FINAL REPORT
Stabilization/Solidification Testing of Raffinate Pit Sludges and Nitroaromatic Soils

for

MK-FERGUSON COMPANY
WELDON SPRING SITE REMEDIAL ACTION PROJECT

May 8, 1992

Waste Technologies Group, Inc.
100 Crescent Centre Parkway
Suite 200
Atlanta (Tucker), Georgia 30084
(404) 723-1600

ACKNOWLEDGEMENTS

The work contained in this report and the report itself have been the result of long hours of dedicated effort by many professionals in the following organizations: EcoTek, Inc. (ATG), EcoTek LSI, and Chen-Northern, Inc.

TABLE OF CONTENTS

SUMMARY

1.0 INTRODUCTION

2.0 BASELINE TESTS
- 2.1 Baseline Chemical Analysis
- 2.2 Baseline TCLP Tests
- 2.3 Stabilized Sludge and Soil Samples
  - 2.3.1 Sample Preparation
  - 2.3.2 TCLP Tests

3.0 RESEARCH AND TESTING TO IDENTIFY ADDITIVES

4.0 OPTIMIZATION OF RAFFINATE PRODUCT
- 4.1 Sample Preparation
- 4.2 TCLP Tests
- 4.3 Physical Tests

5.0 DETAILED LEACHABILITY TESTS

6.0 CONCLUSIONS

References

Appendix A
Table I, Baseline Analytical Results (Dry Basis)
Table II, Baseline Analytical Results (Wet Basis)
Table III, Baseline VOA, SVOA, Herbicide, Pesticide Analytical Results
Table IV-A and B, Raffinate Pit Spike Quantities
Table V, Actual Baseline Spike Concentrations
Table VI, Spiked, Untreated, Baseline TCLP Results
Table VII, Spiked, Treated, Baseline TCLP Results
Table VIII, Optimization Test Matrices and Actual Spike Concentrations
Table IX, Soil Like and Monolithic Product TCLP Results
Table X, Soil Like and Monolithic Product Physical Test Results
Table XI, Soil Like and Monolithic Product ANSI 16.1 Test Results
Table XII, Nitroaromatic Product ANSI 16.1 Test Results

Appendix B
Photographs

Appendix C
Analytical Methods Summary

Appendix D
Laboratory Reports (bound under separate cover)

SUMMARY

The Weldon Spring Site Remedial Action Project is performing a feasibility study under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) to evaluate remedial action alternatives for the management of chemically and radiologically contaminated soils, sludge, sediments and debris. The alternative that this report is concerned with is stabilization/solidification of the raffinate pit sludge and nitroaromatic contaminated soils. The treatability work covered under this study consists generally of characterization of the raffinate sludge and contaminated soils, formula development and optimization for the various waste streams, and leach testing of the stabilized samples to the extent that all regulatory criteria established in the specification are met.

During the characterization phase of this work, both raffinate pits as well as quarry soils were found to be, in most cases, below the maximum concentration of contaminants listed in the appendices of the specification, making it necessary to spike each one of the waste streams with the various contaminants to weighed concentration. The contaminants of greatest concern due to either their concentration or their toxicity were arsenic, thorium, and uranium for the pits. In the nitroaromatic soils, TNT constituted the highest concentration contaminant followed by 2,4 DNT and nitrobenzene.

Additional characterization work took place to determine the existence (or lack of) volatile organic components, herbicides, and pesticides, to eliminate the need for testing any of these components in the leachate collected from any of the TCLP and/or ANS 16.1 tests. This was in fact accomplished, significantly reducing the cost of analytical tests.

The spiked material for each one of the raffinate pits, the quarry soils, and the surface soils were subjected to a baseline TCLP to determine the leachability of these waste streams before any treatment. In most cases, the results indicated that the material spiked to the maximum concentration would fail TCLP. Raffinate pits 1 and 3 failed the TCLP for arsenic, raffinate pit 3 for cadmium, raffinate pit 4 for barium, and the quarry soils failed for nitrobenzene and 2,4 DNT. Since the radioactivity components of these wastes are not part of the TCLP criteria, analyses for these components were not performed.

Solidification samples for each of the waste streams were prepared using the formula developed by Oak Ridge National Laboratories consisting of a blend of cement and flyash as instructed by the specification. The samples were subjected to TCLP testing after curing for 14 and 28 days. The TCLP results indicated that none of the samples tested would be classified as toxic waste per the TCLP criteria.

These results indicated that a satisfactory formula had been found. The next stage of the project required the optimization of the various formula parameters. These parameters were soil to sludge ratios and binder to sludge ratio. Three test matrices were defined that varied the binder-to-sludge ratios from 60% binder to 20% binder in 20% increments. The binder definition is the same as the specification, 60% Class F flyash and 40% Portland II cement. For each binder increment, the test matrix varied the sludge-to-soil ratios from 0-100% in 20% increments. A total of 18 solidification mixtures were prepared in accordance with this test matrix using raffinate pit #3 sludge. Six samples were prepared from each test mixture for a total of 108. Raffinate pit #3 sludge was selected by MK-Ferguson because it contained the highest levels of many of the components of interest. The sludge contained approximately 1000 ppm arsenic, 8,000 ppm nickel, 600 ppm lead, and 1500-1600 ppm uranium and thorium.

The 108 samples were cured for 28 days. During the curing period, none of the samples prepared indicated any presence of drainable water. After curing, MK-Ferguson selected 4 mixtures which represented a soil-like product and 4 mixtures which represented a monolithic product as defined by the project specification. Samples of the 8 mixtures were subjected to TCLP testing. These results indicated that none of the mixtures would be classified as a toxic waste per the TCLP criteria. These results indicate of operational flexibility, allowing the variation of ratios of soil-to-sludge and binder-to-sludge that may be necessary during actual remediation. After TCLP testing, samples of the 8 selected mixtures were subjected to a series of tests and analyses to determine their physical properties. These physical properties included unconfined compressive strength, dry density, specific gravity, volume increase, one dimensional consolidation and permeability. For the monolithic samples the unconfined compressive strength ranged between 125-335 psi, with a volume increase no greater than 21% in any of the samples. The percent compaction ranged from 95-100% for the soil-like product.

