third day. The three remaining samples were spaced out through the remainder of the six week experimental period (days 7, 14, and 29).

The major VOC's identified in the vapor stream corresponded to the VOC's determined in the soils analysis. Vapor phase concentrations were as high as 9261 PPMV for xylene, 1767 PPMV for toluene, and 1423 PPMV for tetrachloroethene. The major contaminants were from the BTEX series with xylenes (all isomers), toluene and ethylbenzene present in substantial quantities (Tables 3.10-3.18 - Headspace Analysis Tables - listed in Appendix B) Additional contaminants present, at relatively high concentrations, were tetrachloroethene, trichloroethane and trichloroethene. Dichloropropane was identified in significant quantity only in the nutrient amended soil column effluent. Trace amounts of chloroform, styrene, and naphthalene were identified in each of the effluent streams.

Some vapor phase compounds were detected in low concentrations that were not detectable in the soils. This is most likely due to elevated initial detection limits. These compounds include dichloromethane, chloroform, dichloropropane, trichloroethene, and stryrene. Two ketone compounds, methyl-2-pentanone and 2-butanone, found in the soils were not found in the vapor phase. This may be due to these compounds being biologically degraded rather than volatilized. Benzene, was found in the soil, was identified in the vapor phase but in concentrations below quantifiable limits.

The quantity of VOC's determined in each effluent gas stream was dependent on the level of biological activity observed within the soil column. For nearly all of the prevalent VOC's quantified, the residual concentrations detected in the azide control column was greater than in either of the active soil columns. Within the active soil columns the VOC content for nutrient amended soil column was routinely less than the non-amended column. The off-gas analysis, tabulated in Appendix C indicated a higher degree of VOC's removed through volatilization in the azide control column than in the active columns. The vapor phase concentration differential was especially clear when comparing the azide control to the nutrient amended column. For example, the amount of trichloroethene removed through volatilization alone in the azide control was 1885 μg as compared to 470 μg in the nutrient amended column. This would indicate

that these compounds were degraded biologically, thus reducing the amount of compound available to be physically removed.

4.0 CORRELATION BETWEEN RESULTS OF SVE AND BIOVENTING BENCH SCALE TESTS

Relative VOC Removal Efficiencies

VOC removal efficiency, when applied to soil vapor extraction, is a function of several factors including:

1. individual VOC properties including molecular weight, vapor pressure, degree, and type of substitution groups (i.e. halogens),
2. physical soil characteristics including soil type and organic matter content, and
3. soil biochemical conditions with respect to supporting microbial growth including soil pH, moisture content, and relative levels of nitrogen (as ammonia), organophosphates and nitrates.

A comparison was made between VOC removal rates achieved during the SVE bench scale tests (conducted at the VAPEX laboratory) and the bioventing bench scale tests (conducted by ENVIROGEN). The results of the comparison of relative removal efficiencies for the total detectable VOCs and the four predominant individual VOCs detected during the tests are presented in Table 4.1. A table and graph of the percent mass of VOCs removed as a function of pore volumes exchanged during the SVE/Column 3 test are presented in Appendix C.

The total number of pore volumes exchanged during each column test were calculated based on the test flow rates, the total column volume (soil filled), the total soil mass and the soil moisture content. A total of 11,013 pore volumes were exchanged during the SVE Column 3 test. A total of 2,973 to 3,163 pore volumes (an average of 3,073 pore volumes) were exchanged within the three bioventing columns.

The percent VOC mass removed during the SVE/Column 3 test was higher than the percent mass removed during the bioventing tests, particularly for the non-amended and the azide control columns (Table 4.1). The percent removed during the bioventing/nutrient amended column test was nearly equivalent, but typically slightly less than the percent VOC mass removed during the SVE/Column 3 test. The higher

VOC mass removal percentage can be attributed to the relatively large number of pore volumes exchanged during the SVE tests in comparison to the bioventing tests (11,000 vs. 3,000). The relatively high percentage of VOC mass removed during the bioventing/nutrient amended column test is indicative of an improved efficiency with respect to VOC removal rates due to enhanced microbial conditions (i.e., biodegradation).

An evaluation of the percent mass removed during the SVE/Column 3 test following approximately 3,000 pore volumes is presented in Table 4.1. The SVE/Column 3 test results at 3,000 pore volumes should be equivalent to the bioventing/non-amended column test results. Comparisons of percent VOC mass removed during the SVE/Column 3 test (3,000 pore volumes exchanged) with the percent mass removed during the bioventing/non-amended column test (3,083 pore volumes exchanged) indicated a relatively close correlation for three of the four predominant VOCs, as well as for the total (detectable) VOCs. The VAPEX values, calculated at 3,000 pore volumes are based only on vapor phase data and do not include losses which may have occurred due to biodegradation. The comparisons were 55% vs. 72%, 88% vs. >98%, 70% vs. 67% and 70% vs. 76% for total xylenes, toluene, ethylbenzene and total VOCs, respectively. The relatively low percent removal of tetrachloroethene during the bioventing/non-amended column test may be a result of the variability associated with the soil sampling protocol associated with the EPA Method 8240 analysis.

Further evaluation of the percent VOC mass removed following approximately 3,000 pore volumes exchanged during the SVE/Column 3 test and the percent mass removed during the bioventing/nutrient amended and azide control column tests indicates a strong trend in which the relative VOC mass removed was greater for the soils in the nutrient amended column, and least in the soils in the azide control column. The VOC concentrations in the nutrient amended soil column, after only 3,000 pore volume exchanges, were nearly equivalent to the final SVE/Column 3 test results requiring 11,000 pore volume exchanges. This indicates two major points:

1. the addition of nutrients enhances the rate of VOC mass reduction as a function of pore volumes exchanged (i.e., increases the relative effectiveness of SVE with respect to VOC removal rates), and

2. the SVE process achieves VOC removal by both physical stripping resulting from the air flow through the column (i.e., convection) and by biodegradation (as demonstrated by the comparison of the VOC removal efficiencies of the non-amended and the azide control columns).

Comparison of SVOC removal efficiencies obtained from ENVIROGEN and VAPEX data was not possible because only the VOC content was analyzed during interim sampling points. No SVOC data from the VAPEX column study is available at 3,000 pore volumes. However, the removal efficiencies observed in the nutrient amended column soil were significantly greater then either the non-amended soil or azide amended control soil. The enhanced reductions, in the nutrient amended soil, was particularly significant when the various phthalate ester concentrations are compared with the less efficient columns. Only 10-15% of each phthalate compound remained in the nutrient amended soils when compared to the final concentrations observed in the azide control soil.

Table 4.1 Percent VOC Removal during SVE and Bioventing Tests

Compound	VAPEX - SVE Study		ENVIROGEN - Bioventing Study		
	PV = 11,013	PV = 3,000	Nutrient Amended PV = 2,973	Non-Amended PV = 3,083	Azide Control PV = 3,163
Total Xylenes	99.0	55.0	90.0	72.0	41.0
Toluene	99.9	88.0	>99.0	>98.0	63.0
Ethylbenzene	99.2	70.0	>98.0	67.0	39.0
Tetrachloroethene	>99.7	88.0	88.0	35.0	92.0
Total VOCs (Detectable)	99.3	70.0	93.1	76.0	45.0

PV= Pore Volume

5.0 Summary

The soil and vapor analysis indicate that greater removal of volatile and semi-volatile compounds can be accomplished through utilization of bioventing technology with nutrient amendment to enhance the biological activity. For the OSCA soils utilized in this study, the concentrations of the majority of the organic compounds present were reduced more under either of the active conditions. Within the active conditions the nutrient amended soils demonstrated the greatest reduction in organic contamination. Analysis of the effluent streams from the vapor extraction systems indicated that biological activity within the soils can reduce the amount of material removed through vapor extraction due to biological removal prior to volatilization.

In addition, the most significant removal of semi-volatile contaminants, such as several of the phthalate esters present in the soils, occurred only in the active soil columns. The majority of the SVOC's final concentrations were at analytical detection limits higher than remediation levels. In addition, isophorone and bis(2-ethylhexyl) phthalate still exceeded the pre-determined remediation levels. As stated previously,

the extent of removal increased as the levels of available nutrients increased. As illustrated with the American Chemical Services OSCA soils, significant reductions in volatile and semi-volatile contaminants were accomplished in only six weeks with the minimal addition of nutrients and air. More complete control of nutrients, some of which were exhausted during the treatability study, and pH could result in even greater removal efficiencies for the OSCA soils.

APPENDICES

A

4A. Sample Preparation.(Aqueous)

1. A volume of sample from 0.1 to 20 mls is placed in a sparger vessel at a final volume of 20 mls the sample is sparged for 12-15 minutes.

2. The target compounds are recovered on a specific sorbent material that is pre-packed and attached to the vessel.

3. The trap is placed on the thermal desorber then by heat stripping the target analytes are transferred to the column.

4B. Sample preparation.(solids)

1. A weight of solid or sludge material from 0.1 to 10 grams is placed in a sparger tube.

2. A volume of lab pure water is added to the vessel to a final volume of 20 mls.

3. The extract is sparged for 12-15 minutes at 30 mls/min Helium.

4. The target compounds are recovered on the sorbent tube.

5. The tube is then thermally desorbed.

4C. Sample preparation.(headspace vapor)

1. Vapor stream is passed directly through the sorbent tube.

2. The tube is then thermally desorbed.

5. Standard Preparation

A stock solution containing all the target analytes is prepared or purchased at a final concentration of 10000 ppm. The stock solvent used is an ultrapure

methanol. From this stock preparation a series of standards are prepared in the required concentrations to achieve the desired detection limit.

6. Quality Control and Quality Assurance

The following Quality control measures are performed as required.

Blank spikes
Matrix spikes
Duplicates
Check standards
3-5 point calibration
Solvent blanks

(All QA/QC available on request)

References:

1. Manura, J.J., S. V. Overton, C.W. Baker and J.N. Manos. 1990. "Short Path Thermal Desorption-design and Theory". The Mass Spec Source. Vol.XIII (4): 22-28

2. Manura, J.J. 1991. "Direct Analysis Using the Short Path Thermal Desorption System.". The Mass Spec Source. Vol. XIV (1) 22-27.

3. Hartman, T.G., J. Lech and R.T. Rosen. 1990. "Determination of Off-Odors and other Volatile Organics in Food Packaging Films by Direct Thermal Analysis-GC-MS". The Mass Spec Source. Vol.XIII (4): 30-33.

4. EPA Methods for the Determination of Organic Compounds in Drinking Water. 1988. Environmental Monitoring Systems Laboratory-Cincinnati.EPA-600/4-88/039. 378 pp.

Nutrient Analysis Methods

ALKALINITY AND pH

A. Introduction

This method is applicable to both water and soil samples, however, large concentrations of weak organic and inorganic acids may cause interference in this assay. In addition, the presence of oil and grease can cause sluggish response in the pH meter. For soil analysis, a sample is diluted with distilled water, mixed vigorously and titrated with a solution of H_2SO_4 to end point of pH 4.5. Aqueous samples are titrated directly with total volume not to exceed 100 ml.

B. Materials and Reagents

1. Laboratory glassware (25 ml Class A buret, 125 ml beakers, etc.)
2. Magnetic stirrer.
3. Sulfuric acid, 0.02N (0.55 ml concentrated H_2SO_4 to one liter of dH_2O).

C. Procedure

1. Combine 5 grams of soil sample to 45 ml dH_2O in 125 ml erlenmeyer flasks and mix vigorously on magnetic stirrer. Before the titration of the sample, record the pH of the slurry.

2. Titrate using a calibrated pH meter with the sulfuric acid solution to pH 4.5. Note the volume of H_2SO_4 solution necessary to titrate soil sample.

D. Calculations

Alkalinity as mg $CaCO_3$/L = (A x N x 50,000)/B

Where:

A = ml standard acid used to reach titration end point

N = normality of the standard acid (0.02)

B = ml sample (usually 50 ml)

Since there was a dilution factor of 1:10 in the preparation of the soil sample, the figure above should be multiplied by 10 to determine the adjusted alkalinity value.

Values obtained using the equation above will be reported as the following example indicates: Alkalinity as 1500 mg $CaCO_3$/L. The calculated lower detection limit of this assay has been calculated as approximately 7 mg/L.

ORTHOPHOSPHATE

A. Introduction

This method determines the total dissolved orthophosphate in wastewater, sludges, and soils. In the case of aqueous samples, if the analysis cannot be performed the same day of collection, the sample should be preserved with the addition of 2 ml concentrated H_2SO_4 per liter and refrigerated at 4°C. High concentrations of copper, iron, and silicate can interfere with analysis by creating a precipitate and subsequent loss of phosphorus. The detection limit of this assay is approximately 0.03 mg orthophosphate.

B. Materials and Reagents

1. Acid-washed glassware: All glassware used in the following procedure should be washed with hot 1:1 HCl and rinsed with distilled water. This glassware should be used only for the determination of orthophosphate and after used, it should be rinsed with distilled water and kept covered until needed again. Commercial detergents should never be used to clean this glassware. Glassware needed includes 50, 100, 500, and 1000 ml volumetric flasks, 125 ml erlenmyer flasks,

2. Spectronic 20 capable of measurements at 880 nm.

3. Sulfuric acid solution, 5N. Dilute 70 ml of conc. H_2SO_4 with dH_2O to 500 ml in a volumetric flask.

4. Antimony potassium tartrate solution. 1.3715 g $K(SbO)C_4H_4O_6 \cdot 1/2H_2O$ dissolved in 400 ml dH_2O in 500 ml volumetric flask, dilute to volume. Store at 4°C in an amber glass-stoppered bottle.

5. Ammonium molybdate solution. Dissolve 20 g $(NH_4)_6Mo_7O_{24}.4H_2O$ in 500 ml of dH_2O. Store in a plastic bottle at 4°C.

6. Ascorbic acid, 0.1M. Dissolve 1.76 g of ascorbic acid in 100 ml of dH_2O. The solution is stable for a week if stored at 4°C.

7. Combined reagent. Mix the above reagents in the following proportions for 100 ml of the mixed reagent: 50 ml 5N H_2SO_4, 5 ml antimony potassium tartrate solution, 15 ml ammonium molybdate solution, and 30 ml of ascorbic acid. MIX AFTER THE ADDITION OF EACH REAGENT. All reagents must reach room temperature before they are mixed and must be mixed in the order given. If turbidity forms in the combined reagent, shake and let it stand for a few minutes until the turbidity disappears before proceeding. This reagent must be freshly prepared for each set of analyses.

8. Stock phosphorus solution. Dissolve in dH_2O 0.2197 g of potassium dihydrogen phosphate, KH_2PO_4 which has been dried in an oven at 105°C. Dilute solution to 1000 ml in a volumetric flask. 1.0 ml = 0.05 mg P.

9. Standard phosphorus solution. Dilute 10.0 ml of the stock phosphorus solution to 500 ml with dH_2O (1.0 ml = mg/ml P). Using the standard solution, prepare the following standards in 50.0 ml volumetric flasks:

ml of Standard Phosphorus Solution	Micrograms of Orthophosphate
0	0
5.0	5
10.0	10
20.0	20
30.0	30
40.0	40
50.0	50

Once prepared, transfer standards into 125 ml erlenmeyer flasks for utilization in the following procedure section.

10. Phenolphthalein. Dissolve 0.5 g of phenolphthalein in a solution of 50 ml ethanol and 50 ml dH_2O.

C. Procedure

1. For soil and sludge, combine 5 g of the sample with 45 ml dH_2O in 50 ml orange cap conical tubes. Mix vigorously to solubilize the orthophosphate present in the diluent. Allow diluted samples to sit for a while (~15 minutes) to allow the larger soil particles to settle into the bottom of the tube.

   Remove 5 ml of the diluted soil sample and pass through a syringe filter (.45 mm) to remove turbidity that may interfere with the assay. Combine the filtered aqueous samples with 45 ml of dH_2O in 125 ml erlenmeyer flasks. In the case of aqueous samples, use 50 ml of neat sample or dilute as necessary to achieve concentration range of assay.

2. Add 1 drop of the phenolphthalein indicator to the 50 ml sample. If a red color develops, add a strong-acid solution drop-wise until the color is discharged.

3. Add 8.0 ml of the combined reagent to sample and mix thoroughly. After a minimum of 10 minutes, but no longer than 30 minutes, measure the absorbance of each sample at 880 nm with the Spectronic 20. Use the reagent blank as the reference solution.

D. CALCULATIONS

1. Prepare a standard curve by plotting the absorbance values of the standards versus the corresponding orthophosphate concentrations. If sample absorbance values are beyond the range of the standards prepared, dilute accordingly and reread sample.

2. Obtain microgram value of sample directly from the prepared standard curve. Divide microgram of orthophosphate by sample volume to report results as mg/l. Factor into the calculations the dilution factors created by the procedure above (i.e. a factor of 100 is created in C.1 in the preparation of the soil and sludge samples).

AMMONIA DISTILLATION/TITRATION

A. Introduction

The sample is pH adjusted to >9.5 and distilled. The distillate is collected in a boric acid indicator solution and then titrated with 0.02 Normal sulfuric acid solution. A calculation performed on the volume titrated against volume of sample distilled will yield a concentration of ammonia in the sample.

B. Materials and Reagents

1. Distillation apparatus

2. Deionized Water

3 Borate Buffer Solution

   a. Add 88 ml 0.1N NaOH solution to 500 ml approximately 0.025M sodium tetra borate solution (9.5g $Na_2B_4O_7 \cdot 10H_2O$/L) and dilute to 1L.

4. Sodium Hydroxide 6N

5. Mixed Indicator Solution

   a. Dissolve 200 mg methyl red indicator in 100 ml ethyl alcohol. Dissolve 100 mg methyl blue in 50 ml ethyl alcohol. Combine solutions. Prepare monthly.

6. Indicating boric acid solution

   a. Dissolve 20 grams Boric Acid granular into 1 Liter DI water, add 10 ml mixed indicator solution, and dilute to 1 Liter

7. Standard Sulfuric Acid Titrant

   a. Prepare and standardized as directed in Alkalinity: 1ml=280 ug N.