Of the eight mixtures, one monolithic mixture (OP-II-1) and one soil-like mixture (OP-III-6) were selected to undergo ANS 16.1 leachability tests. The leachates collected at each of the intervals dictated by the ANS 16.1 test were analyzed for uranium and a variety of other components. Uranium activity values in the leachate were used to calculate the leach index that represents a relative measure of leachability of these products to other materials. The leach index was 15 for the monolithic samples and 14 for the soil-like material. These values are several orders of magnitude below those for other products commonly accepted by the regulatory agencies for low-level waste disposal at commercial facilities.

In summary, the work performed by Waste Technologies Group, Inc. shows that a suitable set of formulas are available to chemically stabilize the wastes at Weldon Spring. These formulas produce material that meets all EPA-related criteria for the hazardous components and also satisfies potentially applicable criteria for long-term leaching of radionuclides.

1.0 INTRODUCTION

The following sections detail the work performed under contract number DE-AC05-860R21548. The sections are organized in approximately the same order as the bid specification for ease of reading. All analytical and spiking data are compiled in Appendix A.

2.0 BASELINE TESTS

A total of two five gallon buckets of material were received for waste types from MK Ferguson for a total of twelve buckets. These waste types were from four (4) raffinate pits, one (1) quarry soil, and one (1) surface soil. This material was homogenized prior to the start of the work outlined in the specification to ensure consistent results throughout the testing process. A total of eight buckets (two buckets for each of the four pits) of material were received from the raffinate pits. Both buckets from each pit were emptied into a 15 gallon polyethylene drums and homogenized by stirring with a teflon paddle until the material obtained a consistent physical appearance. The remaining 4 buckets of material consisted of 2 buckets each of surface soil and quarry soil. One bucket of each of these materials were homogenized by dumping the bucket contents into a plastic drum liner and rolling the drum liner end over end until a homogenous mixture was obtained. After the soils were homogenized, the material was placed back into its original container. These containers were marked "composited". This material was used for all subsequent testing and analysis.

2.1 Baseline Chemical Analysis

Following homogenization, samples of the six waste types, raffinate pits 1-4, quarry soil, and surface soil, were taken and the samples delivered to EcoTek LSI for analysis. The analytical results are listed in Appendix A, Table I. EcoTek LSI reports results on a dry sample basis where the samples are dried at 250 °C. The historical data presented in the bid specification are reported on a wet sample basis. To allow comparisons, Table II presents the data on a wet sample basis.

In addition to the baseline analysis requested in the bid specification, analyses for volatile organics, herbicides, and pesticides were also performed. The TCLP test criteria requires analysis of the leachates for these components unless they are known not to be present. After discussions with MK Ferguson, it was decided to analyze for these components in the baseline analysis to eliminate the expense and time associated with testing for these components in future TCLP leachates. The results of these analyses are listed in Table III.

The results clearly show that TCLP leachates will not require analysis for these components.

2.2 Baseline TCLP Tests

This phase of the project required the spiking of the four raffinate pit sludges and quarry soil with various metallic, radioisotopic, and organic contaminants to their maximum historical values reported in the bid specification. The chemical form of the metallic and radioisotopic contaminants were not specified. After discussions with MK Ferguson, it was decided to spike with nitrate metallic and radioisotopic compounds when possible. The metallic and radioisotopic contaminants were arsenic, barium, cadmium, chromium, lead, nickel, selenium, uranium, and thorium. Arsenic trioxide, barium nitrate, cadmium nitrate, sodium chromate, lead nitrate, nickel nitrate, selenium dioxide, uranyl nitrate, and thorium nitrate were selected as the spiking compounds for these contaminants.

The bid specification listed seven radioisotopic contaminants, U-234, U-238, Th-228, Th-230, Th-232, Ra-226, and Ra-228 of concern for spiking purposes. Since there are no criteria for these contaminants in the TCLP, it was decided that their only influence would be to alter the chemical matrix of the samples. Of the radioisotopes listed, only

U-238 and Th-232 have specific activities low enough to result in spiking concentrations of any significance. As a result, following conversations with MK Ferguson, it was decided to only spike the samples with natural uranium and thorium. Total uranium activity values in the bid specification were converted to units of ppm uranium for spiking purposes assuming a conversion factor of 0.68 pCi/g U/ppm U which is consistent with the assumption that all the uranium present contains U-234, U-235, and U-238 in their natural ratios. No values for Th-232 were reported in the bid specification. Maximum activity levels of Th-232 were calculated by multiplying the Th-228 values reported in the bid specification by the Th-232/Th-228 ratios reported by EcoTek LSI in the baseline analyses. Th-232 values were converted to ppm thorium for spiking purposes by dividing the calculated Th-232 values by a conversion factor of 0.109 pCi/g Th-232/ppm Th.

Based on the previous discussion and the analytical results presented in Table II, the amounts of materials required for spiking purposes were calculated on a per kilogram basis for the raffinate pit sludge and the quarry soil. The results of these calculations are presented in Tables IV-A and IV-B. The tables list the "as-is" and maximum contaminant concentrations and the type and amount of spiking material necessary.

Two kilograms of sludge from the four raffinate pits and the quarry soil were spiked in accordance with Tables IV-A and IV-B. After spiking, 1 kilogram of material was delivered to EcoTek LSI for baseline TCLP tests and 1 kilogram of spiked material was reserved for baseline solidification tests. The actual spiked concentrations for the raffinate pit sludge are listed in Table V. The concentration values in this table include the weight of the spiking reagents and any additional water added to transfer the spiking reagents. Please note that the amount of spiking reagents were not increased to account for this additional mass. No values for percent water were given in the bid specification. It was assumed that this value would change dependant on climatic conditions.

Therefore, it was decided to base spiking reagents on a "as-received" basis. With the exception of raffinate pit #4 sludge, the water used to transfer spiking reagents affected the final spike concentrations only by a small amount. Pit #4 sludge contained very little water. To achieve a good flowable solidification mixture, it was necessary to add substantial amounts of water. This additional water did alter the final spike concentrations substantially. For comparison purposes, an additional column is presented in Table V for raffinate pit #4 which lists the spiked concentrations without the addition of this water.

Two kilograms of quarry soil were spiked with nitroaromatics in accordance with Tables IV-A and IV-B. During the preparation of the solidification mixture with this material (see section 2.3.1), possible chemical reactions with TNT were observed. Because of concern that the this spiked mixture may pose a safety hazard, all testing with this spiking mixture was terminated. Instead, it was decided to spike only with nitrobenzene. Three hundred grams of quarry soil were spiked with 33.5 uL (0.0401 g) of nitrobenzene to yield a mixture containing 134 ppm nitrobenzene. To this mixture, 150 grams of water was added to prepare a sample suitable for solidification. This sample was submitted for baseline TCLP testing.

The bid specification did not require spiking of the surface soils. The results of the baseline TCLP analyses are listed in Table VI. Please note that the volatile organics, herbicides, and pesticides analyses were performed on these TCLP leachates. The results from the baseline chemical analysis were not available at this time. As a result, the TCLP leachates were analyzed for all of the analytes specified in the TCLP criteria.

2.3 Stabilized Sludge and Soil Samples

This phase of the project required the preparation of solidified samples of the spiked raffinate pit sludge and quarry soil. The solidified samples were prepared using the ORNL reference formulation. The reference formulation consisted of a mixture containing a ratio of 0.6 grams of binder to 1 gram of sample. The binder was a mixture of 60% Class F flyash and 40% Portland II cement. After solidification, samples were cured for a period of 14 and 28 days. After each curing period TCLP tests were performed. The following sections describe the sample preparation and present the TCLP results.

2.3.2 Sample Preparation

The fraction remaining of the spiked raffinate sludge mixtures prepared in section 2.2 were used to prepared all of the raffinate pit solidification samples. Two 2" X 2" X 2" samples were prepared for each raffinate pit by placing the solidified mixture into a polyethylene cube. The top of the cubes were sealed with parafilm and the samples allowed to cure. In addition, samples of the solidification mixtures were placed in 100 ml graduated cylinders and observed over time for the presence of drainable water. After 14 and 28 days of curing time, samples from each raffinate pit were submitted for TCLP testing. The drainable water samples were observed throughout the entire 28 day curing period. None of the samples from the four raffinate pits contained drainable water at anytime during the 28 day period.

A sample of quarry soil was spiked with nitroaromatics in accordance with Table IV-B. Solidification samples were prepared with this mixture using the ORNL reference formula. Upon solidification, it was observed that surface water on the top of the 2" X

2" X 2" samples was orange to red in color. Because of the high levels of TNT, approximately 2%, it was immediately assumed that the TNT had undergone some chemical reaction. Information about explosive concentrations of TNT in soil indicated that concentrations of TNT well above 2% were required to obtain an explosive hazard. No information for concentrations of TNT in the alkali environment present in the solidification mixtures was available.

Members of industry and academia were contacted for their opinion. Dr. Ernest Becker, a retired professor from the University of Massachusetts at Boston, was hired to consult on the matter. Dr. Becker indicated that TNT would probably undergo condensation reactions with other organic materials in the sludge matrix which contained carbonyl groups such as aldehydes and ketones. In his experience these compounds tended to be more sensitive that TNT. In his opinion, even these compounds probably would not pose an explosive hazard at a concentration level of 2%. However, he felt that physical testing should be performed to confirm this assessment. At this point, all testing was suspended and all solidification samples were destroyed by placing them into water to dilute the TNT concentrations until physical testing could be performed.

Arrangements were made by MK-Ferguson to prepare identical specimens at Hercules Incorporated, Rocket Center, W. Va., and explosivity tests were performed. The results of these tests showed "the stabilized mixture does not exhibit explosive properties in either the uncured or cured state". Ref. 7.3.

After a series of discussions with MK Ferguson, it was decided to proceed with the baseline tests using quarry soil spiked to its maximum concentration of nitrobenzene presented in the bid specification. No spiking for the other nitroaromatics was performed. Five hundred grams of quarry soil was spiked with 56 uL (0.067 g) of

nitrobenzene to yield a spiked concentration of 134 ppm. Two hundred and fifty grams of water was added and this mixture was solidified using the ORNL reference formula. Again, the amount of spike material was based on the as received material and not on the sample with water added. Four 2" X 2" X 2" samples were prepared in polyethylene cubes and sealed with parafilm. In addition, some of the solidification mixture was placed in a 100 ml graduate for a drainable water test. After 14 and 28 days of curing, sample cubes were submitted for TCLP testing. The sample prepared for drainable water testing was observed for the 28 day curing period. No drainable water was observed at any time during this period.

2.3.2 TCLP Tests

The TCLP results for the baseline solidification samples prepared with spiked material and cured for 14 and 28 days are listed in Table VII. The results indicate that neither samples cured for 14 days or 28 days would be classified as toxic waste per the TCLP criteria. Please note that only semi-volatile organics and metals were evaluated in the TCLP leachates. The concentrations of pesticides, herbicides, and volatile organics were present in waste samples received from MK Ferguson (see section 2.1), were low enough to make it impossible to fail TCLP criteria, given the 20:1 dilution factor introduced by the method. Per (40 CFR 261, App II, 1.2) there was no need to analyze for these constituents.

3.0 RESEARCH AND TESTING TO IDENTIFY ADDITIVES

The bid specification required evaluation of alternate solidification technologies if waste samples prepared with the ORNL reference formulation should fail the TCLP criteria. Since the ORNL reference formulation yielded products the met the TCLP criteria, no work was required for this phase of the project.

4.0 OPTIMIZATION OF RAFFINATE PRODUCT

This phase of the project required optimization of the ORNL reference formula for treatment of the raffinate sludge. The intent of this phase of the project was to develop a monolithic product and a soil like product that would pass the TCLP criteria. In addition to varying binder to sludge ratios, surface soils were to be blended into the raffinate sludge product in the hopes of minimizing final waste volumes and reducing costs. Based on conversations with MK Ferguson, a test matrix was developed for this phase of the project. The test matrix is presented in Table VIII. Based on the baseline TCLP results, MK Ferguson selected raffinate pit #3 sludge as the sludge to be used for all testing. The test matrix requires the evaluation of 18 solidification mixtures. The mixtures are prepared with three (3) different sludge to binder ratios and six (6) different surface soil to sludge ratios. The binder mixture was the same as the ORNL reference formula, 60% Class F flyash and 40% Portland II cement.

4.1 Sample Preparation

Twenty kilograms of raffinate pit #3 sludge were prepared for solidification in the same manner as the sludge was prepared for the baseline solidification tests (see section 2.0). The quantities of spiking reagents and the final spike concentrations are listed in Table VIII. After preparation of the spiked sludge, six 2" X 2" X 2" samples were prepared in polyethylene cubes for each of the 18 solidification mixtures. The spiked sludge was mixed thoroughly with the binder and then the surface soil was added to the mixture.