C. Procedure

1. Sample Preparation

   a. Flask capacity is 300 ml. For samples with very low ammonia content, 300 ml is the desired sample volume. For samples with higher concentrations of ammonia, use less sample and dilute up to 300 mls with DI water. Buffer Solution and adjust to pH 9.5 with 6N NaOH using phenylphthaline indicator solution.

2. Distillation

   a. Distill sample at a rate of 6-10 ml/min with the tip of the delivery tube below the surface of acid receiving solution. Collect distillate in 50 ml Boric Acid Indicating solution. Collect at least 200 ml distillate and titrate with 0.02N Sulfuric Acid Titrant.

D. Quality Control and Quality Assurance

The following Quality control measures are performed.

Blank spikes
Matrix spikes
Duplicate Distillations
Distillation blanks

(other QA/QC available on request)

MICROBIOLOGICAL PROFILE

A. Introduction

This purpose of this method is for the enumeration of bacteria present in soil, sludge, wastewater and groundwater. There are basically two types of microbial populations of interest to ENVIROGEN. The most obvious population are the total viable bacterial present in soil, sludge, etc. This bacterial population may also be characterized by the number of bacteria that are capable of utilizing specific compounds as their sole carbon and energy source. This information is useful to indicate the number of bacteria found indigenously in soil, water, etc. that can degrade the target compounds.

Total viable bacterial counts can be determined in a number of ways, dependent upon the type of sample matrix (e.g. soil, water). The following procedure describes the process for determining the total viable bacterial found in soil and sludge samples. A sample is systematically diluted in sterile liquid medium to obtain a dilution range when plated onto plate count media results in a range capable of being enumerated (30-300 colonies). Since it is not known initially what the bacterial counts will be, a range of dilutions are performed to achieve this 30-300 bacterial colonies per petri plate.

Materials and Reagents

1. Sterile saline solution (.85 % NaCl)
2. Sterile test tubes (18 x 150 mm) containing 9 ml sterile saline solution
3. Petri plates containing R2A agar
4. 50 ml orange cap conical tubes
5. Vortex mixer
6. Incubator (30°C)

C. Procedure

1. Transfer 1 g of sample into 50 ml conical tubes. Pipette 9 ml of the sterile saline solution into the conical tube and vortex thoroughly to achieve adequate mixing. This transfer will serve as the first in a series of dilutions to bring the bacteria to countable range when plated. The effective dilution of the sample is 10^{-1} (1/10).

2. Serially dilute the sample above transferring 1 ml of the sample into the test tubes containing 9 ml of sterile saline solution. Vortex the contents of each tube thoroughly before transfering into subsequent tubes. As a rule of thumb, for soils whose bacterial population is unknown. There should be a total of seven dilution tubes per sample including the one created in step 1 above. Each subsequent dilution of the sample creates a dilution of 1/10.

3. Pipette 0.1 ml of the contents of tubes 3-7 onto petri plates containing R2A agar in triplicate. Spread the liquid evenly on the plates using a glass rod and spreading table.

4. Place plates in the incubator and incubate until visible colonies form (48-72).

D. Calculations

1. Observe the bacterial growth on the petri plates and chose the dilution which gives between 30-300 colonies per plate. Count each triplicate plate in the chosen dilution and record the number of colonies for each plate. Calculate the average number of colonies found on all three plates. Multiply this value by the inverse of the dilution factor. For example, if on the plates which have a dilution factor of 10^{-6}, you count 123, 142, and 137, you would get a value of 1.34×10^{8}. This would be a reported value of 1.3×10^{8} cfu/g.

CONTAMINANT SPECIFIC UTILIZERS

To determine the number of bacteria present in a particular sample that are capable of utilizing specific organic compounds, the procedure above is altered slightly. The sample is diluted in the same manner with the plating on plates containing agar containing BSM and noble agar. The organic compound of interest is also supplied to the bacteria in a number of ways depending upon the nature of the

compound. If the compound is H2O-soluble to the level desired in the media (~5 mM), it is mixed into the agar before the plates are poured. If the compound is volatile and cannot be combined into the agar itself, it can be supplied by vapor addition A common vapor addition method is to incubate the plates under a beaker with a serum bottle containing the volatile compound also under the beaker.

APPENDIX A

Analytical Procdures

Analysis of Volatile Organic Compounds via Short Path Thermal Desorption and Gas Chromatography Mass Spectroscopy.

1. Scope and Application.

The analysis of volatile organics can be achieved using this method of analysis. All matrices, solid, liquid and gaseous, can be analyzed for any purgable organic substances. This analysis uses Thermal Desorption and GC-Mass spectrometric technologies to isolate volatile organic compounds identified in current methodologies. This method is enhanced by using capillary chromatography and cryo-focusing capabilities.

2. Summary of Method.

Liquid or solid samples are Helium sparged in a purge and trap device fitted with a pre-packed thermal desorption tube. Headspace samples are purged directly onto packing material in desorption tubes. The tube packing is specifically made for the particular target analytes. The tube is then thermally desorbed into a cryogenically cooled oven to capture low molecular weight volatile organic compounds in a capillary column. A temperature ramped program is then used to separate the compounds which are then analyzed using mass spectroscopy. Each target compound is analyzed utilizing standard curves with a minimum of three concentrations ranges.

3. Instrumentation

Short Path Thermal Desorber (Scientific Instruments inc.)

Dry purge time	30 sec.
Injection time	30 sec
Desorption time	5-10 min.

Desorption Temp. 250 degrees C

Purge and Trap Device

Flow	30 ml/min.
Purge time	12-15 min.

Sorbent tubes

Packing 2 ply

packing #1 Carbotrap(Supelco)

packing #2 Carboxen (Supelco)

GC type: Hewlett-Packard 5890

Detector: Hewlett-Packard 5971 Mass spec. detector

Injector: Split/ Splitless at 225° isothermal.

Column: Capillary, VOCOL or rt-1, 0.25 mm ID, 30 m. length 0.5 µm film 0.5 ml/min flow.

Program: from 5 to 250 degrees C target dependent

Integration: Hewlett-Packard Chemstation

Injection: TD-2 Thermal Desorber

B

APPENDIX B

Vapor Phase Tabes

Table 3.10 Soil Column Off Gas Analysis: PPMV
Nutrient Amended

Elapsed Time from Previous Sample	0.25	1.50	3.00	15.50	6.00	16.00	47.00	96.00	120.00	360.00
Collection Time Length	0.25	0.25	0.50	1.00	1.00	1.00	1.00	2.00	2.00	2.00
COMPOUND	**PPMV**									
Dichloromethane	0.00	0.00	0.00	1.12	0.37	0.00	0.00	0.00	0.00	0.00
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	1.07	0.27	0.00	0.53	19	0.00	0.00	0.27	0.27	0.00
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethane	86	84	5.01	7.50	12	10	4.72	2.25	5.40	0.00
Carbon Tetrachloride	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dichloropropane	35	67	33	53	21	70	46	13	3.36	0.00
Trichloroethene	4.02	3.03	16	19	24	21	3.43	1.30	4.89	5.15
1,1,2 Trichloroethane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	12	8.32	20	23	32	29	126	26	14	103
Toluene	97	91	28	34	69	64	101	72	12	8.65
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	9	7.13	12	13	13	12	2.61	2.96	8.85	3.90
Styrene	0.92	0.31	0.00	1.84	0.61	0.61	0.61	0.31	0.00	0.00
Xylenes	44	36	131	136	87	83	177	304	32	337
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*ND=Not dectectable

Table 3.11 Soil Column Off Gas Analysis: Total Compound Removal Nutrient Amended

Elapsed Time from Previous Sample	0.25	1.50	3.00	15.50	6.00	16.00	47.00	96.00	120.00	360.00
Collection Time Length	0.25	0.25	0.50	1.00	1.00	1.00	1.00	2.00	2.00	2.00
COMPOUND										
Elapsed Time from Previous Sample	0.25	1.50	3.00	15.50	6.00	16.00	47.00	96.00	120.00	360.00
Collection Time Length	0.25	0.25	0.50	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Dichloromethane	0.00	0.00	0.00	0.30	0.10	0.00	0.00	0.00	0.00	0.00
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.40	0.10	0.00	0.20	7.30	0.00	0.00	0.10	0.10	0.00
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethane	36	35	2.09	3.13	5.01	3.97	1.97	0.94	2.25	0.00
Carbon Tetrachloride	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dichloropropane	12	24	12	19	7.60	25	16	4.50	1.20	0.00
Trichloroethene	1.67	1.26	6.72	7.98	10.04	8.78	1.43	0.54	2.04	2.14
1,1,2 Trichloroethane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzene	U	U	U	U	U	U	U	U	U	U
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	6.06	4.16	10.01	11.64	16	15	63	13	6.79	51
Toluene	28	26	8.10	9.68	20	19	29	21	3.53	2.49
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	2.87	2.32	3.86	4.23	4.15	3.78	0.85	0.97	2.89	1.27
Styrene	0.30	0.10	0.00	0.60	0.20	0.20	0.20	0.10	0.00	0.00
Xylenes	14	12	43	44	29	27	58	99	11	110
Naphthalene	0.30	0.10	0.10	0.00	0.00	0.00	0.10	0.00	0.00	0.00

*Values expressed in µg except where noted.
*ND=Not dectectable
*U=Dectected below quantifiable limits.

Table 3.12 Soil Column Off Gas Analysis: Cumulative Totals
Nutrient Amended

Elapsed Time from Previous Sample Collection Time Length	0.25	1.50	3.00	15.50	6.00	16.00	47.00	96.00	120.00	360.00
	0.25	0.25	0.50	1.00	1.00	1.00	1.00	2.00	2.00	2.00
COMPOUND										
Dichloromethane	ND	0.00	0.00	0.90	2.10	2.40	2.40	2.40	2.40	2.40
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.40	1.90	2.20	2.80	25	47	47	48	48	48
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethane	36	249	361	376	401	428	445	454	464	470
Carbon Tetrachloride	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dichloropropane	12	122	230	322	402	499	624	687	704	707
Trichloroethene	1.67	10.48	34	79	133	189	220	226	233	246
1,1,2 Trichloroethane	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	5.05	36	79	144	227	320	552	779	838	1013
Toluene	28	191	294	348	436	552	695	844	916.88	935
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	2.87	18	37	61	86	110.	124	129	141	154
Styrene	0.30	1.50	1.80	3.60	6.00	7.20	8.40	9.30	9.60	9.60
Xylenes	14	92	256	518	737	904	1158	1628	1957	2318
Naphthalene	0.30	1.50	2.10	2.40	2.40	2.40	2.70	3.00	3.00	3.00

*Values expressed in µg except where noted.
*ND=Not dectectable

Table 3.13 Soil Column Off Gas Analysis: PPMV
No Nutrient Amendments

Elapsed Time from Previous Sample	0.25	1.50	3.00	15.50	6.00	16.00	47.00	96.00	120.00	360.00
Collection Time Length	0.25	0.25	0.50	1.00	1.00	1.00	1.00	2.00	2.00	2.00
COMPOUND	**PPMV**									
Dichloromethane	0.00	0.00	0.00	0.00	0.37	0.00	0.37	1.12	1.87	0.00
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.80	0.00	0.00	0.00	2.93	0.27	1.60	0.27	0.00	0.53
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethane	190	0.00	0.00	12	12	0.00	0.00	12	3.36	5.88
Carbon Tetrachloride	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dichloropropane	1.12	0.00	0.84	0.00	0.56	0.56	1.40	1.40	0.28	0.00
Trichloroethene	734	0.00	0.00	12	12	0.00	0.00	11	5.26	14
1,1,2 Trichloroethane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	1423	0.00	0.00	21	21	0.00	0.00	36	14	142
Toluene	1767	0.00	0.00	31	31	0.00	0.00	79	11	8
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0	0.00	0.00	11	11	0.00	0.00	0.76	8.96	73
Styrene	1	0.00	1.23	0.00	0.61	0.31	0.92	0.61	0.00	0.00
Xylenes	9261	0.00	0.00	207	207	0.00	0.00	70.04	31	382
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*ND=Not dectectable

Table 3.13 Soil Column Off Gas Analysis: PPMV
No Nutrient Amendments

Elapsed Time from Previous Sample	0.25	1.50	3.00	15.50	6.00	16.00	47.00	96.00	120.00	360.00
Collection Time Length	0.25	0.25	0.50	1.00	1.00	1.00	1.00	2.00	2.00	2.00
COMPOUND	**PPMV**									
Dichloromethane	0.00	0.00	0.00	0.00	0.37	0.00	0.37	1.12	1.87	0.00
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1.1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.80	0.00	0.00	0.00	2.93	0.27	1.60	0.27	0.00	0.53
1.2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethane	190	0.00	0.00	12	12	0.00	0.00	12	3.36	5.88
Carbon Tetrachloride	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dichloropropane	1.12	0.00	0.84	0.00	0.56	0.56	1.40	1.40	0.28	0.00
Trichloroethene	734	0.00	0.00	12	12	0.00	0.00	11	5.26	14
1.1.2 Trichloroethane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	1423	0.00	0.00	21	21	0.00	0.00	36	14	142
Toluene	1767	0.00	0.00	31	31	0.00	0.00	79	11	8
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0	0.00	0.00	11	11	0.00	0.00	0.76	8.96	73
Styrene	1	0.00	1.23	0.00	0.61	0.31	0.92	0.61	0.00	0.00
Xylenes	9261	0.00	0.00	207	207	0.00	0.00	70.04	31	382
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*ND=Not dectectable

Table 3.14 Soil Column Off Gas Analysis: Total Compound Removal
No Nutrient Amendments

Elapsed Time from Previous Sample	0.25	1.50	3.00	15.50	6.00	16.00	47.00	96.00	120.00	360.00
Collection Time Length	0.25	0.25	0.50	1.00	1.00	1.00	1.00	2.00	2.00	2.00
COMPOUND										
Elapsed Time from Previous Sample	0.25	1.50	3.00	15.50	6.00	16.00	47.00	96.00	120.00	360.00
Collection Time Length	0.25	0.25	0.50	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Dichloromethane	0.00	0.00	0.00	0.00	0.10	0.00	0.10	0.30	0.50	0.00
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.30	0.00	0.00	0.00	1.10	0.10	0.60	0.10	0.00	0.20
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethane	79.30	0.00	0.00	4.91	4.91	0.00	0.00	4.97	1.40	2.45
Carbon Tetrachloride	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dichloropropane	0.40	0.00	0.30	0.00	0.20	0.20	0.50	0.50	0.10	0.00
Trichloroethene	305.88	0.00	0.00	4.97	4.97	0.00	0.00	4.43	2.19	5.69
1,1,2 Trichloroethane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzene	U	U	U	U	U	U	U	U	U	U
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	711	0.00	0.00	10	10	0.00	0.00	18	6.94	71
Toluene	510	0.00	0.00	8.93	8.93	0.00	0.00	23	3.10	2.37
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.00	0.00	0.00	3.66	3.66	0.00	0.00	0.25	2.92	23.80
Styrene	0.30	0.00	0.40	0.00	0.20	0.10	0.30	0.20	0.00	0.00
Xylenes	3020	0.00	0.00	67	67	0.00	0.00	23	10	1256
Naphthalene	0.90	0.00	0.50	0.00	0.70	0.20	0.40	0.20	0.00	0.20

*Values expressed in µg except where noted.
*ND=Not dectectable
*U=Dectected below quantifiable limits.

Table 3.15 Soil Column Off Gas Analysis: Cumulative Totals
No Nutrient Amendments

Elapsed Time from Previous Sample	0.25	1.50	3.00	15.50	6.00	16.00	47.00	96.00	120.00	360.00
Collection Time Length	0.25	0.25	0.50	1.00	1.00	1.00	1.00	2.00	2.00	2.00
COMPOUND										
Dichloromethane	ND	0.00	0.00	0.00	0.30	0.60	0.90	2.10	4.50	6.00
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.30	1.20	1.20	1.20	4.50	8.10	10.20	12.30	12.60	13.20
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethane	79	317	317	332	361	376	376	391	410	422
Carbon Tetrachloride	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dichloropropane	0.30	1.60	2.50	3.40	4.00	5.20	7.30	10.30	12.10	12.40
Trichloroethene	ND	1224	1224	1238	1268	1283	1283	1296	1316	1340
1,1,2 Trichloroethane	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	711	2846	2846	2877	2939	2970	2970	3024	3098	3331
Toluene	510	2039	2039	2066	2120	2146	2146	2214	2292	2308
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	0.00	0.00	11	33	44	44	45	54	134
Styrene	0.30	1.20	2.40	3.60	4.20	5.10	6.30	7.80	8.40	8.40
Xylenes	3020	12079	12079	12281	12686	12888	12888	12956	13055	13459
Naphthalene	0.9	3.60	5.10	6.60	8.70	11	13	15	16	16

*Values expressed in µg except where noted.
*ND=Not dectectable

Table 3.16 Soil Column Off Gas Analysis: PPMV
Azide Control

Elapsed Time from Previous Sample	0.25	1.50	3.00	15.50	6.00	16.00	47.00	96.00	120.00	360.00
Collection Time Length	0.25	0.25	0.50	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Compound	**PPMV**									
Dichloromethane	0.00	1.12	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.00	0.80	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.00
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethane	83	10	76	78	54	51	0.00	2.10	6.36	5.80
Carbon Tetrachloride	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dichloropropane	0.00	0.28	0.28	1.96	1.40	0.00	0.00	0.00	0.00	0.00
Trichloroethene	231	7.25	68	70	221	219	0.00	2.37	5.31	16
1,1,2 Trichloroethane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	30	33	133	118	156	151	2.74	27	15	150
Toluene	145	24	148	144	156	148	4.42	150	15	146
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	48	26	25	7.13	23	19	2.85	3.74	9.19	78
Styrene	0.00	0.92	1.53	0.00	0.31	0.00	0.00	0.00	0.00	0.00
Xylenes	232	228	435	246	342	323	17	442	35	484
Naphthalene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*ND=Not dectectable
*U=Dectected below quantifiable limits.