Samples for drainable water testing were prepared in 100ml graduates as it appeared appropriate by the mixture consistency. Drainable water test samples were prepared for mixtures OP-I-1, OP-II-1,OP-II-2, and OP-III-1 through OP-III-6, where OP stands for

the optimization tests, the roman numeral the test matrix, and the number the test matrix mixture number (see Table VIII).

After preparation, the sample cubes were sealed with plastic wrap to cure. Any extra sample was placed in sealed plastic bags to cure. The samples were cured for 28 days. The samples prepared for the drainable water tests were observed throughout the 28 day cure period. None of the samples contained any drainable water during this period.

A precise definition of a monolithic product and a soil-like product was sought for this project. After a series of discussions between WTG and MK-Ferguson, it was decided that the application or placement method of the product could be used as a guide. The "pumpable grout" is needed to encase and stabilize larger objects in place, and/or fill void spaces inside the cell. The resulting product is a monolithic structure. Likewise, the "soil-like" materials is to be placed in the cell through standard blading/compaction methods, much like soil. A precise testing method or value could not be agreed upon. MK-Ferguson sent a representative, Mr. Serban Grozescu, to evaluate the samples. Of the eighteen solidification mixtures, Mr. Grozescu selected mixtures OP-I-3, OP-II-1, OP-II-2, and OP-II-3 for evaluation as a monolithic product. He selected mixtures OP-II-4, OP-II-6, OP-III-5, and OP-III-6 for evaluation as a soil like product. Following their selection, these mixtures were subjected to the TCLP and various physical tests, as listed in Table X (App. A).

4.2 TCLP Tests

The TCLP test results for the optimization mixtures are listed in Table IX. None of the monolithic mixtures would be classified as a toxic waste per the TCLP criteria. The test results indicated the three of the four soil like mixtures would be classified as a toxic

waste based on the concentrations of cadmium in the leachate.

The cadmium value for the fourth soil like mixture (OP-II-6) appeared to be biased. The lab testing data was reviewed. It was discovered that the less aggressive TCLP leaching fluid was used on this sample. An evaluation was immediately performed and it was determined that the less aggressive leaching fluid was used in error. The tests were repeated using a modified TCLP. A ten gram sample was leached in 200 ml of leach fluid for 24 hours and the leachate analyzed. The tests were run in duplicate on a sample of the OP-II-6 mixture. In addition, duplicate samples of mixture OP-III-6 were ran as control samples to compare with actual TCLP results.

The results are listed in Table IX. The control sample results agree with the laboratory TCLP results. The results for the samples of the OP-II-6 mixture clearly indicate that this mixture would also be classified as toxic waste per the TCLP criteria. These results caused concern until it was discovered through conversations with MK Ferguson that the cadmium values in the bid specification used to determine spiking levels were biased high by a factor of 100. Obviously, at these low cadmium levels, none of the mixtures would be classified as a toxic waste.

4.3 Physical Tests

Table X lists the results of the physical testing of the monolithic and soil like products. In addition, drainable water results, specific gravity values, and volume increase ratios are listed. The volume increase ratios were based on a spiked sludge density of 1.30 g/cc and a surface soil density of 1.09 g/cc. The surface soil density was measured on the composited sample. This result is probably much lower than the actual density of undisturbed surface soil. Therefore, the volume increase ratios are probably biased low.

Even with higher soil densities, the bid specification of less than a 30% volume increase should be easily met in all cases.

For the monolithic samples, the unconfined compressive strength ranged from 125 to 335 psi, all of which are above the minimum required by the specification. The soil-like material will undergo compaction in the cell along with untreated soil (not requiring treatment) and will not be subject to a minimum unconfined compressive strength requirement.

4.4 Clogging Analysis

One of the analysis specified in the bid specification as part of Section 10940 was a clogging analysis. No specific criteria was specified. Obviously, clogging of the leachate collection system will depend in large part on the collection system design. Design components such as the use of perforated or permeable piping, aggregate sizes, etc. could substantially impact the analysis. Since no specific design information was supplied with the bid specification, it was assumed that the purpose of the clogging analysis is to address the potential of leachable waste components precipitating in or around a leachate collection system resulting in a potential clog.

Several anions and cations were analyzed in the ANS 16.1 leachates for the soil-like and monolithic product (see Table XI). Of the cations, only Ca, Fe, Mg, and Ni could precipitate and form a potential clogging problem. Based on the anion analysis, calcium carbonate, calcium hydroxide, calcium fluoride, magnesium carbonate, magnesium fluoride, magnesium hydroxide, iron (II) hydroxide, iron (III) hydroxide, nickel hydroxide, and nickel carbonate were the only possible insoluble compounds identified. The following table lists these compounds, their solubility products as given in the

Thirteenth Edition of Lange's Handbook of Chemistry, their calculated solubility, and their maximum concentrations based on the ANS 16.1 leachate analysis presented in Table XI for the soil-like and monolithic product. Solubility products were for the temperature range of 18 to 25°C.

Compound	Solubility Product	Calculated Solubility	Max Conc (ppm) Soil-Like	Max Conc (ppm) Monolithic
$CaCO_3$	2.8E-9	5.29	298	204
CaF_2	5.3E-9	136	1.44	1.83
$Ca(OH)^2$	5.5E-9	1307	220	151
$MgCO_3$	3.5E-8	15.8	18.3	0.64
MgF_2	6.5E-9	116	1.15	0.30
$Mg(OH)_2$	1.8E-11	15.3	12.7	0.44
$Fe(OH)_2$	8E-16	0.83	13.9	0.48
$Fe(OH)_3$	4E-38	4.78E-5	16.5	0.57
$Ni(OH)_2$	2.0E-15	1.38	5.76	0.23
$NiCO_3$	6.6E-9	9.64	6.22	0.25

Of the compounds listed above, calcium carbonate could exist at by far the highest concentrations. Leachate analysis measured alkalinity and not hydroxide and carbonate concentrations. However, it can be assumed that since the calcium leached from the samples at the concentrations presented in Table XI, it must be present in the leachates as the hydroxide. Therefore, any potential for the calcium to precipitate as calcium carbonate would require the presence of soluble carbonates in the leachate collection system. Since the only possible source of natural carbonates is carbon dioxide, the precipitation of calcium carbonate does not appear to represent a credible scenario.

One interpretation of the data is to assume that the cations were present in the insoluble form in the leachate as small colloidal material. Since total suspended solids analyses were not performed on the leachate samples, this is a real possibility. The leachate samples did not appear to contain suspended solids. Therefore, their particle size must have been quite small (i.e. <5 uM).

In any case, whether the cations are present in the leachate as soluble specifies that may precipitate or as colloidal materials, in both cases, the potential exists for the formation of very small particulate material. Therefore, any leachate collection system should be designed to pass small particulate material.

5.0 DETAILED LEACHABILITY TESTS

The purpose of this phase of the project was to define the long term disposal/ burial conditions. The bid specification required that two tests be performed on the solidified products, the Materials Characterization Center Static Leach Test (MCC-1P) and the American Nuclear Society Leach Test (ANSI/ANS 16.1). After discussions with MK Ferguson, it was decided to only perform the ANS 16.1 tests on the solidified products. MK Ferguson selected two samples prepared during the optimization tests for testing as a monolithic and a soil like product. These samples corresponded to test matrix mixtures OP-II-1 and OP-III-6 for the monolithic and soil like samples respectively. An extra sample prepared during the baseline solidification of the quarry soil was used to evaluate a stabilized nitroaromatic contaminated solid.

A five inch diameter pyrex vessel was selected for the ANS 16.1 leach vessel. The pyrex vessel was filled to a depth of approximately 5 inches with demineralized water (1550 cc). The two inch sample cube was suspended by teflon tape in the center of the vessel at an equal distance from the surface of the water and the vessel bottom. The volume of water met the ANS 16.1 requirement of a water volume to sample surface ratio of 10. The pyrex vessel diameter was sized so that the sample would be surrounded by an equal thickness of leach solution per the ANS 16.1 procedure.

For samples OP-II-1 and OP-III-6, total uranium leached was used to calculate the leach index. To ensure accuracy of the results, a test was performed to determine if any uranium would plate out on the pyrex vessel walls during leach tests. A 100 ppm uranium standard solution was prepared and 1550 cc of this solution was placed in the pyrex leach vessel for a period of 48 hours. The solution was analyzed for uranium immediately upon preparation and after 48 hours of contact with the pyrex leach vessel.

The average of several uranium analysis indicated an initial uranium concentration of 91.7 ppm and a final uranium concentration of 91.9 ppm, well within the range of analytical error. Based on these results, it was concluded that the pyrex vessel would not cause a bias in the uranium leach results. Of the other leachate components specified in the bid specification for analyses, only fluoride might undergo a possible reaction with the pyrex vessel that may have biased the leachate analyses. To evaluate this possibility, 500 ml of a 10 ppm fluoride standard was placed in a pyrex 500 ml volumetric flask for a period of 24 hours. The standard was immediately analyzed for fluoride upon preparation in the flask and after 24 hours. The initial and final fluoride concentrations were 10.4 and 9.9 ppm respectively. These results were within the expected analytical error range of 5%. Therefore, it was concluded that fluoride would not interact significantly with the pyrex vessel during a 24 hour leach period.

For the sample of treated Quarry Soils, Nitrobenzene, and 2,4-Dimitrotoluene were used to calculate the leach index. The three test samples, OP-II-1, OP-III-6, and Quarry Soils were rinsed, the rinse collected, and the samples leached in 1550 cc of demineralized water. The water was changed and collected at 2, 7, 24, 48, 72, 96, and 120 hours per the ANS 16.1 procedure. After collection, the leachate was transferred to EcoTek LSI for preservation and analysis for the analytes listed in the bid specification. The results are listed in Tables XI and XII. Leach index values were then calculated based on the leachate uranium values for OP-II-1 and OP-III-6 and 2,4-DNT for Quarry Soils. These indexes were 15, 14, and 15 respectively for OP-II-1, OP-III-6, and Quarry Soil.

6.0 CONCLUSIONS AND RECOMMENDATIONS

As MK-Ferguson evaluated the alternatives that existed to remediate the Weldon Spring Site in Missouri, the work they contracted with WTG has shown that chemical stabilization/solidification of the nitroaromatic soils and the raffinate pit sludge is not only a viable alternative but an economically feasible alternative.

A generic formula developed by the Oak Ridge National Laboratory was found to be satisfactory to chemically stabilize each one of the wastes treated and meet all regulatory criteria in existence today. The technical approach taken by MK-Ferguson, facilitated the development of several formulations all of which meet the established criteria. This makes chemical stabilization/solidification also a desirable alternative as a treatment technology for the remediation of the Weldon Spring Site.

The testing performed during this Treatability Study work was aimed at measuring the long-term stability of the treated material as well as the physical and chemical characteristics which will ensure low leachability of the hazardous and radioactive components of the waste. The leach indexes obtained are several orders of magnitude higher than those required by the regulatory agencies for low-level radioactive waste disposal (shallow land burial) and therefore, provides a greater margin of safety.

The formula tested on nitroaromatic soils proved to be satisfactory in meeting the established criteria. This formula however, could be optimized to minimize the use of binder. Furthermore, the low moisture content of these soils require the use of added water. This water could be provided by the dewatering of the raffinate pits if necessary, eliminating the need to treat and discharge this water.

The variability of physical conditions of these sludges and soils throughout the year make it unrealistic to think the results of this study are directly and absolutely applicable to a full-scale remediation effort. Additional testings at the bench-scale and pilot-scale, are recommended to establish a greater level of confidence that the treatment process identified and tested in this study can absorb the variations in physical properties throughout the duration of the project.