Table 3.17 Soil Column Off Gas Analysis: Total Compound Removal
Azide Control

Elapsed Time from Previous Sample	0.25	1.50	3.00	15.50	6.00	16.00	47.00	96.00	120.00	360.00
Collection Time Length	0.25	0.25	0.50	1.00	1.00	1.00	1.00	2.00	2.00	2.00
Compound										
Dichloromethane	0.00	0.30	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.00	0.30	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethane	35	4	31	32	23	21	0	0.88	2.65	2.42
Carbon Tetrachloride	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dichloropropane	0.00	0.10	0.10	0.70	0.50	0.00	0.00	0.00	0.00	0.00
Trichloroethene	96	3	28	29	92	91	0.00	0.99	2.21	6.55
1,1,2 Trichloroethane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Benzene	U	U	U	U	U	U	U	U	U	U
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	15	17	66	59	78	76	1.37	13	7.33	75
Toluene	42	7	43	41	45	43	1.27	43	4.47	42
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	16	8.48	8.04	2.33	7.35	6.08	0.93	1.22	3.00	25
Styrene	0.00	0.30	0.50	0.00	0.10	0.00	0.00	0.00	0.00	0.00
Xylenes	76	74	142	80	111	105	5.46	144	12	158
Naphthalene	0.30	0.10	0.20	0.00	0.00	0.10	0.00	0.00	0.00	0.00

*Values expressed in µg except where noted.
*ND=Not dectectable
*U=Dectected below quantifiable limits.

APPENDIX B

Vapor Phase Tabes

Table 3.18 Soil Column Off Gas Analysis: Cumulative Totals
Azide Control

Elapsed Time from Previous Sample	0.25	1.50	3.00	15.50	6.00	16.00	47.00	96.00	120.00	360.00
Collection Time Length	0.25	0.25	0.50	1.00	1.00	1.00	1.00	2.00	2.00	2.00
COMPOUND										
Dichloromethane	ND	0.90	1.80	1.80	1.80	2.40	3.00	3.00	3.00	3.00
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	ND	0.90	1.80	1.80	1.80	2.40	3.00	3.00	3.00	3.00
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethane	35	151	258	450	615	746	809	812	822	837
Carbon Tetrachloride	ND	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dichloropropane	ND	0.30	0.90	3.30	6.90	8.40	8.40	8.40	8.40	8.40
Trichloroethene	96	394	488	659	1023	1572	1846	1849	1859	1885
1,1,2 Trichloroethane	ND	0	0	0	0	0	0	0	0	0
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	16	110	359	736	1146	1607	1837	1882	1944	2191
Toluene	42	188	337	589	849	1111	1243	1377	1521	1660
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	16	88	138	169	198	238	259	266	278	363
Styrene	ND	0.90	3.30	4.80	5.10	5.40	5.40	5.40	5.40	5.40
Xylenes	76	526	1175	1841	2416	3066	3398	3847	4314	4822
Naphthalene	0.30	1.50	2.40	3.00	3.00	3.30	3.60	3.60	3.60	3.60

*Values expressed in µg except where noted.
*ND=Not dectectable
*U=Dectected below quantifiable limits.

APPENDIX C

Analytical Report from National Environmental Testing Laboratory

ANALYTICAL REPORT

Report To: Mr. John Polonsky
Vapex Environmental Tech
480 Neponset Street
Canton, MA 02021

Project: Semivolatiles

03/23/1993

FOLLOW UP PRE-TEST NON-AMENDED (CONTROL) COLUMN SZ70 ANALYSES

NET Job Number: 93.00677

National Environmental Testing

NET Atlantic, Inc.
Cambridge Division
12 Oak Park
Bedford, MA 01730

NET Cambridge Division

ANALYTICAL REPORT

Report To:	Reported By:
Mr. John Polonsky Vapex Environmental Tech 480 Neponset Street Canton, MA 02021	National Environmental Testing NET Atlantic, Incorporated Cambridge Division 12 Oak Park Bedford, MA 01730

Report Date: 03/23/1993 — NET Job Number: 93.00677

Project: Semivolatiles — NET Client No: 79670

P.O. No: — Collected By: — Shipped Via:

Job Description: Semivolatiles — Airbill No:

This report has been approved and certified for release by the following staff. Please feel free to call the NET Project Manager at 617-275-3535 with any questions or comments.

D. Wesley Miller
NET Project Manager

Michael F. Delaney, Ph.D.
Laboratory Director

Analytical data for the following samples are included in this data report.

SAMPLE ID	NET ID	DATE TAKEN	TIME TAKEN	DATE REC'D	MATRIX
Control-1	72939			03/15/1993	SOIL

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 03/23/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00677

Project: Semivolatiles

Date Rec'd: 03/15/1993

Sample ID: Control-1

NET Sample No: 72939

Parameter		Result	Units	Analysis Date	Analyst
EX Acid/Base/Neutrals 8270	S	03/16/1993	date	03/16/1993	ner

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 03/23/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00677

Project: Semivolatiles

Date Rec'd: 03/15/1993

Sample ID: Control-1

NET Sample No: 72939

Parameter	Result	Units	Analysis Date	Analyst
TCL Acid/Base/Neutrals 8270 S				
Acenaphthene	<9000.	ug/Kg	03/23/1993	jcg
Acenaphthylene	<9000.	ug/Kg		
Anthracene	<9000.	ug/Kg		
Benzo(a)Anthracene	<9000.	ug/Kg		
Benzo(a)Pyrene	<9000.	ug/Kg		
Benzo(b)Fluoranthene	<9000.	ug/Kg		
Benzo(g,h,i)Perylene	<9000.	ug/Kg		
Benzo(k)Fluoranthene	<9000.	ug/Kg		
Benzoic Acid	<9000.	ug/Kg		
Benzyl Alcohol	<9000.	ug/Kg		
4-Bromophenyl-phenylether	<9000.	ug/Kg		
Butylbenzylphthalate	89000	ug/Kg		
4-Chloro-3-Methylphenol	<9000.	ug/Kg		
4-Chloroaniline	<9000.	ug/Kg		
bis(2-Chloroethoxy)Methane	<9000.	ug/Kg		
bis(2-Chloroethyl)Ether	<9000.	ug/Kg		
bis(2-Chloroisopropyl)Ether	<9000.	ug/Kg		
2-Chloronaphthalene	<9000.	ug/Kg		
2-Chlorophenol	<9000.	ug/Kg		
4-Chlorophenyl-phenylether	<9000.	ug/Kg		
Chrysene	<9000.	ug/Kg		
Di-n-Butylphthalate	480000	ug/Kg		
Di-n-Octyl Phthalate	<9000.	ug/Kg		
Dibenz(a,h)Anthracene	<9000.	ug/Kg		
Dibenzofuran	<9000.	ug/Kg		
1,2-Dichlorobenzene	20000	ug/Kg		
1,3-Dichlorobenzene	<9000.	ug/Kg		
1,4-Dichlorobenzene	<9000.	ug/Kg		
3,3'-Dichlorobenzidine	<9000.	ug/Kg		
2,4-Dichlorophenol	<9000.	ug/Kg		
Diethylphthalate	<9000.	ug/Kg		
Dimethyl Phthalate	50000	ug/Kg		
2,4-Dimethylphenol	<9000.	ug/Kg		
4,6-Dinitro-2-Methylphenol	<9000.	ug/Kg		
2,4-Dinitrophenol	<9000.	ug/Kg		
2,4-Dinitrotoluene	<9000.	ug/Kg		
2,6-Dinitrotoluene	<9000.	ug/Kg		
bis(2-Ethylhexyl)Phthalate	910000	ug/Kg		
Fluoranthene	<9000.	ug/Kg		
Fluorene	<9000.	ug/Kg		
Hexachlorobenzene	<9000.	ug/Kg		
Hexachlorobutadiene	<9000.	ug/Kg		
Hexachlorocyclopentadiene	<9000.	ug/Kg		
Hexachloroethane	<9000.	ug/Kg		
Indeno(1,2,3-cd)Pyrene	<9000.	ug/Kg		
Isophorone	160000	ug/Kg		
2-Methylnaphthalene	110000	ug/Kg		

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 03/23/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00677

Project: Semivolatiles

Date Rec'd: 03/15/1993

Sample ID: Control-1

NET Sample No: 72939

Parameter	Result	Units	Analysis Date	Analyst
2-Methylphenol	<9000.	ug/Kg		
4-Methylphenol	10000	ug/Kg	03/23/1993	jcg
N-Nitroso-di-n-Propylamine	<9000.	ug/Kg		
N-Nitrosodimethylamine	<9000.	ug/Kg		
N-Nitrosodiphenylamine	<9000.	ug/Kg		
Naphthalene	260000	ug/Kg		
2-Nitroaniline	<9000.	ug/Kg		
3-Nitroaniline	<9000.	ug/Kg		
4-Nitroaniline	<9000.	ug/Kg		
Nitrobenzene	<9000.	ug/Kg		
2-Nitrophenol	<9000.	ug/Kg		
4-Nitrophenol	<9000.	ug/Kg		
Pentachlorophenol	<9000.	ug/Kg		
Phenanthrene	<9000.	ug/Kg		
Phenol	<9000.	ug/Kg		
Pyrene	<9000.	ug/Kg		
1,2,4-Trichlorobenzene	<9000.	ug/Kg		
2,4,5-Trichlorophenol	<9000.	ug/Kg		
2,4,6-Trichlorophenol	<9000.	ug/Kg		

NET Cambridge Division

QUALITY CONTROL DATA

Client: Vapex Environmental Tech

NET Job No: 93.00677

Project: Semivolatiles

Report Date: 03/23/1993

Surrogate Standard Percent Recovery

Abbreviated Surrogate Standard Names:

SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10	SS11	SS12
2-Fluor	Phenol-	2,4,6-T	2-Fluor	Nitrobe	p-Terph						

			Percent Recovery											
Sample ID	NET ID	Matrix	SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10	SS11	SS12
Control-1	72939	SOIL	DIL	DIL	DIL	DIL	DIL	DIL						

Notes:
NR - This surrogate standard is Not Required. Other versions of this test method may use this surrogate standard.
Dil - This surrogate standard was diluted to below detectable levels due to concentrations of analytes in this sample.

Complete Surrogate Standard Names Listed by Analysis:

Pesticide Surrogate Standards:
Decachl = Decachlorobiphenyl
Dibutyl = Dibutylchlorendate
Tetrach = Tetrachloro-m-xylene

Volatile Surrogate Standards:
Bromofl = Bromofluorobenzene
1,2-Dichl = 1,2-Dichloroethane-d4
Toluene = Toluene-d8

Drinking Water Method 524 1,2-Dichl = 1,2-Dichlorobenzene-d4

Semivolatile Surrogate Standards:
2-Fluor (1st) = 2-Fluorobiphenyl
2-Fluor (2nd) = 2-Fluorophenol
Phenol- = Phenol-d6
Nitrobe = Nitrobenzene-d5
2,4,6-T = 2,4,6-Tribromophenol
p-Terph = p-Terphenyl

Herbicides Surrogate Standard:
2,4-Dic = 2,4-Dichlorophenyl acetic acid

Petroleum Hydrocarbon Fingerprint Surrogate Standard:
2-Fluor = 2-Fluorobiphenyl
para-Te = para-Terphynyl

NET Cambridge Division
QUALITY CONTROL DATA

Report To: Vapex Environmental Tech

NET Job No: 93.00677

Project: Semivolatiles

Report Date : 03/23/1993

Method Blank Analysis Data

Test Name	Result	Units	Run Batch	Run Date	Analyst Initials
TCL Acid/Base/Neutrals 8270 S					
2-Fluorophenol	74	% recov.	189	03/20/1993	cdl
Phenol-d5	82	% recov.	189	03/20/1993	cdl
2,4,6-Tribromophenol	80	% recov.	189	03/20/1993	cdl
2-Fluorobiphenyl	82	% recov.	189	03/20/1993	cdl
Nitrobenzene-d15	81	% recov.	189	03/20/1993	cdl
p-Terphenyl-d14	100	% recov.	189	03/20/1993	cdl
Acenaphthene	<40	ug/Kg	189	03/20/1993	cdl
Acenapnthylene	<40	ug/Kg	189	03/20/1993	cdl
Anthracene	<40	ug/Kg	189	03/20/1993	cdl
Benzo(a)Anthracene	<40	ug/Kg	189	03/20/1993	cdl
Benzo(a)Pyrene	<40	ug/Kg	189	03/20/1993	cdl
Benzo(b)Fluoranthene	<40	ug/Kg	189	03/20/1993	cdl
Benzo(g,h,i)Perylene	<40	ug/Kg	189	03/20/1993	cdl
Benzo(k)Fluoranthene	<40	ug/Kg	189	03/20/1993	cdl
4-Bromophenyl-phenylether	<40	ug/Kg	189	03/20/1993	cdl
Butylbenzylphthalate	<40	ug/Kg	189	03/20/1993	cdl
4-Chloro-3-Methylphenol	<40	ug/Kg	189	03/20/1993	cdl
bis(2-Chloroethoxy)Methane	<40	ug/Kg	189	03/20/1993	cdl
bis(2-Chloroethyl)Ether	<40	ug/Kg	189	03/20/1993	cdl
bis(2-Chloroisopropyl)Ether	<40	ug/Kg	189	03/20/1993	cdl
2-Chloronaphthalene	<40	ug/Kg	189	03/20/1993	cdl
2-Chlorophenol	<40	ug/Kg	189	03/20/1993	cdl
4-Chlorophenyl-phenylether	<40	ug/Kg	189	03/20/1993	cdl
Chrysene	<40	ug/Kg	189	03/20/1993	cdl
Di-n-Butylphthalate	<40	ug/Kg	189	03/20/1993	cdl
Di-n-Octyl Phthalate	<40	ug/Kg	189	03/20/1993	cdl
Dibenz(a,h)Anthracene	<40	ug/Kg	189	03/20/1993	cdl
1,2-Dichlorobenzene	<40	ug/Kg	189	03/20/1993	cdl
1,3-Dichlorobenzene	<40	ug/Kg	189	03/20/1993	cdl
1,4-Dichlorobenzene	<40	ug/Kg	189	03/20/1993	cdl
3,3'-Dichlorobenzidine	<40	ug/Kg	189	03/20/1993	cdl
2,4-Dichlorophenol	<40	ug/Kg	189	03/20/1993	cdl
Diethylphthalate	<40	ug/Kg	189	03/20/1993	cdl
Dimethyl Phthalate	<40	ug/Kg	189	03/20/1993	cdl
2,4-Dimethylphenol	<40	ug/Kg	189	03/20/1993	cdl
4,6-Dinitro-2-Methylphenol	<40	ug/Kg	189	03/20/1993	cdl
2,4-Dinitrophenol	<40	ug/Kg	189	03/20/1993	cdl
2,4-Dinitrotoluene	<40	ug/Kg	189	03/20/1993	cdl
2,6-Dinitrotoluene	<40	ug/Kg	189	03/20/1993	cdl
bis(2-Ethylhexyl)Phthalate	<40	ug/Kg	189	03/20/1993	cdl
Fluoranthene	<40	ug/Kg	189	03/20/1993	cdl
Fluorene	<40	ug/Kg	189	03/20/1993	cdl
Hexachlorobenzene	<40	ug/Kg	189	03/20/1993	cdl
Hexachlorobutadiene	<40	ug/Kg	189	03/20/1993	cdl
Hexachlorocyclopentadiene	<40	ug/Kg	189	03/20/1993	cdl
Hexachloroethane	<40	ug/Kg	189	03/20/1993	cdl
Indeno(1,2,3-cd)Pyrene	<40	ug/Kg	189	03/20/1993	cdl
Isophorone	<40	ug/Kg	189	03/20/1993	cdl
N-Nitroso-di-n-Propylamine	<40	ug/Kg	189	03/20/1993	cdl
N-Nitrosodimethylamine	<40	ug/Kg	189	03/20/1993	cdl

NET Cambridge Division
QUALITY CONTROL DATA

Report To: Vapex Environmental Tech

NET Job No: 93.00677

Project: Semivolatiles

Report Date : 03/23/1993

Method Blank Analysis Data

Test Name	Result	Units	Run Batch	Run Date	Analyst Initials
N-Nitrosodiphenylamine	<40	ug/Kg	189	03/20/1993	cdl
Naphthalene	<40	ug/Kg	189	03/20/1993	cdl
Nitrobenzene	<40	ug/Kg	189	03/20/1993	cdl
2-Nitrophenol	<40	ug/Kg	189	03/20/1993	cdl
4-Nitrophenol	<40	ug/Kg	189	03/20/1993	cdl
Pentachlorophenol	<40	ug/Kg	189	03/20/1993	cdl
Phenanthrene	<40	ug/Kg	189	03/20/1993	cdl
Phenol	<40	ug/Kg	189	03/20/1993	cdl
Pyrene	<40	ug/Kg	189	03/20/1993	cdl
1,2,4-Trichlorobenzene	<40	ug/Kg	189	03/20/1993	cdl
2,4,6-Trichlorophenol	<40	ug/Kg	189	03/20/1993	cdl

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 01/29/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Date Rec'd: 01/15/1993

Sample ID: CONTROL-1

NET Sample No: 71143

Parameter		Result	Units	Analysis Date	Analyst
EX Acid/Base/Neutrals 8270	S	1/20/1993	date	01/20/1993	ner

Pre-Test Analyses

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 01/29/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Date Rec'd: 01/15/1993

Sample ID: NUTRIENT-1

NET Sample No: 71144

Parameter		Result	Units	Analysis Date	Analyst
EX Acid/Base/Neutrals 8270	S	1/20/1993	date	01/20/1993	ner

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 01/29/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Date Rec'd: 01/15/1993

Sample ID: KILLED-1

NET Sample No: 71145

Parameter		Result	Units	Analysis Date	Analyst
EX Acid/Base/Neutrals 8270	S	1/20/1993	date	01/20/1993	ner

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 01/29/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Date Rec'd: 01/15/1993

Sample ID: CONTROL-1

NET Sample No: 71143

Parameter	Result		Units	Analysis Date	Analyst
TCL Volatiles by GC/MS 8240 S					
Acetone	<38000.		ug/Kg	01/21/1993	dhg
Benzene	<38000.		ug/Kg		
Bromodichloromethane	<38000.		ug/Kg		
Bromoform	<38000.		ug/Kg		
Bromomethane	<38000.		ug/Kg		
2-Butanone (MEK)	<38000.		ug/Kg		
Carbon Disulfide	<38000.		ug/Kg		
Carbon Tetrachloride	<38000.		ug/Kg		
Chlorobenzene	<38000.		ug/Kg		
Chloroethane	<38000.		ug/Kg		
2-Chloroethylvinyl ether	<38000.		ug/Kg		
Chloroform	<38000.		ug/Kg		
Chloromethane	<38000.		ug/Kg		
Dibromochloromethane	<38000.		ug/Kg		
1,2-Dichlorobenzene	<38000.		ug/Kg		
1,3-Dichlorobenzene	<38000.		ug/Kg		
1,4-Dichlorobenzene	<38000.		ug/Kg		
1,1-Dichloroethane	<38000.		ug/Kg		
1,2-Dichloroethane	<38000.		ug/Kg		
1,1-Dichloroethene	<38000.		ug/Kg		
trans-1,2-Dichloroethene	<38000.		ug/Kg		
1,2-Dichloropropane	<38000.		ug/Kg		
cis-1,3-Dichloropropene	<38000.		ug/Kg		
trans-1,3-Dichloropropene	<38000.		ug/Kg		
Ethylbenzene	480000		ug/Kg		
2-Hexanone	<38000.		ug/Kg		
4-Methyl-2-pentanone (MIBK	58000		ug/Kg		
Methylene Chloride	<38000.		ug/Kg		
Styrene	<38000.		ug/Kg		
1,1,2,2-Tetrachloroethane	<38000.		ug/Kg		
Tetrachloroethene	170000		ug/Kg		
Toluene	830000		ug/Kg		
1,1,1-Trichloroethane	<38000.		ug/Kg		
1,1,2-Trichloroethane	<38000.		ug/Kg		
Trichloroethene	<38000.		ug/Kg		
Trichlorofluoromethane	<38000.		ug/Kg		
Vinyl Acetate	<38000.		ug/Kg		
Vinyl Chloride	<38000.		ug/Kg		
m-Xylene	1900000	*	ug/Kg		
o-Xylene	810000		ug/Kg		
p-Xylene	<38000.	*	ug/Kg		

* M and P xylenes co-elute. The reported result is either one, the other or a combination of the two isomers.