REFERENCES

A. MKF-JEG 1989 Raffinate Pit Data

B. ORNL - Weldon Spring Raffinate Pits:
Evaluation of Cement-based Grouts as a Stabilization Option
Date Issued - June 1989

C. Hercules Report Dated February 1992
Explosivity Testing of Stabilized TNT Contaminated Soil Samples

D. EPA - Stabilization/Solidification of CERCLA and RCRA Wastes

APPENDIX A

TABLE I

MK Ferguson Baseline Analytical Results (Dry Basis)

Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4	Quarry Soil	Surface Soil
Lab ID#	1464-01	1464-02	1464-03	1464-04	1464-05	1464-06
% Moisture	59.7	74.1	64.1	36.3	7.6	18.4
Oil & Grease	160	370	200	28		23
PCB Aroclor 1248 (ppb)	<0.10	<0.81	<0.12	<0.063		<0.051
Fluoride	88.7	25.9	63.9	287		<25.0
Nitrate/Nitrite	243	<12.5	720	20.7		1752
Sulfate	3018	2600	1800	3200		730
Antimony	30.8	51.2	35.1	<15.0		<11.1
Arsenic	483	2250	706	41		<19.8
Barium	216	281	386	773		103.492
Beryllium	28.6	63.1	15.5	2.86		0.675
Cadmium	17.9	27.5	10.1	<1.67		<1.24
Chromium	40	102	85.1	25.1		15.1
Cobalt	7.81	43.2	12	7.78		7.05
Copper	217	746	629	34.6		5.72
Lead	104	990	249	82.1		23.9
Lithium	<12.2	<15.6	<14.4	93.1		<6.19
Manganese	636	5170	679	226		912
Mercury	<0.05	9.85	10.9	<0.0636		<0.084
Molybdenum	2050	3220	763	46.8		<3.71
Nickel	35.6	114	227	34.3		13.6
Selenium	31.9	<9.34	<74.7	<43.4		<32.2
Silver	<8.52	<109	<8.61	<5.01		<3.71
Thallium	<6.08	<77.8	<100	<58.4		<43.3
Vanadium	7760	16000	4290	166		22.2
Zinc	1800	538	139	97.3		73.5
Nitrobenzene					<0.083	<0.10
1,3 DNB					<1.3	<0.077
2,6 DNT					11	<0.077
2,4 DNT					21	<0.081
1,3,5 TNB					95	<0.071
2,4,6 TNT					3000	<0.070
Total U (ppm)	2800	4040	2890	7590		5
U-234 (pCi/g)	1300	1700	1300	2600		3.7
U-238 (pCi/g)	950	1400	940	2700		3.6
Th-228 (pCi/g)	62	460	310	560		1.5
Th-230 (pCi/g)	50000	87000	19000	560		20
Th-232 (pCi/g)	120	500	300	530		1.3
Ra-228 (pCi/g)	36	340	230	690		14
Ra-226 (pCi/g)	2600	3800	1400	81		<14

Note: Results reported in units of ppm unless otherwise specified

TABLE II

MK Ferguson Baseline Analytical Results (Wet Basis)						
Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4	Quarry Soil	Surface Soil
Lab ID#	1464-01	1464-02	1464-03	1464-04	1464-05	1464-06
% Moisture	59.700	74.100	64.100	36.300	7.600	18.400
Oil & Grease	64.480	95.830	71.800	17.836		18.768
PCB Aroclor 1248 (ppb)	<.040	<.210	<.043	<.040		<.042
Fluoride	35.746	6.708	22.940	182.819		<20.4
Nitrate/Nitrite	97.929	<3.24	258.480	13.186		1429.632
Sulfate	1216.254	673.400	646.200	2038.400		595.680
Antimony	12.412	13.261	12.601	<9.56		<9.06
Arsenic	194.649	582.750	253.454	26.117		<16.1
Barium	87.048	72.779	138.574	492.401		84.449
Beryllium	11.526	16.343	5.565	1.822		0.551
Cadmium	7.214	7.123	3.626	<1.06		<1.01
Chromium	16.120	26.418	30.551	15.989		12.322
Cobalt	3.147	11.189	4.308	4.956		5.753
Copper	87.451	193.214	225.811	22.040		4.668
Lead	41.912	256.410	89.391	52.298		19.502
Lithium	<4.92	<4.04	<5.17	59.305		<5.05
Manganese	256.308	1339.030	243.761	143.962		744.192
Mercury	<.020	2.551	3.913	<.041		<.069
Molybdenum	826.150	833.980	273.917	29.812		<3.03
Nickel	14.347	29.526	81.493	21.849		11.098
Selenium	12.856	<2.42	<26.8	<27.6		<26.3
Silver	<3.43	<28.2	<3.09	<3.19		<3.03
Thallium	<2.45	<20.2	<35.9	<37.2		<35.3
Vanadium	3127.280	4144.000	1540.110	105.742		18.115
Zinc	725.400	139.342	49.901	61.980		59.976
Nitrobenzene					<.077	<.082
1,3 DNB					<1.20	<.063
2,6 DNT					10.164	<.063
2,4 DNT					19.404	<.066
1,3,5 TNB					87.780	<.058
2,4,6 TNT					2772.000	<.057
Total U (ppm)	725.200	1046.360	1037.510	4834.830		4.080
U-234 (pCi/g)	523.900	440.300	466.700	1656.200		3.019
U-238 (pCi/g)	382.850	362.600	337.460	1719.900		2.938
Th-228 (pCi/g)	24.986	119.140	111.290	356.720		1.224
Th-230 (pCi/g)	20150.000	22533.000	6821.000	356.720		16.320
Th-232 (pCi/g)	48.360	129.500	107.700	337.610		1.061
Ra-228 (pCi/g)	14.508	88.060	82.570	439.530		11.424
Ra-226 (pCi/g)	1047.800	984.200	502.600	51.597		<11.4

Note: Results reported in units of ppm unless otherwise specified

TABLE III

MK Ferguson Baseline Analytical Results

Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4	Quarry Soil	Surface Soil
Lab ID#	1464A-01	1464A-02	1464A-03	1464A-04	1464A-05	1464A-06
Pesticide (ppm)						
Endrin	<0.0082	<0.013	<0.0088	<0.0050	<0.0036	<0.0041
Lindane	<0.0041	<0.0065	<0.0044	<0.0025	<0.018	<0.0020
Methoxychlor	<0.082	<0.13	<0.088	<0.050	<0.036	<0.041
Toxaphene	<0.41	<0.65	<0.44	<0.25	<0.18	<0.20
Chlordane	<0.16	<0.26	<0.18	<0.10	<0.072	<0.082
Heptachlor	<0.0082	<0.013	<0.0088	<0.0050	<0.0036	<0.0041
Alpha-BHC	<0.0041	<0.0065	<0.0044	<0.0025	<0.018	<0.0020
Beta-BHC	<0.016	<0.026	<0.018	<0.10	<0.072	<0.0082
Delta-BHC	<0.0082	<0.013	<0.0088	<0.0050	<0.036	<0.0041
Aldrin	<0.0082	<0.013	<0.0088	<0.0050	<0.036	<0.0041
Heptachlor Epoxide	<0.0082	<0.013	<0.0088	<0.0050	<0.0036	<0.0041
Endosulfan I	<0.0082	<0.013	<0.0088	<0.0050	<0.0036	<0.0041
4,4-DDE	<0.049	<0.077	<0.053	<0.030	<0.022	<0.025
Dieldrin	<0.057	<0.090	<0.062	<0.035	<0.025	<0.029
4,4 DDT	<0.20	<0.32	<0.22	<0.12	<0.090	<0.10
4,4-DDD	<0.0082	<0.013	<0.0088	<0.0050	<0.0036	<0.0041
Endosulfan II	<0.14	<0.22	<0.15	<0.085	<0.061	<0.069
Endosulfan Sulfate	<0.16	<0.25	<0.17	<0.095	<0.068	<0.078
Herbicide (ppm)						
2,4 D	<0.020	<0.029	<0.023	<0.022	<0.208	<0.021
2,4,5 TP Silvex	<0.0041	<0.0058	<0.0045	<0.0044	<0.042	<0.0042
VOA (ppb)						
Chloromethane	BQL	BQL	BQL	BQL	BQL	BQL
Bromomethane	BQL	BQL	BQL	BQL	BQL	BQL
Vinyl Chloride	BQL	BQL	BQL	BQL	BQL	BQL
Chloroethane	BQL	BQL	BQL	BQL	BQL	BQL
Methylene Chloride	89	150	100	62	59	130
Acetone	62	54	40	37	130	BQL
Carbon Disulfide	BQL	BQL	BQL	BQL	BQL	BQL
1,1 Dichloroethylene	BQL	BQL	BQL	BQL	BQL	BQL
1,1 Dichloroethane	BQL	BQL	BQL	BQL	BQL	BQL
1,2 Dichloroethylene	BQL	BQL	BQL	BQL	BQL	2
Chloroform	BQL	BQL	BQL	BQL	1	BQL
1,2 Dichloroethane	BQL	BQL	BQL	BQL	BQL	BQL
2-Butanone	34	45	30	28	9	BQL
1,1,1 Trichloroethane	BQL	BQL	BQL	BQL	BQL	BQL
Carbon Tetachloride	BQL	BQL	BQL	BQL	BQL	BQL
Vinyl Acetate	BQL	BQL	BQL	BQL	BQL	BQL
Bromodichloromethane	BQL	BQL	BQL	BQL	BQL	BQL
1,2 Dichloropropane	BQL	BQL	BQL	BQL	BQL	BQL
cis-1,3 Dichloropropene	BQL	BQL	BQL	BQL	BQL	BQL
Trichloroethylene	BQL	BQL	110	BQL	1	2
Dibromochloromethane	BQL	BQL	BQL	BQL	BQL	BQL
1,1,2 Trichloroethane	BQL	BQL	BQL	BQL	BQL	BQL
Benzene	BQL	BQL	BQL	BQL	BQL	BQL
Trans 1,3 Dichloropropene	BQL	BQL	BQL	BQL	BQL	BQL
Bromoform	BQL	BQL	BQL	BQL	BQL	BQL
Methyl ethyl ketone	BQL	BQL	BQL	BQL	12	BQL
2-hexanone	BQL	BQL	BQL	BQL	BQL	BQL
Tetrachloroethylene	BQL	BQL	BQL	BQL	BQL	BQL
1,1,2,2-Tetrachloroethane	BQL	BQL	BQL	BQL	BQL	BQL
Toluene	BQL	BQL	BQL	2	3	7
Chlorobenzene	BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	BQL	BQL	BQL	BQL	BQL	2
Styrene	BQL	BQL	BQL	BQL	BQL	BQL
Xylene	BQL	BQL	BQL	BQL	BQL	2
2-Chloroethyl vinyl ether	BQL	BQL	BQL	BQL	BQL	BQL

TABLE IV-A

MK Ferguson Raffinate Pit Spike Quantities per Kilogram

Spiking Levels	Arsenic			
AsTrioxide As(ppm)	757391			
Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4
Lab ID#	1464-01	1464-02	1464-03	1464-04
As Is	195	583	253	26
Max	675	983	1060	665
Aliquot Size (g)	0.6342	0.5285	1.0649	0.8435

Spiking Levels	Barium			
BaNitrate Ba(ppm)	525484			
Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4
Lab ID#	1464-01	1464-02	1464-03	1464-04
As Is	87	73	139	492
Max	149	78	333	7740
Aliquot Size (g)	0.1179	0.0096	0.3700	13.7922

Spiking Levels	Cadmium			
CdNitrate*4Water Cd(ppm)	364399			
Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4
Lab ID#	1464-01	1464-02	1464-03	1464-04
As Is	7	7	4	<1.06
Max	12	14	321	9
Aliquot Size (g)	0.0126	0.0186	0.8710	0.0237

Spiking Levels	Chromium			
NaChromate*4Water Cr(ppm)	222139			
Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4
Lab ID#	1464-01	1464-02	1464-03	1464-04
As Is	16	26	31	16
Max	39	169	34	23
Aliquot Size (g)	0.1034	0.6419	0.0160	0.0311

Spiking Levels	Lead			
PbNitrate Pb(ppm)	625585			
Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4
Lab ID#	1464-01	1464-02	1464-03	1464-04
As Is	42	256	89	52
Max	252	370	644	158
Aliquot Size (g)	0.3358	0.1816	0.8865	0.1690

Spiking Levels	Nickel			
NiNitrate*6Water Ni(ppm)	201856			
Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4
Lab ID#	1464-01	1464-02	1464-03	1464-04
As Is	14	30	81	22
Max	30	66	8790	134
Aliquot Size (g)	0.0795	0.1822	43.1422	0.5556

Spiking Levels	Selenium			
SeDioxide Se(ppm)	711615			
Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4
Lab ID#	1464-01	1464-02	1464-03	1464-04
As Is	13	<2.42	<26.8	<27.6
Max	76	31	81	33
Aliquot Size (g)	0.0880	0.0434	0.1140	0.0462

TABLE IV-B

MK Ferguson Raffinate Pit Spike Quantities per Kilogram

Spiking Levels	Total U (ppm)			
UNH U(ppm)	474040			
Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4
Lab ID#	1464-01	1464-02	1464-03	1464-04
As Is	725	1046	1038	4835
Max	1765	1000	1618	5000
Aliquot Size (g)	2.1935	-0.0978	1.2246	0.3484