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 01/29/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Date Rec'd: 01/15/1993

Sample ID: CONTROL-1

NET Sample No: 71143

Parameter	Result	Units	Analysis Date	Analyst
TCL Acid/Base/Neutrals 8270 S				
Acenaphthene	<3000.	ug/Kg	01/26/1993	cdl
Acenaphthylene	<3000.	ug/Kg		
Anthracene	<3000.	ug/Kg		
Benzo(a)Anthracene	<3000.	ug/Kg		
Benzo(a)Pyrene	<3000.	ug/Kg		
Benzo(b)Fluoranthene	<3000.	ug/Kg		
Benzo(g,h,i)Perylene	<3000.	ug/Kg		
Benzo(k)Fluoranthene	<3000.	ug/Kg		
Benzoic Acid	<3000.	ug/Kg		
Benzyl Alcohol	<3000.	ug/Kg		
4-Bromophenyl-phenylether	<3000.	ug/Kg		
Butylbenzylphthalate	10000	ug/Kg		
4-Chloro-3-Methylphenol	<3000.	ug/Kg		
4-Chloroaniline	<3000.	ug/Kg		
bis(2-Chloroethoxy)Methane	<3000.	ug/Kg		
bis(2-Chloroethyl)Ether	<3000.	ug/Kg		
bis(2-Chloroisopropyl)Ether	<3000.	ug/Kg		
2-Chloronaphthalene	<3000.	ug/Kg		
2-Chlorophenol	<3000.	ug/Kg		
4-Chlorophenyl-phenylether	<3000.	ug/Kg		
Chrysene	<3000.	ug/Kg		
Di-n-Butylphthalate	56000	ug/Kg		
Di-n-Octyl Phthalate	<3000.	ug/Kg		
Dibenz(a,h)Anthracene	<3000.	ug/Kg		
Dibenzofuran	<3000.	ug/Kg		
1,2-Dichlorobenzene	<3000.	ug/Kg		
1,3-Dichlorobenzene	<3000.	ug/Kg		
1,4-Dichlorobenzene	<3000.	ug/Kg		
3,3'-Dichlorobenzidine	<3000.	ug/Kg		
2,4-Dichlorophenol	<3000.	ug/Kg		
Diethylphthalate	<3000.	ug/Kg		
Dimethyl Phthalate	5000	ug/Kg		
2,4-Dimethylphenol	4000	ug/Kg		
4,6-Dinitro-2-Methylphenol	<3000.	ug/Kg		
2,4-Dinitrophenol	<3000.	ug/Kg		
2,4-Dinitrotoluene	<3000.	ug/Kg		
2,6-Dinitrotoluene	<3000.	ug/Kg		
bis(2-Ethylhexyl)Phthalate	110000	ug/Kg		
Fluoranthene	<3000.	ug/Kg		
Fluorene	<3000.	ug/Kg		
Hexachlorobenzene	<3000.	ug/Kg		
Hexachlorobutadiene	<3000.	ug/Kg		
Hexachlorocyclopentadiene	<3000.	ug/Kg		
Hexachloroethane	<3000.	ug/Kg		
Indeno(1,2,3-cd)Pyrene	<3000.	ug/Kg		
Isophorone	20000	ug/Kg		
2-Methylnaphthalene	10000	ug/Kg		

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 01/29/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Date Rec'd: 01/15/1993

Sample ID: CONTROL-1

NET Sample No: 71143

Parameter	Result	Units	Analysis Date	Analyst
2-Methylphenol	2000	ug/Kg		
4-Methylphenol	7000	ug/Kg	01/26/1993	cdl
N-Nitroso-di-n-Propylamine	<3000.	ug/Kg		
N-Nitrosodimethylamine	<3000.	ug/Kg		
N-Nitrosodiphenylamine	<3000.	ug/Kg		
Naphthalene	25000	ug/Kg		
2-Nitroaniline	<3000.	ug/Kg		
3-Nitroaniline	<3000.	ug/Kg		
4-Nitroaniline	<3000.	ug/Kg		
Nitrobenzene	<3000.	ug/Kg		
2-Nitrophenol	<3000.	ug/Kg		
4-Nitrophenol	<3000.	ug/Kg		
Pentachlorophenol	<3000.	ug/Kg		
Phenanthrene	<3000.	ug/Kg		
Phenol	<3000.	ug/Kg		
Pyrene	<3000.	ug/Kg		
1,2,4-Trichlorobenzene	<3000.	ug/Kg		
2,4,5-Trichlorophenol	<3000.	ug/Kg		
2,4,6-Trichlorophenol	<3000.	ug/Kg		

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 01/29/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Date Rec'd: 01/15/1993

Sample ID: NUTRIENT-1

NET Sample No: 71144

Parameter	Result		Units	Analysis Date	Analyst
TCL Volatiles by GC/MS 8240 S					
Acetone	<39000.		ug/Kg	01/21/1993	dhg
Benzene	<39000.		ug/Kg		
Bromodichloromethane	<39000.		ug/Kg		
Bromoform	<39000.		ug/Kg		
Bromomethane	<39000.		ug/Kg		
2-Butanone (MEK)	<39000.		ug/Kg		
Carbon Disulfide	<39000.		ug/Kg		
Carbon Tetrachloride	<39000.		ug/Kg		
Chlorobenzene	<39000.		ug/Kg		
Chloroethane	<39000.		ug/Kg		
2-Chloroethylvinyl ether	<39000.		ug/Kg		
Chloroform	<39000.		ug/Kg		
Chloromethane	<39000.		ug/Kg		
Dibromochloromethane	<39000.		ug/Kg		
1,2-Dichlorobenzene	<39000.		ug/Kg		
1,3-Dichlorobenzene	<39000.		ug/Kg		
1,4-Dichlorobenzene	<39000.		ug/Kg		
1,1-Dichloroethane	<39000.		ug/Kg		
1,2-Dichloroethane	<39000.		ug/Kg		
1,1-Dichloroethene	<39000.		ug/Kg		
trans-1,2-Dichloroethene	<39000.		ug/Kg		
1,2-Dichloropropane	<39000.		ug/Kg		
cis-1,3-Dichloropropene	<39000.		ug/Kg		
trans-1,3-Dichloropropene	<39000.		ug/Kg		
Ethylbenzene	580000		ug/Kg		
2-Hexanone	<39000.		ug/Kg		
4-Methyl-2-pentanone (MIBK	71000		ug/Kg		
Methylene Chloride	<39000.		ug/Kg		
Styrene	<39000.		ug/Kg		
1,1,2,2-Tetrachloroethane	<39000.		ug/Kg		
Tetrachloroethene	210000		ug/Kg		
Toluene	990000		ug/Kg		
1,1,1-Trichloroethane	<39000.		ug/Kg		
1,1,2-Trichloroethane	<39000.		ug/Kg		
Trichloroethene	<39000.		ug/Kg		
Trichlorofluoromethane	<39000.		ug/Kg		
Vinyl Acetate	<39000.		ug/Kg		
Vinyl Chloride	<39000.		ug/Kg		
m-Xylene	2300000	*	ug/Kg		
o-Xylene	980000		ug/Kg		
p-Xylene	<39000.	*	ug/Kg		

* M and P xylenes co-elute. The reported result is either one, the other or a combination of the two isomers.

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 01/29/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Date Rec'd: 01/15/1993

Sample ID: NUTRIENT-1

NET Sample No: 71144

Parameter	Result	Units	Analysis Date	Analyst
TCL Acid/Base/Neutrals 8270 S				
Acenaphthene	<9000.	ug/Kg	01/26/1993	cdl
Acenaphthylene	<9000.	ug/Kg		
Anthracene	<9000.	ug/Kg		
Benzo(a)Anthracene	<9000.	ug/Kg		
Benzo(a)Pyrene	<9000.	ug/Kg		
Benzo(b)Fluoranthene	<9000.	ug/Kg		
Benzo(g,h,i)Perylene	<9000.	ug/Kg		
Benzo(k)Fluoranthene	<9000.	ug/Kg		
Benzoic Acid	<9000.	ug/Kg		
Benzyl Alcohol	<9000.	ug/Kg		
4-Bromophenyl-phenylether	<9000.	ug/Kg		
Butylbenzylphthalate	80000	ug/Kg		
4-Chloro-3-Methylphenol	<9000.	ug/Kg		
4-Chloroaniline	<9000.	ug/Kg		
bis(2-Chloroethoxy)Methane	<9000.	ug/Kg		
bis(2-Chloroethyl)Ether	<9000.	ug/Kg		
bis(2-Chloroisopropyl)Ether	<9000.	ug/Kg		
2-Chloronaphthalene	<9000.	ug/Kg		
2-Chlorophenol	<9000.	ug/Kg		
4-Chlorophenyl-phenylether	<9000.	ug/Kg		
Chrysene	<9000.	ug/Kg		
Di-n-Butylphthalate	350000	ug/Kg		
Di-n-Octyl Phthalate	<9000.	ug/Kg		
Dibenz(a,h)Anthracene	<9000.	ug/Kg		
Dibenzofuran	<9000.	ug/Kg		
1,2-Dichlorobenzene	20000	ug/Kg		
1,3-Dichlorobenzene	<9000.	ug/Kg		
1,4-Dichlorobenzene	<9000.	ug/Kg		
3,3'-Dichlorobenzidine	<9000.	ug/Kg		
2,4-Dichlorophenol	<9000.	ug/Kg		
Diethylphthalate	<9000.	ug/Kg		
Dimethyl Phthalate	40000	ug/Kg		
2,4-Dimethylphenol	30000	ug/Kg		
4,6-Dinitro-2-Methylphenol	<9000.	ug/Kg		
2,4-Dinitrophenol	<9000.	ug/Kg		
2,4-Dinitrotoluene	<9000.	ug/Kg		
2,6-Dinitrotoluene	<9000.	ug/Kg		
bis(2-Ethylhexyl)Phthalate	610000	ug/Kg		
Fluoranthene	<9000.	ug/Kg		
Fluorene	<9000.	ug/Kg		
Hexachlorobenzene	<9000.	ug/Kg		
Hexachlorobutadiene	<9000.	ug/Kg		
Hexachlorocyclopentadiene	<9000.	ug/Kg		
Hexachloroethane	<9000.	ug/Kg		
Indeno(1,2,3-cd)Pyrene	<9000.	ug/Kg		
Isophorone	130000	ug/Kg		
2-Methylnaphthalene	93000	ug/Kg		

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 01/29/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Date Rec'd: 01/15/1993

Sample ID: NUTRIENT-1

NET Sample No: 71144

Parameter	Result	Units	Analysis Date	Analyst
2-Methylphenol	10000	ug/Kg		
4-Methylphenol	40000	ug/Kg	01/26/1993	cdl
N-Nitroso-di-n-Propylamine	<9000.	ug/Kg		
N-Nitrosodimethylamine	<9000.	ug/Kg		
N-Nitrosodiphenylamine	<9000.	ug/Kg		
Naphthalene	230000	ug/Kg		
2-Nitroaniline	<9000.	ug/Kg		
3-Nitroaniline	<9000.	ug/Kg		
4-Nitroaniline	<9000.	ug/Kg		
Nitrobenzene	<9000.	ug/Kg		
2-Nitrophenol	<9000.	ug/Kg		
4-Nitrophenol	<9000.	ug/Kg		
Pentachlorophenol	<9000.	ug/Kg		
Phenanthrene	<9000.	ug/Kg		
Phenol	<9000.	ug/Kg		
Pyrene	<9000.	ug/Kg		
1,2,4-Trichlorobenzene	<9000.	ug/Kg		
2,4,5-Trichlorophenol	<9000.	ug/Kg		
2,4,6-Trichlorophenol	<9000.	ug/Kg		

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 01/29/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Date Rec'd: 01/15/1993

Sample ID: KILLED-1

NET Sample No: 71145

Parameter	Result		Units	Analysis Date	Analyst
TCL Volatiles by GC/MS 8240 S					
Acetone	<38000.		ug/Kg	01/22/1993	dhg
Benzene	<38000.		ug/Kg		
Bromodichloromethane	<38000.		ug/Kg		
Bromoform	<38000.		ug/Kg		
Bromomethane	<38000.		ug/Kg		
2-Butanone (MEK)	<38000.		ug/Kg		
Carbon Disulfide	<38000.		ug/Kg		
Carbon Tetrachloride	<38000.		ug/Kg		
Chlorobenzene	<38000.		ug/Kg		
Chloroethane	<38000.		ug/Kg		
2-Chloroethylvinyl ether	<38000.		ug/Kg		
Chloroform	<38000.		ug/Kg		
Chloromethane	<38000.		ug/Kg		
Dibromochloromethane	<38000.		ug/Kg		
1,2-Dichlorobenzene	<38000.		ug/Kg		
1,3-Dichlorobenzene	<38000.		ug/Kg		
1,4-Dichlorobenzene	<38000.		ug/Kg		
1,1-Dichloroethane	<38000.		ug/Kg		
1,2-Dichloroethane	<38000.		ug/Kg		
1,1-Dichloroethene	<38000.		ug/Kg		
trans-1,2-Dichloroethene	<38000.		ug/Kg		
1,2-Dichloropropane	<38000.		ug/Kg		
cis-1,3-Dichloropropene	<38000.		ug/Kg		
trans-1,3-Dichloropropene	<38000.		ug/Kg		
Ethylbenzene	590000		ug/Kg		
2-Hexanone	<38000.		ug/Kg		
4-Methyl-2-pentanone (MIBK	78000		ug/Kg		
Methylene Chloride	<38000.		ug/Kg		
Styrene	<38000.		ug/Kg		
1,1,2,2-Tetrachloroethane	<38000.		ug/Kg		
Tetrachloroethene	210000		ug/Kg		
Toluene	1000000		ug/Kg		
1,1,1-Trichloroethane	<38000.		ug/Kg		
1,1,2-Trichloroethane	<38000.		ug/Kg		
Trichloroethene	<38000.		ug/Kg		
Trichlorofluoromethane	<38000.		ug/Kg		
Vinyl Acetate	<38000.		ug/Kg		
Vinyl Chloride	<38000.		ug/Kg		
m-Xylene	2300000	*	ug/Kg		
o-Xylene	980000		ug/Kg		
p-Xylene	<38000.	*	ug/Kg		

* M and P xylenes co-elute. The reported result is either one, the other or a combination of the two isomers.

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 01/29/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Date Rec'd: 01/15/1993

Sample ID: KILLED-1

NET Sample No: 71145

Parameter	Result	Units	Analysis Date	Analyst
TCL Acid/Base/Neutrals 8270 S				
Acenaphthene	<9000.	ug/Kg	01/26/1993	cdl
Acenaphthylene	<9000.	ug/Kg		
Anthracene	<9000.	ug/Kg		
Benzo(a)Anthracene	<9000.	ug/Kg		
Benzo(a)Pyrene	<9000.	ug/Kg		
Benzo(b)Fluoranthene	<9000.	ug/Kg		
Benzo(g,h,i)Perylene	<9000.	ug/Kg		
Benzo(k)Fluoranthene	<9000.	ug/Kg		
Benzoic Acid	<9000.	ug/Kg		
Benzyl Alcohol	<9000.	ug/Kg		
4-Bromophenyl-phenylether	<9000.	ug/Kg		
Butylbenzylphthalate	90000	ug/Kg		
4-Chloro-3-Methylphenol	<9000.	ug/Kg		
4-Chloroaniline	<9000.	ug/Kg		
bis(2-Chloroethoxy)Methane	<9000.	ug/Kg		
bis(2-Chloroethyl)Ether	<9000.	ug/Kg		
bis(2-Chloroisopropyl)Ether	<9000.	ug/Kg		
2-Chloronaphthalene	<9000.	ug/Kg		
2-Chlorophenol	<9000.	ug/Kg		
4-Chlorophenyl-phenylether	<9000.	ug/Kg		
Chrysene	<9000.	ug/Kg		
Di-n-Butylphthalate	400000	ug/Kg		
Di-n-Octyl Phthalate	<9000.	ug/Kg		
Dibenz(a,h)Anthracene	<9000.	ug/Kg		
Dibenzofuran	<9000.	ug/Kg		
1,2-Dichlorobenzene	20000	ug/Kg		
1,3-Dichlorobenzene	<9000.	ug/Kg		
1,4-Dichlorobenzene	<9000.	ug/Kg		
3,3'-Dichlorobenzidine	<9000.	ug/Kg		
2,4-Dichlorophenol	<9000.	ug/Kg		
Diethylphthalate	<9000.	ug/Kg		
Dimethyl Phthalate	50000	ug/Kg		
2,4-Dimethylphenol	30000	ug/Kg		
4,6-Dinitro-2-Methylphenol	<9000.	ug/Kg		
2,4-Dinitrophenol	<9000.	ug/Kg		
2,4-Dinitrotoluene	<9000.	ug/Kg		
2,6-Dinitrotoluene	<9000.	ug/Kg		
bis(2-Ethylhexyl)Phthalate	690000	ug/Kg		
Fluoranthene	<9000.	ug/Kg		
Fluorene	<9000.	ug/Kg		
Hexachlorobenzene	<9000.	ug/Kg		
Hexachlorobutadiene	<9000.	ug/Kg		
Hexachlorocyclopentadiene	<9000.	ug/Kg		
Hexachloroethane	<9000.	ug/Kg		
Indeno(1,2,3-cd)Pyrene	<9000.	ug/Kg		
Isophorone	130000	ug/Kg		
2-Methylnaphthalene	97000	ug/Kg		

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 01/29/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Date Rec'd: 01/15/1993

Sample ID: KILLED-1

NET Sample No: 71145

Parameter	Result	Units	Analysis Date	Analyst
2-Methylphenol	10000	ug/Kg		
4-Methylphenol	50000	ug/Kg	01/26/1993	cdl
N-Nitroso-di-n-Propylamine	<9000.	ug/Kg		
N-Nitrosodimethylamine	<9000.	ug/Kg		
N-Nitrosodiphenylamine	<9000.	ug/Kg		
Naphthalene	250000	ug/Kg		
2-Nitroaniline	<9000.	ug/Kg		
3-Nitroaniline	<9000.	ug/Kg		
4-Nitroaniline	<9000.	ug/Kg		
Nitrobenzene	<9000.	ug/Kg		
2-Nitrophenol	<9000.	ug/Kg		
4-Nitrophenol	<9000.	ug/Kg		
Pentachlorophenol	<9000.	ug/Kg		
Phenanthrene	<9000.	ug/Kg		
Phenol	<9000.	ug/Kg		
Pyrene	<9000.	ug/Kg		
1,2,4-Trichlorobenzene	<9000.	ug/Kg		
2,4,5-Trichlorophenol	<9000.	ug/Kg		
2,4,6-Trichlorophenol	<9000.	ug/Kg		

Nelson Levi

NET CAMBRIDGE

SOIL VOLATILE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

JOB NO. 93 00078 SAMPLE NO. 71098

KE7M

FILE

COMPOUNDS	SPIKE ADDED (UG/Kg)	SAMPLE CONCENTRATION (UG/Kg)	MS CONCENTRATION (UG/Kg)	MS % REC.	QC LIMITS REC
1,1-DICHLOROETHENE..	50	0.0	49.8	99.6	59-172
TRICHLOROETHENE.....	50	0.0	50.1	100.2	62-137
BENZENE.....	50	0.0	52.4	104.8	66-142
TOLUENE.....	50	0.0	50.2	100.4	59-139
CHLOROBENZENE.....	50	0.0	49.8	99.6	60-133

FILE

COMPOUNDS	SPIKE ADDED (UG/Kg)	MSD CONCENTRATION (UG/Kg)	MSD % REC.	% RPD.	QC LIMITS % RPD	% REC
1,1-DICHLOROETHENE..	50	49.8	99.6	0	22	59-172
TRICHLOROETHENE.....	50	51.2	102.4	2	24	62-137
BENZENE.....	50	54.6	109.1	4	21	66-142
TOLUENE.....	50	52.0	104.1	4	21	59-139
CHLOROBENZENE.....	50	51.9	103.8	4	21	60-133

(MRPD FOR COMM. = 28%)

VALUES OUTSIDE OF QC LIMITS

RPD: 0 OUT OF ___ 5 ___ OUTSIDE LIMITS

SPIKE RECOVERY: 0 OUT OF ___ 10 ___ OUTSIDE OF LIMITS

COMMENTS: _____

Z 50

NET Cambridge Division
QUALITY CONTROL DATA

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Report Date: 01/29/1993

Matrix Spike/Matrix Spike Duplicate Results

Compound	Spike Amount	Sample Result	Units	MS Result	MS % Recovery	MSD Result	MSD % Recovery	RPD
Phenol	3000	<200.	ug/Kg	2720	90.70	2780	92.70	2.20
Pyrene	2000	2000	ug/Kg	3080	54.00	3280	64.00	16.90
1,2,4-Trichlorobenzene	2000	<200.	ug/Kg	1940	97.00	2080	104.00	6.90
2,4,5-Trichlorophenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2,4,6-Trichlorophenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0

NOTE: Data reported for spiked samples were analyzed in the same batch, but may not necessarily be that of your sample.

NET Cambridge Division
QUALITY CONTROL DATA

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Report Date: 01/29/1993

Matrix Spike/Matrix Spike Duplicate Results

Compound	Spike Amount	Sample Result	Units	MS Result	MS % Recovery	MSD Result	MSD % Recovery	RPD
2-Chlorophenol	3000	<200.	ug/Kg	2780	92.70	3040	101.30	8.80
4-Chlorophenyl-phenylether	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Chrysene	0.0	900	ug/Kg	0.00	0	0.00	0	0
Di-n-Butylphthalate	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Di-n-Octyl Phthalate	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Dibenz(a,h)Anthracene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Dibenzofuran	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
1,2-Dichlorobenzene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
1,3-Dichlorobenzene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
1,4-Dichlorobenzene	2000	<200.	ug/Kg	1800	90.00	1780	89.00	1.10
3,3'-Dichlorobenzidine	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2,4-Dichlorophenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Diethylphthalate	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Dimethyl Phthalate	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2,4-Dimethylphenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
4,6-Dinitro-2-Methylphenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2,4-Dinitrophenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2,4-Dinitrotoluene	2000	<200.	ug/Kg	1140	57.00	1620	81.00	34.80
2,6-Dinitrotoluene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
bis(2-Ethylhexyl)Phthalate	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Fluoranthene	0.0	2000	ug/Kg	0.00	0	0.00	0	0
Fluorene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Hexachlorobenzene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Hexachlorobutadiene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Hexachlorocyclopentadiene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Hexachloroethane	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Indeno(1,2,3-cd)Pyrene	0.0	400	ug/Kg	0.00	0	0.00	0	0
Isophorone	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2-Methylnaphthalene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2-Methylphenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
4-Methylphenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
N-Nitroso-di-n-Propylamine	2000	<200.	ug/Kg	1760	88.00	1760	88.00	0.00
N-Nitrosodimethylamine	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
N-Nitrosodiphenylamine	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Naphthalene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2-Nitroaniline	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
3-Nitroaniline	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
4-Nitroaniline	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Nitrobenzene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2-Nitrophenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
4-Nitrophenol	3000	<200.	ug/Kg	560	18.70	2320	77.30	122.10
Pentachlorophenol	3000	<200.	ug/Kg	760	25.30	2020	67.30	90.70
Phenanthrene	0.0	900	ug/Kg	0.00	0	0.00	0	0

NOTE: Data reported for spiked samples were analyzed in the same batch, but may not necessarily be that of your sample.

NET Cambridge Division
QUALITY CONTROL DATA

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Report Date: 01/29/1993

Matrix Spike/Matrix Spike Duplicate Results

Compound	Spike Amount	Sample Result	Units	MS Result	MS % Recovery	MSD Result	MSD % Recovery	RPD
Hexachlorocyclopentadiene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Hexachloroethane	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Indeno(1,2,3-cd)Pyrene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Isophorone	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2-Methylnaphthalene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2-Methylphenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
4-Methylphenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
N-Nitroso-di-n-Propylamine	50	<200.	ug/Kg	45	90.00	48	96.00	6.50
N-Nitrosodimethylamine	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
N-Nitrosodiphenylamine	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Naphthalene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2-Nitroaniline	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
3-Nitroaniline	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
4-Nitroaniline	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Nitrobenzene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2-Nitrophenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
4-Nitrophenol	75	<200.	ug/Kg	38	50.70	40	53.30	5.00
Pentachlorophenol	75	<200.	ug/Kg	36	48.00	28	37.30	25.10
Phenanthrene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Phenol	75	<200.	ug/Kg	70	93.30	70	93.30	0.00
Pyrene	50	<200.	ug/Kg	59	118.00	52	104.00	12.60
1,2,4-Trichlorobenzene	50	<200.	ug/Kg	48	96.00	47	94.00	2.10
2,4,5-Trichlorophenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2,4,6-Trichlorophenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
TCL Acid/Base/Neutrals 8270 S								
Acenaphthene	2000	<200.	ug/Kg	2000	100.00	2220	111.00	10.40
Acenaphthylene	0.0	200	ug/Kg	0.00	0	0.00	0	0
Anthracene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Benzo(a)Anthracene	0.0	600	ug/Kg	0.00	0	0.00	0	0
Benzo(a)Pyrene	0.0	700	ug/Kg	0.00	0	0.00	0	0
Benzo(b)Fluoranthene	0.0	800	ug/Kg	0.00	0	0.00	0	0
Benzo(g,h,i)Perylene	0.0	400	ug/Kg	0.00	0	0.00	0	0
Benzo(k)Fluoranthene	0.0	700	ug/Kg	0.00	0	0.00	0	0
Benzoic Acid	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Benzyl Alcohol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
4-Bromophenyl-phenylether	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Butylbenzylphthalate	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
4-Chloro-3-Methylphenol	3000	<200.	ug/Kg	2660	88.70	3000	100.00	11.90
4-Chloroaniline	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
bis(2-Chloroethoxy)Methane	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
bis(2-Chloroethyl)Ether	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
bis(2-Chloroisopropyl)Ether	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2-Chloronaphthalene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0

NOTE: Data reported for spiked samples were analyzed in the same batch, but may not necessarily be that of your sample.

NET Cambridge Division
QUALITY CONTROL DATA

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Report Date: 01/29/1993

Matrix Spike/Matrix Spike Duplicate Results

Compound	Spike Amount	Sample Result	Units	MS Result	MS % Recovery	MSD Result	MSD % Recovery	RPD
TCL Acid/Base/Neutrals 8270 S								
Acenaphthene	50	<200.	ug/Kg	52	104.00	50	100.00	3.90
Acenaphthylene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Anthracene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Benzo(a)Anthracene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Benzo(a)Pyrene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Benzo(b)Fluoranthene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Benzo(g,h,i)Perylene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Benzo(k)Fluoranthene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Benzoic Acid	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Benzyl Alcohol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
4-Bromophenyl-phenylether	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Butylbenzylphthalate	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
4-Chloro-3-Methylphenol	75	<200.	ug/Kg	72	96.00	74	98.70	2.80
4-Chloroaniline	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
bis(2-Chloroethoxy)Methane	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
bis(2-Chloroethyl)Ether	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
bis(2-Chloroisopropyl)Ether	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2-Chloronaphthalene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2-Chlorophenol	75	<200.	ug/Kg	73	97.30	74	98.70	1.40
4-Chlorophenyl-phenylether	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Chrysene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Di-n-Butylphthalate	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Di-n-Octyl Phthalate	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Dibenz(a,h)Anthracene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Dibenzofuran	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
1,2-Dichlorobenzene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
1,3-Dichlorobenzene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
1,4-Dichlorobenzene	50	<200.	ug/Kg	45	90.00	48	96.00	6.50
3,3'-Dichlorobenzidine	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2,4-Dichlorophenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Diethylphthalate	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Dimethyl Phthalate	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2,4-Dimethylphenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
4,6-Dinitro-2-Methylphenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2,4-Dinitrophenol	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
2,4-Dinitrotoluene	50	<200.	ug/Kg	30	60.00	30	60.00	0.00
2,6-Dinitrotoluene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
bis(2-Ethylhexyl)Phthalate	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Fluoranthene	0.0	200	ug/Kg	0.00	0	0.00	0	0
Fluorene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Hexachlorobenzene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0
Hexachlorobutadiene	0.0	<200.	ug/Kg	0.00	0	0.00	0	0

NOTE: Data reported for spiked samples were analyzed in the same batch, but may not necessarily be that of your sample.

NET Cambridge Division
QUALITY CONTROL DATA

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Report Date : 01/29/1993

Method Blank Analysis Data

Test Name	Result	Units	Run Batch	Run Date	Analyst Initials
N-Nitrosodiphenylamine	<40	ug/Kg	178	01/26/1993	jcg
Naphthalene	<40	ug/Kg	178	01/26/1993	jcg
Nitrobenzene	<40	ug/Kg	178	01/26/1993	jcg
2-Nitrophenol	<40	ug/Kg	178	01/26/1993	jcg
4-Nitrophenol	<40	ug/Kg	178	01/26/1993	jcg
Pentachlorophenol	<40	ug/Kg	178	01/26/1993	jcg
Phenanthrene	<40	ug/Kg	178	01/26/1993	jcg
Phenol	<40	ug/Kg	178	01/26/1993	jcg
Pyrene	<40	ug/Kg	178	01/26/1993	jcg
1,2,4-Trichlorobenzene	<40	ug/Kg	178	01/26/1993	jcg
2,4,6-Trichlorophenol	<40	ug/Kg	178	01/26/1993	jcg

NET Cambridge Division
QUALITY CONTROL DATA

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Report Date : 01/29/1993

Method Blank Analysis Data

Test Name	Result	Units	Run Batch	Run Date	Analyst Initials
TCL Acid/Base/Neutrals 8270 S					
2-Fluorophenol	80	% recov.	178	01/26/1993	jcg
Phenol-d5	86	% recov.	178	01/26/1993	jcg
2,4,6-Tribromophenol	75	% recov.	178	01/26/1993	jcg
2-Fluorobiphenyl	94	% recov.	178	01/26/1993	jcg
Nitrobenzene-d15	103	% recov.	178	01/26/1993	jcg
p-Terphenyl-d14	105	% recov.	178	01/26/1993	jcg
Acenaphthene	<40	ug/Kg	178	01/26/1993	jcg
Acenaphthylene	<40	ug/Kg	178	01/26/1993	jcg
Anthracene	<40	ug/Kg	178	01/26/1993	jcg
Benzo(a)Anthracene	<40	ug/Kg	178	01/26/1993	jcg
Benzo(a)Pyrene	<40	ug/Kg	178	01/26/1993	jcg
Benzo(b)Fluoranthene	<40	ug/Kg	178	01/26/1993	jcg
Benzo(g,h,i)Perylene	<40	ug/Kg	178	01/26/1993	jcg
Benzo(k)Fluoranthene	<40	ug/Kg	178	01/26/1993	jcg
4-Bromophenyl-phenylether	<40	ug/Kg	178	01/26/1993	jcg
Butylbenzylphthalate	<40	ug/Kg	178	01/26/1993	jcg
4-Chloro-3-Methylphenol	<40	ug/Kg	178	01/26/1993	jcg
bis(2-Chloroethoxy)Methane	<40	ug/Kg	178	01/26/1993	jcg
bis(2-Chloroethyl)Ether	<40	ug/Kg	178	01/26/1993	jcg
bis(2-Chloroisopropyl)Ether	<40	ug/Kg	178	01/26/1993	jcg
2-Chloronaphthalene	<40	ug/Kg	178	01/26/1993	jcg
2-Chlorophenol	<40	ug/Kg	178	01/26/1993	jcg
4-Chlorophenyl-phenylether	<40	ug/Kg	178	01/26/1993	jcg
Chrysene	<40	ug/Kg	178	01/26/1993	jcg
Di-n-Butylphthalate	<40	ug/Kg	178	01/26/1993	jcg
Di-n-Octyl Phthalate	<40	ug/Kg	178	01/26/1993	jcg
Dibenz(a,h)Anthracene	<40	ug/Kg	178	01/26/1993	jcg
1,2-Dichlorobenzene	<40	ug/Kg	178	01/26/1993	jcg
1,3-Dichlorobenzene	<40	ug/Kg	178	01/26/1993	jcg
1,4-Dichlorobenzene	<40	ug/Kg	178	01/26/1993	jcg
3,3'-Dichlorobenzidine	<40	ug/Kg	178	01/26/1993	jcg
2,4-Dichlorophenol	<40	ug/Kg	178	01/26/1993	jcg
Diethylphthalate	<40	ug/Kg	178	01/26/1993	jcg
Dimethyl Phthalate	<40	ug/Kg	178	01/26/1993	jcg
2,4-Dimethylphenol	<40	ug/Kg	178	01/26/1993	jcg
4,6-Dinitro-2-Methylphenol	<40	ug/Kg	178	01/26/1993	jcg
2,4-Dinitrophenol	<40	ug/Kg	178	01/26/1993	jcg
2,4-Dinitrotoluene	<40	ug/Kg	178	01/26/1993	jcg
2,6-Dinitrotoluene	<40	ug/Kg	178	01/26/1993	jcg
bis(2-Ethylhexyl)Phthalate	<40	ug/Kg	178	01/26/1993	jcg
Fluoranthene	<40	ug/Kg	178	01/26/1993	jcg
Fluorene	<40	ug/Kg	178	01/26/1993	jcg
Hexachlorobenzene	<40	ug/Kg	178	01/26/1993	jcg
Hexachlorobutadiene	<40	ug/Kg	178	01/26/1993	jcg
Hexachlorocyclopentadiene	<40	ug/Kg	178	01/26/1993	jcg
Hexachloroethane	<40	ug/Kg	178	01/26/1993	jcg
Indeno(1,2,3-cd)Pyrene	<40	ug/Kg	178	01/26/1993	jcg
Isophorone	<40	ug/Kg	178	01/26/1993	jcg
N-Nitroso-di-n-Propylamine	<40	ug/Kg	178	01/26/1993	jcg
N-Nitrosodimethylamine	<40	ug/Kg	178	01/26/1993	jcg

NET Cambridge Division
QUALITY CONTROL DATA

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Report Date : 01/29/1993

Project: Pre-Test Analyses

Method Blank Analysis Data

Test Name	Result	Units	Run Batch	Run Date	Analyst Initials
TCL Volatiles by GC/MS 8240 S					
Bromofluorobenzene	101	% recov.	307	01/20/1993	mfw
1,2-Dichloroethane-d4	103	% recov.	307	01/20/1993	mfw
Toluene-d8	103	% recov.	307	01/20/1993	mfw
Acetone	<250.	ug/Kg	307	01/20/1993	mfw
Benzene	<250.	ug/Kg	307	01/20/1993	mfw
Bromodichloromethane	<250.	ug/Kg	307	01/20/1993	mfw
Bromoform	<250.	ug/Kg	307	01/20/1993	mfw
Bromomethane	<250.	ug/Kg	307	01/20/1993	mfw
2-Butanone (MEK)	<250.	ug/Kg	307	01/20/1993	mfw
Carbon Disulfide	<250.	ug/Kg	307	01/20/1993	mfw
Carbon Tetrachloride	<250.	ug/Kg	307	01/20/1993	mfw
Chlorobenzene	<250.	ug/Kg	307	01/20/1993	mfw
Chloroethane	<250.	ug/Kg	307	01/20/1993	mfw
2-Chloroethylvinyl ether	<250.	ug/Kg	307	01/20/1993	mfw
Chloroform	<250.	ug/Kg	307	01/20/1993	mfw
Chloromethane	<250.	ug/Kg	307	01/20/1993	mfw
Dibromochloromethane	<250.	ug/Kg	307	01/20/1993	mfw
1,2-Dichlorobenzene	<250.	ug/Kg	307	01/20/1993	mfw
1,3-Dichlorobenzene	<250.	ug/Kg	307	01/20/1993	mfw
1,4-Dichlorobenzene	<250.	ug/Kg	307	01/20/1993	mfw
1,1-Dichloroethane	<250.	ug/Kg	307	01/20/1993	mfw
1,2-Dichloroethane	<250.	ug/Kg	307	01/20/1993	mfw
1,1-Dichloroethene	<250.	ug/Kg	307	01/20/1993	mfw
trans-1,2-Dichloroethene	<250.	ug/Kg	307	01/20/1993	mfw
1,2-Dichloropropane	<250.	ug/Kg	307	01/20/1993	mfw
cis-1,3-Dichloropropene	<250.	ug/Kg	307	01/20/1993	mfw
trans-1,3-Dichloropropene	<250.	ug/Kg	307	01/20/1993	mfw
Ethylbenzene	<250.	ug/Kg	307	01/20/1993	mfw
2-Hexanone	<250.	ug/Kg	307	01/20/1993	mfw
4-Methyl-2-pentanone (MIBK	<250.	ug/Kg	307	01/20/1993	mfw
Methylene Chloride	<250.	ug/Kg	307	01/20/1993	mfw
Styrene	<250.	ug/Kg	307	01/20/1993	mfw
1,1,2,2-Tetrachloroethane	<250.	ug/Kg	307	01/20/1993	mfw
Tetrachloroethene	<250.	ug/Kg	307	01/20/1993	mfw
Toluene	<250.	ug/Kg	307	01/20/1993	mfw
1,1,1-Trichloroethane	<250.	ug/Kg	307	01/20/1993	mfw
1,1,2-Trichloroethane	<250.	ug/Kg	307	01/20/1993	mfw
Trichloroethene	<250.	ug/Kg	307	01/20/1993	mfw
Trichlorofluoromethane	<250.	ug/Kg	307	01/20/1993	mfw
Vinyl Acetate	<250.	ug/Kg	307	01/20/1993	mfw
Vinyl Chloride	<250.	ug/Kg	307	01/20/1993	mfw
m-Xylene	<250.	ug/Kg	307	01/20/1993	mfw
o-Xylene	<250.	ug/Kg	307	01/20/1993	mfw
p-Xylene	<250.	ug/Kg	307	01/20/1993	mfw

NET Cambridge Division
QUALITY CONTROL DATA

Report To: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Report Date : 01/29/1993

Method Blank Analysis Data

Test Name	Result	Units	Run Batch	Run Date	Analyst Initials
TCL Volatiles by GC/MS 8240 S					
Bromofluorobenzene	98	% recov.	306	01/21/1993	dhg
1,2-Dichloroethane-d4	97	% recov.	306	01/21/1993	dhg
Toluene-d8	102	% recov.	306	01/21/1993	dhg
Acetone	680 .	ug/Kg	306	01/21/1993	dhg
Benzene	<250.	ug/Kg	306	01/21/1993	dhg
Bromodichloromethane	<250.	ug/Kg	306	01/21/1993	dhg
Bromoform	<250.	ug/Kg	306	01/21/1993	dhg
Bromomethane	<250.	ug/Kg	306	01/21/1993	dhg
2-Butanone (MEK)	<250.	ug/Kg	306	01/21/1993	dhg
Carbon Disulfide	<250.	ug/Kg	306	01/21/1993	dhg
Carbon Tetrachloride	<250.	ug/Kg	306	01/21/1993	dhg
Chlorobenzene	<250.	ug/Kg	306	01/21/1993	dhg
Chloroethane	<250.	ug/Kg	306	01/21/1993	dhg
2-Chloroethylvinyl ether	<250.	ug/Kg	306	01/21/1993	dhg
Chloroform .	<250.	ug/Kg	306	01/21/1993	dhg
Chloromethane	<250.	ug/Kg	306	01/21/1993	dhg
Dibromochloromethane	<250.	ug/Kg	306	01/21/1993	dhg
1,2-Dichlorobenzene	<250.	ug/Kg	306	01/21/1993	dhg
1,3-Dichlorobenzene	<250.	ug/Kg	306	01/21/1993	dhg
1,4-Dichlorobenzene	<250.	ug/Kg	306	01/21/1993	dhg
1,1-Dichloroethane	<250.	ug/Kg	306	01/21/1993	dhg
1,2-Dichloroethane	<250.	ug/Kg	306	01/21/1993	dhg
1,1-Dichloroethene	<250.	ug/Kg	306	01/21/1993	dhg
trans-1,2-Dichloroethene	<250.	ug/Kg	306	01/21/1993	dhg
1,2-Dichloropropane	<250.	ug/Kg	306	01/21/1993	dhg
cis-1,3-Dichloropropene	<250.	ug/Kg	306	01/21/1993	dhg
trans-1,3-Dichloropropene	<250.	ug/Kg	306	01/21/1993	dhg
Ethylbenzene	<250.	ug/Kg	306	01/21/1993	dhg
2-Hexanone	<250.	ug/Kg	306	01/21/1993	dhg
4-Methyl-2-pentanone (MIBK	<250.	ug/Kg	306	01/21/1993	dhg
Methylene Chloride	<250.	ug/Kg	306	01/21/1993	dhg
Styrene	<250.	ug/Kg	306	01/21/1993	dhg
1,1,2,2-Tetrachloroethane	<250.	ug/Kg	306	01/21/1993	dhg
Tetrachloroethene	<250.	ug/Kg	306	01/21/1993	dhg
Toluene	<250.	ug/Kg	306	01/21/1993	dhg
1,1,1-Trichloroethane	<250.	ug/Kg	306	01/21/1993	dhg
1,1,2-Trichloroethane	<250.	ug/Kg	306	01/21/1993	dhg
Trichloroethene	<250.	ug/Kg	306	01/21/1993	dhg
Trichlorofluoromethane	<250.	ug/Kg	306	01/21/1993	dhg
Vinyl Acetate	<250.	ug/Kg	306	01/21/1993	dhg
Vinyl Chloride	<250.	ug/Kg	306	01/21/1993	dhg
m-Xylene	<250.	ug/Kg	306	01/21/1993	dhg
o-Xylene	<250.	ug/Kg	306	01/21/1993	dhg
p-Xylene	<250.	ug/Kg	306	01/21/1993	dhg

NET Cambridge Division

QUALITY CONTROL DATA

Client: Vapex Environmental Tech

NET Job No: 93.00087

Project: Pre-Test Analyses

Report Date: 01/29/1993

Surrogate Standard Percent Recovery

Abbreviated Surrogate Standard Names:

SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10	SS11	SS12
Bromofl	1,2-Dic	Toluene	2-Fluor	Phenol-	2,4,6-T	2-Fluor	Nitrobe	p-Terph			

			Percent Recovery											
Sample ID	NET ID	Matrix	SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10	SS11	SS12
CONTROL-1	71143	SOIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL			
NUTRIENT-1	71144	SOIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL			
KILLED-1	71145	SOIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL			
COL-2 START	71146	SOIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL			
COL-1 START	71147	SOIL	DIL	DIL	DIL									
OFFSITE-COL-START	71148	SOIL	DIL	DIL	DIL									

Notes:
NR - This surrogate standard is Not Required. Other versions of this test method may use this surrogate standard.
Dil - This surrogate standard was diluted to below detectable levels due to concentrations of analytes in this sample.

Complete Surrogate Standard Names Listed by Analysis:

Pesticide Surrogate Standards:
Decachl = Decachlorobiphenyl
Dibutyl = Dibutylchlorendate
Tetrach = Tetrachloro-m-xylene

Volatile Surrogate Standards:
Bromofl = Bromofluorobenzene
1,2-Dichl = 1,2-Dichloroethane-d4
Toluene = Toluene-d8

Drinking Water Method 524 1,2-Dichl = 1,2-Dichlorobenzene-d4

Semivolatlile Surrogate Standards:
2-Fluor (1st) = 2-Fluorobiphenyl
2-Fluor (2nd) = 2-Fluorophenol
Phenol- = Phenol-d6
Nitrobe = Nitrobenzene-d5
2,4,6-T = 2,4,6-Tribromophenol
p-Terph = p-Terphenyl

Herbicides Surrogate Standard:
2,4-Dic = 2,4-Dichlorophenyl acetic acid

Petroleum Hydrocarbon Fingerprint Surrogate Standard:
2-Fluor = 2-Fluorobiphenyl
para-Te = para-Terphynyl

VAPEX

CHAIN OF CUSTODY RECORD

NATIONAL ENVIRONMENTAL TESTING, INC.

Cambridge Division, 12 Oak Park, Bedford, MA 01730

PROJECT NAME WAR - Column
COMPANY Envirogen
ADDRESS 4100 Quakerbridge Lawrenceville NJ 08648
PHONE (609) 936-9300

SAMPLED BY GEORGE LATHAM (Print Name) Signature
(Print Name) Signature

SAMPLE NO.	DATE	TIME	SAMPLE LOCATION	CONTAINER SIZE	CONTAINER Q/P	GRAB	COMP	NO. OF CONTAINERS	SAMPLE MATRIX	PRESERVATIVE	ANALYSES								COMMENTS
1	1/15/92	11:00	Control - 1	125				1	So.	vapr.	X								SW846-8240
2			Nutrient - 1	125				1			X								
3			Killed - 1	125				1			X								
1			Control - 1	500				1				X							SW846-8270
2			Nutrient - 1	500				1				X							
3			Killed - 1	500				1				X							

Relinquished by	Date / Time	Received by	Relinquished by	Date / Time	Received by
[signature]	1/15/92 1300hrs			1/15 10:30	[signature]
Relinquished by	Date / Time	Received by	Relinquished by	Date / Time	Received for Laboratory by

Method of Shipment FEDEX

Remarks: VAPEX PO # 1328

PT 1 ORIGINAL PT 2 NET Project Manager - Yellow PT 3 Customer Copy - Pink

ANALYTICAL REPORT

Report To:	Mr. John Polonsky Vapex Environmental Tech 480 Neponset Street Canton, MA 02021
Project:	Envirogen Post-Test

03/09/1993

NET Job Number: 93.00525

National Environmental Testing

NET Atlantic, Inc.
Cambridge Division
12 Oak Park
Bedford, MA 01730

NET Cambridge Division

ANALYTICAL REPORT

Report To:	Reported By:
Mr. John Polonsky Vapex Environmental Tech 480 Neponset Street Canton, MA 02021	National Environmental Testing NET Atlantic, Incorporated Cambridge Division 12 Oak Park Bedford, MA 01730

Report Date: 03/09/1993 | Collected By: Clifton Chunn | NET Job Number: 93.00525

Project: Envirogen | Shipped Via: UPS | Client P.O. No:

Job Description: Envirogen | Airbill No: 02618636556 | NET Client No: 79670

This report has been approved and certified for release by the following staff. Please feel free to call the NET Project Manager at 617-275-3535 with any questions or comments.

Edward A. Lawler
NET Project Manager

Michael F. Delaney, Ph.D.
Laboratory Director

Analytical data for the following samples are included in this data report.

SAMPLE ID	NET ID	DATE TAKEN	TIME TAKEN	DATE REC'D	MATRIX
NURTIENT	72377	02/25/1993		02/26/1993	SOIL
CONTROL	72378	02/25/1993		02/26/1993	SOIL
KILLED	72379	02/25/1993		02/26/1993	SOIL

Post-Test Analyses

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 03/09/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00525

Project: Envirogen

Date Rec'd: 02/26/1993

Sample ID: KILLED

NET Sample No: 72379

Parameter		Result	Units	Analysis Date	Analyst
EX Acid/Base/Neutrals 8270	S	03/01/1993	date	03/01/1993	ljs

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 03/09/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00525

Project: Envirogen

Date Rec'd: 02/26/1993

Sample ID: NURTIENT

NET Sample No: 72377

Parameter	Result		Units	Analysis Date	Analyst
TCL Volatiles by GC/MS 8240 S					
Acetone	<8600.		ug/Kg	03/05/1993	mfw
Benzene	<8600.		ug/Kg		
Bromodichloromethane	<8600.		ug/Kg		
Bromoform	<8600.		ug/Kg		
Bromomethane	<8600.		ug/Kg		
2-Butanone (MEK)	<8600.		ug/Kg		
Carbon Disulfide	<8600.		ug/Kg		
Carbon Tetrachloride	<8600.		ug/Kg		
Chlorobenzene	<8600.		ug/Kg		
Chloroethane	<8600.		ug/Kg		
2-Chloroethylvinyl ether	<8600.		ug/Kg		
Chloroform	<8600.		ug/Kg		
Chloromethane	<8600.		ug/Kg		
Dibromochloromethane	<8600.		ug/Kg		
1,2-Dichlorobenzene	14000		ug/Kg		
1,3-Dichlorobenzene	<8600.		ug/Kg		
1,4-Dichlorobenzene	<8600.		ug/Kg		
1,1-Dichloroethane	<8600.		ug/Kg		
1,2-Dichloroethane	<8600.		ug/Kg		
1,1-Dichloroethene	<8600.		ug/Kg		
trans-1,2-Dichloroethene	<8600.		ug/Kg		
1,2-Dichloropropane	<8600.		ug/Kg		
cis-1,3-Dichloropropene	<8600.		ug/Kg		
trans-1,3-Dichloropropene	<8600.		ug/Kg		
Ethylbenzene	<8600.		ug/Kg		
2-Hexanone	<8600.		ug/Kg		
4-Methyl-2-pentanone (MIBK	<8600.		ug/Kg		
Methylene Chloride	<8600.		ug/Kg		
Styrene	<8600.		ug/Kg		
1,1,2,2-Tetrachloroethane	<8600.		ug/Kg		
Tetrachloroethene	26000		ug/Kg		
Toluene	<8600.		ug/Kg		
1,1,1-Trichloroethane	<8600.		ug/Kg		
1,1,2-Trichloroethane	<8600.		ug/Kg		
Trichloroethene	<8600.		ug/Kg		
Trichlorofluoromethane	<8600.		ug/Kg		
Vinyl Acetate	<8600.		ug/Kg		
Vinyl Chloride	<8600.		ug/Kg		
m-Xylene	18000	*	ug/Kg		
o-Xylene	310000		ug/Kg		
p-Xylene	<8600.	*	ug/Kg		

* M and P xylenes co-elute. The reported result is either one, the other or a combination of the two isomers.

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 03/09/1993

:port To: Vapex Environmental Tech

NET Job No: 93.00525

-oject: Envirogen

Date Rec'd: 02/26/1993

Sample ID: NURTIENT

ET Sample No: 72377

Parameter	Result	Units	Analysis Date	Analyst
TCL Acid/Base/Neutrals 8270 S				
Acenaphthene	<7000	ug/Kg	03/08/1993	cdl
Acenaphthylene	<7000	ug/Kg		
Anthracene	<7000	ug/Kg		
Benzo(a)Anthracene	<7000	ug/Kg		
Benzo(a)Pyrene	<7000	ug/Kg		
Benzo(b)Fluoranthene	<7000	ug/Kg		
Benzo(g,h,i)Perylene	<7000	ug/Kg		
Benzo(k)Fluoranthene	<7000	ug/Kg		
Benzoic Acid	<7000	ug/Kg		
Benzyl Alcohol	7000	ug/Kg		
4-Bromophenyl-phenylether	<7000	ug/Kg		
Butylbenzylphthalate	20000	ug/Kg		
4-Chloro-3-Methylphenol	<7000	ug/Kg		
4-Chloroaniline	<7000	ug/Kg		
bis(2-Chloroethoxy)Methane	<7000	ug/Kg		
bis(2-Chloroethyl)Ether	<7000	ug/Kg		
bis(2-Chloroisopropyl)Ether	<7000	ug/Kg		
2-Chloronaphthalene	<7000	ug/Kg		
2-Chlorophenol	<7000	ug/Kg		
4-Chlorophenyl-phenylether	<7000	ug/Kg		
Chrysene	<7000	ug/Kg		
Di-n-Butylphthalate	55000	ug/Kg		
Di-n-Octyl Phthalate	<7000	ug/Kg		
Dibenz(a,h)Anthracene	<7000	ug/Kg		
Dibenzofuran	<7000	ug/Kg		
1,2-Dichlorobenzene	20000	ug/Kg		
1,3-Dichlorobenzene	<7000	ug/Kg		
1,4-Dichlorobenzene	<7000	ug/Kg		
3,3'-Dichlorobenzidine	<7000	ug/Kg		
2,4-Dichlorophenol	<7000	ug/Kg		
Diethylphthalate	<7000	ug/Kg		
Dimethyl Phthalate	<7000	ug/Kg		
2,4-Dimethylphenol	<7000	ug/Kg		
4,6-Dinitro-2-Methylphenol	<7000	ug/Kg		
2,4-Dinitrophenol	<7000	ug/Kg		
2,4-Dinitrotoluene	<7000	ug/Kg		
2,6-Dinitrotoluene	<7000	ug/Kg		
bis(2-Ethylhexyl)Phthalate	70000	ug/Kg		
Fluoranthene	<7000	ug/Kg		
Fluorene	<7000	ug/Kg		
Hexachlorobenzene	<7000	ug/Kg		
Hexachlorobutadiene	<7000	ug/Kg		
Hexachlorocyclopentadiene	<7000	ug/Kg		
Hexachloroethane	<7000	ug/Kg		
Indeno(1,2,3-cd)Pyrene	<7000	ug/Kg		
Isophorone	50000	ug/Kg		
2-Methylnaphthalene	66000	ug/Kg		

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 03/09/1993

Report To: Vapex Environmental Tech

Project: Envirogen

NET Job No: 93.00525

Date Rec'd: 02/26/1993

Sample ID: NURTIENT

NET Sample No: 72377

Parameter	Result	Units	Analysis Date	Analyst
2-Methylphenol	<7000	ug/Kg	03/08/1993	cdl
4-Methylphenol	<7000	ug/Kg		
N-Nitroso-di-n-Propylamine	<7000	ug/Kg		
N-Nitrosodimethylamine	<7000	ug/Kg		
N-Nitrosodiphenylamine	<7000	ug/Kg		
Naphthalene	140000	ug/Kg		
2-Nitroaniline	<7000	ug/Kg		
3-Nitroaniline	<7000	ug/Kg		
4-Nitroaniline	<7000	ug/Kg		
Nitrobenzene	<7000	ug/Kg		
2-Nitrophenol	<7000	ug/Kg		
4-Nitrophenol	<7000	ug/Kg		
Pentachlorophenol	<7000	ug/Kg		
Phenanthrene	<7000	ug/Kg		
Phenol	<7000	ug/Kg		
Pyrene	<7000	ug/Kg		
1,2,4-Trichlorobenzene	<7000	ug/Kg		
2,4,5-Trichlorophenol	<7000	ug/Kg		
2,4,6-Trichlorophenol	<7000	ug/Kg		

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 03/09/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00525

Project: Envirogen

Date Rec'd: 02/26/1993

Sample ID: CONTROL

NET Sample No: 72378

Parameter	Result		Units	Analysis Date	Analyst
TCL Volatiles by GC/MS 8240 S					
Acetone	<18000.		ug/Kg	03/05/1993	mfw
Benzene	<18000.		ug/Kg		
Bromodichloromethane	<18000.		ug/Kg		
Bromoform	<18000.		ug/Kg		
Bromomethane	<18000.		ug/Kg		
2-Butanone (MEK)	<18000.		ug/Kg		
Carbon Disulfide	<18000.		ug/Kg		
Carbon Tetrachloride	<18000.		ug/Kg		
Chlorobenzene	<18000.		ug/Kg		
Chloroethane	<18000.		ug/Kg		
2-Chloroethylvinyl ether	<18000.		ug/Kg		
Chloroform	<18000.		ug/Kg		
Chloromethane	<18000.		ug/Kg		
Dibromochloromethane	<18000.		ug/Kg		
1,2-Dichlorobenzene	22000		ug/Kg		
1,3-Dichlorobenzene	<18000.		ug/Kg		
1,4-Dichlorobenzene	<18000.		ug/Kg		
1,1-Dichloroethane	<18000.		ug/Kg		
1,2-Dichloroethane	<18000.		ug/Kg		
1,1-Dichloroethene	<18000.		ug/Kg		
trans-1,2-Dichloroethene	<18000.		ug/Kg		
1,2-Dichloropropane	<18000.		ug/Kg		
cis-1,3-Dichloropropene	<18000.		ug/Kg		
trans-1,3-Dichloropropene	<18000.		ug/Kg		
Ethylbenzene	160000		ug/Kg		
2-Hexanone	<18000.		ug/Kg		
4-Methyl-2-pentanone (MIBK	<18000.		ug/Kg		
Methylene Chloride	<18000.		ug/Kg		
Styrene	<18000.		ug/Kg		
1,1,2,2-Tetrachloroethane	<18000.		ug/Kg		
Tetrachloroethene	110000		ug/Kg		
Toluene	<18000.		ug/Kg		
1,1,1-Trichloroethane	<18000.		ug/Kg		
1,1,2-Trichloroethane	<18000.		ug/Kg		
Trichloroethene	<18000.		ug/Kg		
Trichlorofluoromethane	<18000.		ug/Kg		
Vinyl Acetate	<18000.		ug/Kg		
Vinyl Chloride	<18000.		ug/Kg		
m-Xylene	88000	*	ug/Kg		
o-Xylene	680000		ug/Kg		
p-Xylene	<18000.	*	ug/Kg		

* M and P xylenes co-elute. The reported result is either one, the other or a combination of the two isomers.

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 03/09/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00525

Project: Envirogen

Date Rec'd: 02/26/1993

Sample ID: CONTROL

NET Sample No: 72378

Parameter	Result	Units	Analysis Date	Analyst
TCL Acid/Base/Neutrals 8270 S				
Acenaphthene	<7000	ug/Kg	03/05/1993	cdl
Acenaphthylene	<7000	ug/Kg		
Anthracene	<7000	ug/Kg		
Benzo(a)Anthracene	<7000	ug/Kg		
Benzo(a)Pyrene	<7000	ug/Kg		
Benzo(b)Fluoranthene	<7000	ug/Kg		
Benzo(g,h,i)Perylene	<7000	ug/Kg		
Benzo(k)Fluoranthene	<7000	ug/Kg		
Benzoic Acid	<7000	ug/Kg		
Benzyl Alcohol	<7000	ug/Kg		
4-Bromophenyl-phenylether	<7000	ug/Kg		
Butylbenzylphthalate	60000	ug/Kg		
4-Chloro-3-Methylphenol	<7000	ug/Kg		
4-Chloroaniline	<7000	ug/Kg		
bis(2-Chloroethoxy)Methane	<7000	ug/Kg		
bis(2-Chloroethyl)Ether	<7000	ug/Kg		
bis(2-Chloroisopropyl)Ether	<7000	ug/Kg		
2-Chloronaphthalene	<7000	ug/Kg		
2-Chlorophenol	<7000	ug/Kg		
4-Chlorophenyl-phenylether	<7000	ug/Kg		
Chrysene	<7000	ug/Kg		
Di-n-Butylphthalate	240000	ug/Kg		
Di-n-Octyl Phthalate	<7000	ug/Kg		
Dibenz(a,h)Anthracene	<7000	ug/Kg		
Dibenzofuran	<7000	ug/Kg		
1,2-Dichlorobenzene	20000	ug/Kg		
1,3-Dichlorobenzene	<7000	ug/Kg		
1,4-Dichlorobenzene	<7000	ug/Kg		
3,3'-Dichlorobenzidine	<7000	ug/Kg		
2,4-Dichlorophenol	<7000	ug/Kg		
Diethylphthalate	<7000	ug/Kg		
Dimethyl Phthalate	20000	ug/Kg		
2,4-Dimethylphenol	<7000	ug/Kg		
4,6-Dinitro-2-Methylphenol	<7000	ug/Kg		
2,4-Dinitrophenol	<7000	ug/Kg		
2,4-Dinitrotoluene	<7000	ug/Kg		
2,6-Dinitrotoluene	<7000	ug/Kg		
bis(2-Ethylhexyl)Phthalate	670000	ug/Kg		
Fluoranthene	<7000	ug/Kg		
Fluorene	<7000	ug/Kg		
Hexachlorobenzene	<7000	ug/Kg		
Hexachlorobutadiene	<7000	ug/Kg		
Hexachlorocyclopentadiene	<7000	ug/Kg		
Hexachloroethane	<7000	ug/Kg		
Indeno(1,2,3-cd)Pyrene	<7000	ug/Kg		
Isophorone	120000	ug/Kg		
2-Methylnaphthalene	84000	ug/Kg		

NET Cambridge Division
ANALYTICAL REPORT

port Date: 03/09/1993

eport To: Vapex Environmental Tech

NET Job No: 93.00525

oject: Envirogen

Date Rec'd: 02/26/1993

ample ID: CONTROL

ET Sample No: 72378

Parameter	Result	Units	Analysis Date	Analyst
2-Methylphenol	<7000	ug/Kg		
4-Methylphenol	<7000	ug/Kg	03/05/1993	cdl
N-Nitroso-di-n-Propylamine	<7000	ug/Kg		
N-Nitrosodimethylamine	<7000	ug/Kg		
N-Nitrosodiphenylamine	<7000	ug/Kg		
Naphthalene	210000	ug/Kg		
2-Nitroaniline	<7000	ug/Kg		
3-Nitroaniline	<7000	ug/Kg		
4-Nitroaniline	<7000	ug/Kg		
Nitrobenzene	<7000	ug/Kg		
2-Nitrophenol	<7000	ug/Kg		
4-Nitrophenol	<7000	ug/Kg		
Pentachlorophenol	<7000	ug/Kg		
Phenanthrene	<7000	ug/Kg		
Phenol	<7000	ug/Kg		
Pyrene	<7000	ug/Kg		
1,2,4-Trichlorobenzene	<7000	ug/Kg		
2,4,5-Trichlorophenol	<7000	ug/Kg		
2,4,6-Trichlorophenol	<7000	ug/Kg		

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 03/09/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00525

Project: Envirogen

Date Rec'd: 02/26/1993

Sample ID: KILLED

NET Sample No: 72379

Parameter	Result		Units	Analysis Date	Analyst
TCL Volatiles by GC/MS 8240 S					
Acetone	<17000.		ug/Kg	03/05/1993	mfw
Benzene	<17000.		ug/Kg		
Bromodichloromethane	<17000.		ug/Kg		
Bromoform	<17000.		ug/Kg		
Bromomethane	<17000.		ug/Kg		
2-Butanone (MEK)	<17000.		ug/Kg		
Carbon Disulfide	<17000.		ug/Kg		
Carbon Tetrachloride	<17000.		ug/Kg		
Chlorobenzene	<17000.		ug/Kg		
Chloroethane	<17000.		ug/Kg		
2-Chloroethylvinyl ether	<17000.		ug/Kg		
Chloroform	<17000.		ug/Kg		
Chloromethane	<17000.		ug/Kg		
Dibromochloromethane	<17000.		ug/Kg		
1,2-Dichlorobenzene	<17000.		ug/Kg		
1,3-Dichlorobenzene	<17000.		ug/Kg		
1,4-Dichlorobenzene	<17000.		ug/Kg		
1,1-Dichloroethane	<17000.		ug/Kg		
1,2-Dichloroethane	<17000.		ug/Kg		
1,1-Dichloroethene	<17000.		ug/Kg		
trans-1,2-Dichloroethene	<17000.		ug/Kg		
1,2-Dichloropropane	<17000.		ug/Kg		
cis-1,3-Dichloropropene	<17000.		ug/Kg		
trans-1,3-Dichloropropene	<17000.		ug/Kg		
Ethylbenzene	360000		ug/Kg		
2-Hexanone	<17000.		ug/Kg		
4-Methyl-2-pentanone (MIBK	19000		ug/Kg		
Methylene Chloride	<17000.		ug/Kg		
Styrene	<17000.		ug/Kg		
1,1,2,2-Tetrachloroethane	<17000.		ug/Kg		
Tetrachloroethene	<17000.		ug/Kg		
Toluene	370000		ug/Kg		
1,1,1-Trichloroethane	<17000.		ug/Kg		
1,1,2-Trichloroethane	<17000.		ug/Kg		
Trichloroethene	<17000.		ug/Kg		
Trichlorofluoromethane	<17000.		ug/Kg		
Vinyl Acetate	<17000.		ug/Kg		
Vinyl Chloride	<17000.		ug/Kg		
m-Xylene	1300000	*	ug/Kg		
o-Xylene	630000		ug/Kg		
p-Xylene	<17000.	*	ug/Kg		

* M and P xylenes co-elute. The reported result is either one, the other or a combination of the two isomers.

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 03/09/1993

Report To: Vapex Environmental Tech

NET Job No: 93.00525

Project: Envirogen

Date Rec'd: 02/26/1993

Sample ID: KILLED

NET Sample No: 72379

Parameter	Result	Units	Analysis Date	Analyst
TCL Acid/Base/Neutrals 8270 S				
Acenaphthene	<7000.	ug/Kg	03/05/1993	cdl
Acenaphthylene	<7000.	ug/Kg		
Anthracene	<7000.	ug/Kg		
Benzo(a)Anthracene	<7000.	ug/Kg		
Benzo(a)Pyrene	<7000.	ug/Kg		
Benzo(b)Fluoranthene	<7000.	ug/Kg		
Benzo(g,h,i)Perylene	<7000.	ug/Kg		
Benzo(k)Fluoranthene	<7000.	ug/Kg		
Benzoic Acid	<7000.	ug/Kg		
Benzyl Alcohol	<7000.	ug/Kg		
4-Bromophenyl-phenylether	<7000.	ug/Kg		
Butylbenzylphthalate	79000	ug/Kg		
4-Chloro-3-Methylphenol	<7000.	ug/Kg		
4-Chloroaniline	<7000.	ug/Kg		
bis(2-Chloroethoxy)Methane	<7000.	ug/Kg		
bis(2-Chloroethyl)Ether	<7000.	ug/Kg		
bis(2-Chloroisopropyl)Ether	<7000.	ug/Kg		
2-Chloronaphthalene	<7000.	ug/Kg		
2-Chlorophenol	<7000.	ug/Kg		
4-Chlorophenyl-phenylether	<7000.	ug/Kg		
Chrysene	<7000.	ug/Kg		
Di-n-Butylphthalate	350000	ug/Kg		
Di-n-Octyl Phthalate	8000	ug/Kg		
Dibenz(a,h)Anthracene	<7000.	ug/Kg		
Dibenzofuran	<7000.	ug/Kg		
1,2-Dichlorobenzene	20000	ug/Kg		
1,3-Dichlorobenzene	<7000.	ug/Kg		
1,4-Dichlorobenzene	<7000.	ug/Kg		
3,3'-Dichlorobenzidine	<7000.	ug/Kg		
2,4-Dichlorophenol	<7000.	ug/Kg		
Diethylphthalate	<7000.	ug/Kg		
Dimethyl Phthalate	40000	ug/Kg		
2,4-Dimethylphenol	30000	ug/Kg		
4,6-Dinitro-2-Methylphenol	<7000.	ug/Kg		
2,4-Dinitrophenol	<7000.	ug/Kg		
2,4-Dinitrotoluene	<7000.	ug/Kg		
2,6-Dinitrotoluene	<7000.	ug/Kg		
bis(2-Ethylhexyl)Phthalate	760000	ug/Kg		
Fluoranthene	<7000.	ug/Kg		
Fluorene	<7000.	ug/Kg		
Hexachlorobenzene	<7000.	ug/Kg		
Hexachlorobutadiene	<7000.	ug/Kg		
Hexachlorocyclopentadiene	<7000.	ug/Kg		
Hexachloroethane	<7000.	ug/Kg		
Indeno(1,2,3-cd)Pyrene	<7000.	ug/Kg		
Isophorone	130000	ug/Kg		
2-Methylnaphthalene	92000	ug/Kg		

NET Cambridge Division
ANALYTICAL REPORT

Report Date: 03/09/1993

Report To: Vapex Environmental Tech

Project: Envirogen

NET Job No: 93.00525

Date Rec'd: 02/26/1993

Sample ID: KILLED

NET Sample No: 72379

Parameter	Result	Units	Analysis Date	Analyst
2-Methylphenol	<7000.	ug/Kg		
4-Methylphenol	<7000	ug/Kg	03/05/1993	cdl
N-Nitroso-di-n-Propylamine	<7000.	ug/Kg		
N-Nitrosodimethylamine	<7000.	ug/Kg		
N-Nitrosodiphenylamine	<7000.	ug/Kg		
Naphthalene	230000	ug/Kg		
2-Nitroaniline	<7000.	ug/Kg		
3-Nitroaniline	<7000.	ug/Kg		
4-Nitroaniline	<7000.	ug/Kg		
Nitrobenzene	<7000.	ug/Kg		
2-Nitrophenol	<7000.	ug/Kg		
4-Nitrophenol	<7000.	ug/Kg		
Pentachlorophenol	<7000.	ug/Kg		
Phenanthrene	<7000.	ug/Kg		
Phenol	20000	ug/Kg		
Pyrene	<7000.	ug/Kg		
1,2,4-Trichlorobenzene	<7000.	ug/Kg		
2,4,5-Trichlorophenol	<7000.	ug/Kg		
2,4,6-Trichlorophenol	<7000.	ug/Kg		

NET Cambridge Division

QUALITY CONTROL DATA

Client: Vapex Environmental Tech

NET Job No: 93.00525

Project: Envirogen

Report Date: 03/09/1993

Surrogate Standard Percent Recovery

Abbreviated Surrogate Standard Names:

SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10	SS11	SS12
Bromofl	1,2-Dic	Toluene	2-Fluor	Phenol-	2,4,6-T	2-Fluor	Nitrobe	p-Terph			

			Percent Recovery											
Sample ID	NET ID	Matrix	SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9	SS10	SS11	SS12
NURTIENT	72377	SOIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL			
CONTROL	72378	SOIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL			
KILLED	72379	SOIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL	DIL			

Notes:

NR - This surrogate standard is Not Required. Other versions of this test method may use this surrogate standard.

Dil - This surrogate standard was diluted to below detectable levels due to concentrations of analytes in this sample.

Complete Surrogate Standard Names Listed by Analysis:

Pesticide Surrogate Standards:

Decachl = Decachlorobiphenyl Dibutyl = Dibutylchlorendate Tetrach = Tetrachloro-m-xylene

Volatile Surrogate Standards:

Bromofl = Bromofluorobenzene 1,2-Dichl = 1,2-Dichloroethane-d4 Toluene = Toluene-d8

Drinking Water Method 524 1,2-Dichl = 1,2-Dichlorobenzene-d4

Semivolatile Surrogate Standards:

2-Fluor (1st) = 2-Fluorobiphenyl Phenol- = Phenol-d6 2,4,6-T = 2,4,6-Tribromophenol

2-Fluor (2nd) = 2-Fluorophenol Nitrobe = Nitrobenzene-d5 p-Terph = p-Terphenyl

Herbicides Surrogate Standard:

2,4-Dic = 2,4-Dichlorophenyl acetic acid

Petroleum Hydrocarbon Fingerprint Surrogate Standard:

2-Fluor = 2-Fluorobiphenyl para-Te = para-Terphynyl

NET Cambridge Division
QUALITY CONTROL DATA

Report To: Vapex Environmental Tech

NET Job No: 93.00525

Project: Envirogen

Report Date : 03/09/1993

Method Blank Analysis Data

Test Name	Result	Units	Run Batch	Run Date	Analyst Initials
TCL Volatiles by GC/MS 8240 S					
Bromofluorobenzene	106	% recov.	320	03/04/1993	mfw
1,2-Dichloroethane-d4	94	% recov.	320	03/04/1993	mfw
Toluene-d8	106	% recov.	320	03/04/1993	mfw
Acetone	<250.	ug/Kg	320	03/04/1993	mfw
Benzene	<250.	ug/Kg	320	03/04/1993	mfw
Bromodichloromethane	<250.	ug/Kg	320	03/04/1993	mfw
Bromoform	<250.	ug/Kg	320	03/04/1993	mfw
Bromomethane	<250.	ug/Kg	320	03/04/1993	mfw
2-Butanone (MEK)	<250.	ug/Kg	320	03/04/1993	mfw
Carbon Disulfide	<250.	ug/Kg	320	03/04/1993	mfw
Carbon Tetrachloride	<250.	ug/Kg	320	03/04/1993	mfw
Chlorobenzene	<250.	ug/Kg	320	03/04/1993	mfw
Chloroethane	<250.	ug/Kg	320	03/04/1993	mfw
2-Chloroethylvinyl ether	<250.	ug/Kg	320	03/04/1993	mfw
Chloroform	<250.	ug/Kg	320	03/04/1993	mfw
Chloromethane	<250.	ug/Kg	320	03/04/1993	mfw
Dibromochloromethane	<250.	ug/Kg	320	03/04/1993	mfw
1,2-Dichlorobenzene	<250.	ug/Kg	320	03/04/1993	mfw
1,3-Dichlorobenzene	<250.	ug/Kg	320	03/04/1993	mfw
1,4-Dichlorobenzene	<250.	ug/Kg	320	03/04/1993	mfw
1,1-Dichloroethane	<250.	ug/Kg	320	03/04/1993	mfw
1,2-Dichloroethane	<250.	ug/Kg	320	03/04/1993	mfw
1,1-Dichloroethene	<250.	ug/Kg	320	03/04/1993	mfw
trans-1,2-Dichloroethene	<250.	ug/Kg	320	03/04/1993	mfw
1,2-Dichloropropane	<250.	ug/Kg	320	03/04/1993	mfw
cis-1,3-Dichloropropene	<250.	ug/Kg	320	03/04/1993	mfw
trans-1,3-Dichloropropene	<250.	ug/Kg	320	03/04/1993	mfw
Ethylbenzene	<250.	ug/Kg	320	03/04/1993	mfw
2-Hexanone	<250.	ug/Kg	320	03/04/1993	mfw
4-Methyl-2-pentanone (MIBK	<250.	ug/Kg	320	03/04/1993	mfw
Methylene Chloride	<250.	ug/Kg	320	03/04/1993	mfw
Styrene	<250.	ug/Kg	320	03/04/1993	mfw
1,1,2,2-Tetrachloroethane	<250.	ug/Kg	320	03/04/1993	mfw
Tetrachloroethene	<250.	ug/Kg	320	03/04/1993	mfw
Toluene	<250.	ug/Kg	320	03/04/1993	mfw
1,1,1-Trichloroethane	<250.	ug/Kg	320	03/04/1993	mfw
1,1,2-Trichloroethane	<250.	ug/Kg	320	03/04/1993	mfw
Trichloroethene	<250.	ug/Kg	320	03/04/1993	mfw
Trichlorofluoromethane	<250.	ug/Kg	320	03/04/1993	mfw
Vinyl Acetate	<250.	ug/Kg	320	03/04/1993	mfw
Vinyl Chloride	<250.	ug/Kg	320	03/04/1993	mfw
m-Xylene	<250.	ug/Kg	320	03/04/1993	mfw
o-Xylene	<250.	ug/Kg	320	03/04/1993	mfw
p-Xylene	<250.	ug/Kg	320	03/04/1993	mfw

NET Cambridge Division
QUALITY CONTROL DATA

Report To: Vapex Environmental Tech

NET Job No: 93.00525

Project: Envirogen

Report Date : 03/09/1993

Method Blank Analysis Data

Test Name	Result	Units	Run Batch	Run Date	Analyst Initials
TCL Acid/Base/Neutrals 8270 S					
2-Fluorophenol	88	% recov.	186	03/05/1993	cdl
Phenol-d5	92	% recov.	186	03/05/1993	cdl
2,4,6-Tribromophenol	98	% recov.	186	03/05/1993	cdl
2-Fluorobiphenyl	98	% recov.	186	03/05/1993	cdl
Nitrobenzene-d15	94	% recov.	186	03/05/1993	cdl
p-Terphenyl-d14	107	% recov.	186	03/05/1993	cdl
Acenaphthene	<40	ug/Kg	186	03/05/1993	cdl
Acenapnthylene	<40	ug/Kg	186	03/05/1993	cdl
Anthracene	<40	ug/Kg	186	03/05/1993	cdl
Benzo(a)Anthracene	<40	ug/Kg	186	03/05/1993	cdl
Benzo(a)Pyrene	<40	ug/Kg	186	03/05/1993	cdl
Benzo(b)Fluoranthene	<40	ug/Kg	186	03/05/1993	cdl
Benzo(g,h,i)Perylene	<40	ug/Kg	186	03/05/1993	cdl
Benzo(k)Fluoranthene	<40	ug/Kg	186	03/05/1993	cdl
4-Bromophenyl-phenylether	<40	ug/Kg	186	03/05/1993	cdl
Butylbenzylphthalate	<40	ug/Kg	186	03/05/1993	cdl
4-Chloro-3-Methylphenol	<40	ug/Kg	186	03/05/1993	cdl
bis(2-Chloroethoxy)Methane	<40	ug/Kg	186	03/05/1993	cdl
bis(2-Chloroethyl)Ether	<40	ug/Kg	186	03/05/1993	cdl
bis(2-Chloroisopropyl)Ether	<40	ug/Kg	186	03/05/1993	cdl
2-Chloronaphthalene	<40	ug/Kg	186	03/05/1993	cdl
2-Chlorophenol	<40	ug/Kg	186	03/05/1993	cdl
4-Chlorophenyl-phenylether	<40	ug/Kg	186	03/05/1993	cdl
Chrysene	<40	ug/Kg	186	03/05/1993	cdl
Di-n-Butylphthalate	100	ug/Kg	186	03/05/1993	cdl
Di-n-Octyl Phthalate	<40	ug/Kg	186	03/05/1993	cdl
Dibenz(a,h)Anthracene	<40	ug/Kg	186	03/05/1993	cdl
1,2-Dichlorobenzene	<40	ug/Kg	186	03/05/1993	cdl
1,3-Dichlorobenzene	<40	ug/Kg	186	03/05/1993	cdl
1,4-Dichlorobenzene	<40	ug/Kg	186	03/05/1993	cdl
3,3'-Dichlorobenzidine	<40	ug/Kg	186	03/05/1993	cdl
2,4-Dichlorophenol	<40	ug/Kg	186	03/05/1993	cdl
Diethylphthalate	<40	ug/Kg	186	03/05/1993	cdl
Dimethyl Phthalate	<40	ug/Kg	186	03/05/1993	cdl
2,4-Dimethylphenol	<40	ug/Kg	186	03/05/1993	cdl
4,6-Dinitro-2-Methylphenol	<40	ug/Kg	186	03/05/1993	cdl
2,4-Dinitrophenol	<40	ug/Kg	186	03/05/1993	cdl
2,4-Dinitrotoluene	<40	ug/Kg	186	03/05/1993	cdl
2,6-Dinitrotoluene	<40	ug/Kg	186	03/05/1993	cdl
bis(2-Ethylhexyl)Phthalate	<40	ug/Kg	186	03/05/1993	cdl
Fluoranthene	<40	ug/Kg	186	03/05/1993	cdl
Fluorene	<40	ug/Kg	186	03/05/1993	cdl
Hexachlorobenzene	<40	ug/Kg	186	03/05/1993	cdl
Hexachlorobutadiene	<40	ug/Kg	186	03/05/1993	cdl
Hexachlorocyclopentadiene	<40	ug/Kg	186	03/05/1993	cdl
Hexachloroethane	<40	ug/Kg	186	03/05/1993	cdl
Indeno(1,2,3-cd)Pyrene	<40	ug/Kg	186	03/05/1993	cdl
Isophorone	<40	ug/Kg	186	03/05/1993	cdl
N-Nitroso-di-n-Propylamine	<40	ug/Kg	186	03/05/1993	cdl
N-Nitrosodimethylamine	<40	ug/Kg	186	03/05/1993	cdl

NET Cambridge Division
QUALITY CONTROL DATA

Report To: Vapex Environmental Tech

NET Job No: 93.00525

Project: Envirogen

Report Date : 03/09/1993

Method Blank Analysis Data

Test Name	Result	Units	Run Batch	Run Date	Analyst Initials
N-Nitrosodiphenylamine	<40	ug/Kg	186	03/05/1993	cdl
Naphthalene	<40	ug/Kg	186	03/05/1993	cdl
Nitrobenzene	<40	ug/Kg	186	03/05/1993	cdl
2-Nitrophenol	<40	ug/Kg	186	03/05/1993	cdl
4-Nitrophenol	<40	ug/Kg	186	03/05/1993	cdl
Pentachlorophenol	<40	ug/Kg	186	03/05/1993	cdl
Phenanthrene	<40	ug/Kg	186	03/05/1993	cdl
Phenol	<40	ug/Kg	186	03/05/1993	cdl
Pyrene	<40	ug/Kg	186	03/05/1993	cdl
1,2,4-Trichlorobenzene	<40	ug/Kg	186	03/05/1993	cdl
2,4,6-Trichlorophenol	<40	ug/Kg	186	03/05/1993	cdl

NET Cambridge Division
QUALITY CONTROL DATA

NET Job No: 93.00525

Report To: Vapex Environmental Tech

Report Date: 03/09/1993

Project: Envirogen

Matrix Spike/Matrix Spike Duplicate Results

Compound	Spike Amount	Sample Result	Units	MS Result	MS % Recovery	MSD Result	MSD % Recovery	RPD
TCL Acid/Base/Neutrals 8270 S								
Acenaphthene	50	<400.	ug/Kg	59	118.00	59	118.00	0.00
Acenapnthylene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Anthracene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Benzo(a)Anthracene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Benzo(a)Pyrene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Benzo(b)Fluoranthene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Benzo(g,h,i)Perylene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Benzo(k)Fluoranthene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Benzoic Acid	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Benzyl Alcohol	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
4-Bromophenyl-phenylether	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Butylbenzylphthalate	0.0	9900	ug/Kg	0.00	0	0.00	0	0
4-Chloro-3-Methylphenol	75	<400.	ug/Kg	71	94.70	80	106.70	11.80
4-Chloroaniline	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
bis(2-Chloroethoxy)Methane	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
bis(2-Chloroethyl)Ether	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
bis(2-Chloroisopropyl)Ether	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
2-Chloronaphthalene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
2-Chlorophenol	75	<400.	ug/Kg	72	96.00	73	97.30	1.30
4-Chlorophenyl-phenylether	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Chrysene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Di-n-Butylphthalate	0.0	8800	ug/Kg	0.00	0	0.00	0	0
Di-n-Octyl Phthalate	0.0	400	ug/Kg	0.00	0	0.00	0	0
Dibenz(a,h)Anthracene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Dibenzofuran	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
1,2-Dichlorobenzene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
1,3-Dichlorobenzene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
1,4-Dichlorobenzene	50	<400.	ug/Kg	50	100.00	48	96.00	4.00
3,3'-Dichlorobenzidine	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
2,4-Dichlorophenol	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Diethylphthalate	0.0	600	ug/Kg	0.00	0	0.00	0	0
Dimethyl Phthalate	0.0	400	ug/Kg	0.00	0	0.00	0	0
2,4-Dimethylphenol	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
4,6-Dinitro-2-Methylphenol	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
2,4-Dinitrophenol	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
2,4-Dinitrotoluene	50	<400.	ug/Kg	34	68.00	38	76.00	11.10
2,6-Dinitrotoluene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
bis(2-Ethylhexyl)Phthalate	0.0	35000	ug/Kg	0.00	0	0.00	0	0
Fluoranthene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Fluorene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Hexachlorobenzene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Hexachlorobutadiene	0.0	2000	ug/Kg	0.00	0	0.00	0	0

NOTE: Data reported for spiked samples were analyzed in the same batch, but may not necessarily be that of your sample.

NET Cambridge Division
QUALITY CONTROL DATA

Report To: Vapex Environmental Tech

NET Job No: 93.00525

Project: Envirogen

Report Date: 03/09/1993

Matrix Spike/Matrix Spike Duplicate Results

Compound	Spike Amount	Sample Result	Units	MS Result	MS % Recovery	MSD Result	MSD % Recovery	RPD
Hexachlorocyclopentadiene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Hexachloroethane	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Indeno(1,2,3-cd)Pyrene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Isophorone	0.0	9600	ug/Kg	0.00	0	0.00	0	0
2-Methylnaphthalene	0.0	500	ug/Kg	0.00	0	0.00	0	0
2-Methylphenol	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
4-Methylphenol	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
N-Nitroso-di-n-Propylamine	50	<400.	ug/Kg	59	118.00	61	122.00	3.30
N-Nitrosodimethylamine	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
N-Nitrosodiphenylamine	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Naphthalene	0.0	600	ug/Kg	0.00	0	0.00	0	0
2-Nitroaniline	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
3-Nitroaniline	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
4-Nitroaniline	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Nitrobenzene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
2-Nitrophenol	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
4-Nitrophenol	75	<400.	ug/Kg	33	44.00	49	65.30	39.00
Pentachlorophenol	28000	5400	ug/Kg	28600	82.90	68000	223.60	91.70
Phenanthrene	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
Phenol	75	<400.	ug/Kg	71	94.70	70	93.30	1.50
Pyrene	50	<400	ug/Kg	55	110.00	57	114.00	3.60
1,2,4-Trichlorobenzene	50	<400.	ug/Kg	62	124.00	65	130.00	4.70
2,4,5-Trichlorophenol	0.0	<400.	ug/Kg	0.00	0	0.00	0	0
2,4,6-Trichlorophenol	0.0	<400.	ug/Kg	0.00	0	0.00	0	0

NOTE: Data reported for spiked samples were analyzed in the same batch, but may not necessarily be that of your sample.

CHAIN OF CUSTODY RECORD

NATIONAL ENVIRONMENTAL TESTING, INC.

Cambridge Division, 12 Oak Park, Bedford, MA 01730

PROJECT NAME
COMPANY Envirogen, Inc.
ADDRESS 1100 Quakerbridge Rd Lawrenceville, NJ 08648
PHONE (609) 936-9300

SAMPLED BY Clifton D. Chunn (Print Name) Clifton D. Chunn Signature
(Print Name) Signature

SAMPLE NO.	DATE	TIME	SAMPLE LOCATION	CONTAINER SIZE	CONTAINER G/P	GRAB	COMP	NO. OF CONTAINERS	SAMPLE MATRIX	PRESERVATIVE	Volatile Organics	Extractable Organics	Pesticides PCBs	Metals	Cyanide	Phenols					COMMENTS
Nutrient	2/25			50g			X	1	Soil	None		X									
Control	2/25			50g			X	1	Soil	None		X									
Killed	2/25			50g			X	1	Soil	None		X									
Nutrient	2/25						X	1	Soil	None	X										
Control	2/25						X	1	Soil	None	X										
Killed	2/25						X	1	Soil	None	X										

Relinquished by	Date / Time	Received by	Relinquished by	Date / Time	Received by
Clifton D. Chunn	2/25/11 5:00 p.m.			2/26/11 10:15	[illegible]
Relinquished by	Date / Time	Received by	Relinquished by	Date / Time	Received for Laboratory by

Method of Shipment: Overnight UPS

Remarks:

PT 1 – ORIGINAL PT 2 NET Project Manager – Yellow PT 3 – Customer Copy – Pink