Spiking Levels	Tot.Th(ppm)			
ThNitrate4Water Th(ppm)	420269			
Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4
Lab ID#	1464-01	1464-02	1464-03	1464-04
As Is	440	1177	979	3069
Max	2131	1097	1776	9551
Aliquot Size (g)	4.0240	-0.1912	1.8954	15.4233
Max(Th-228) pCi/g	120	110	200	1100

MK Ferguson Quarry Soil Spike Quantities per Kilogram

Spiking Levels	Nitrobenzene
STD Conc(ppm)	1000000
Sample	Quarry Soil
Lab ID#	1464-05
As Is	<.077
Max	133
Aliquot Size (g)	0.1330

Spiking Levels	2,4 DNT
STD Conc(ppm)	1000000
Sample	Quarry Soil
Lab ID#	1464-05
As Is	19
Max	29
Aliquot Size (g)	0.0095

Spiking Levels	1,3,5 TNB
STD Conc(ppm)	1000000
Sample	Quarry Soil
Lab ID#	1464-05
As Is	88
Max	277
Aliquot Size (g)	0.1892

Spiking Levels	2,4,6 TNT
STD Conc(ppm)	1000000
Sample	Quarry Soil
Lab ID#	1464-05
As Is	2772
Max	20055
Aliquot Size (g)	17.2830

*Note: Max Cadmium Values in the Bid Spec were Biased High by a factor of 100

TABLE V

Actual Spike Concentrations Baseline TCLP/Solidification Testing

Element	Reagent Fraction	g Reagent	As Is (ppm)	Raff Pit #1 Spike (ppm)	Max (ppm)	g Reagent	As Is (ppm)	Raff Pit #2 Spike (ppm)	Max (ppm)
As	0.757391	1.2678	195	648	675	1.0595	583	955	983
Ba	0.525484	0.2373	87	143	149	0.0184	73	76	78
Cd	0.364399	0.0252	7	11	12	0.0404	7	14	14
Cr	0.222139	0.2069	16	37	39	1.2841	26	164	169
Pb	0.625585	0.6707	42	242	252	0.3621	256	358	370
Ni	0.201856	0.1600	14	29	30	0.3686	30	65	66
Se	0.711615	0.1757	13	73	76	0.0876	0	30	31
U	0.47404	4.3850	725	1694	1765	0.0000	1046	1015	1000
Th	0.420269	8.0429	440	2045	2131	0.0000	1177	1143	1097
Water	1	68				57			

Element	Reagent Fraction	g Reagent	As Is (ppm)	Raff Pit #3 Spike (ppm)	Max (ppm)	g Reagent	As Is (ppm)	Raff Pit #4 Spike (ppm)	Max (ppm)	*Spike wo Water (ppm)
As	0.757391	2.1304	253	916	1060	1.6849	26	409	665	644
Ba	0.525484	0.7404	139	288	333	27.5854	492	4767	7740	7505
Cd	0.364399	1.7422	4	278	321	0.0481	0	5	9	8
Cr	0.222139	0.0323	31	30	34	0.0627	16	14	23	22
Pb	0.625585	1.7735	89	556	644	0.3422	52	98	158	154
Ni	0.201856	86.2846	81	7593	8790	1.1135	22	83	134	130
Se	0.711615	0.2276	0	70	81	0.0932	0	20	33	32
U	0.47404	2.4492	1038	1398	1618	0.6993	4835	3080	5000	4849
Th	0.420269	3.7904	979	1534	1776	30.8332	3069	5880	9551	9259
Water	1	216				1185				

Note: Spiking Levels Include Water Used to Transfer Spiking Reagents
In the case of Pit #4, excess water was added due to the high level of solids.
As a result, for comparison purposes, spiking levels are reported with and without water.
2000 grams of sample was used in all cases

TABLE VI

	MK Ferguson Baseline Spiked, Untreated, TCLP Results (ppm)					
Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4	Quarry Soil	Surface Soil
Lab ID#	1464B-01	1464B-02	1464B-03	1464B-04	1464E-01	1464E-02
Benzene	<0.005	<0.005	<0.005	<0.005		
Carbon Tetrachloride	<0.005	<0.005	<0.005	<0.005		
Chlorobenzene	<0.005	<0.005	<0.005	<0.005		
Chloroform	<0.005	<0.005	<0.005	<0.005		
1,2-Dichloroethane	<0.005	<0.005	<0.005	<0.005		
1,1-Dichloroethylene	<0.005	<0.005	<0.005	<0.005		
Methyl ethyl ketone	<0.100	<0.100	<0.100	<0.100		
Tetrachloroethylene	<0.005	<0.005	<0.005	<0.005		
Trichloroethylene	<0.005	<0.005	<0.005	<0.005		
Vinyl Chloride	<0.010	<0.010	<0.010	<0.010		
o-Cresol	<0.020	<0.020	<0.020	<0.020	<0.010	<0.010
m-Cresol	<0.020	<0.020	<0.020	<0.020	<0.010	<0.010
p-Cresol	<0.020	<0.020	<0.020	<0.020	<0.010	<0.010
Total Cresol	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	<0.020	<0.020	<0.020	<0.020	<0.010	<0.010
2,4-Dinitrotoluene	<0.020	<0.020	<0.020	<0.020	0.953	<0.010
Hexachlorobenzene	<0.020	<0.020	<0.020	<0.020	<0.010	<0.010
Hexachlorobutadiene	<0.020	<0.020	<0.020	<0.020	<0.010	<0.010
Hexachloroethane	<0.020	<0.020	<0.020	<0.020	<0.010	<0.010
Nitrobenzene	<0.020	<0.020	<0.020	<0.020	3.010	0.003
Pentachlorophenol	<0.100	<0.100	<0.100	<0.100	<0.049	<0.049
Pyridine	<0.020	<0.020	<0.020	<0.020	<0.010	<0.010
2,4,5-Trichlorophenol	<0.100	<0.100	<0.100	<0.100	<0.049	<0.049
2,4,6-Trichlorophenol	<0.020	<0.020	<0.020	<0.020	<0.010	<0.010
Endrin	<0.00034	<0.00022	<0.00022	<0.00018		
Lindane	<0.00017	<0.00011	<0.00011	<0.000091		
Methoxychlor	<0.0034	<0.0022	<0.0022	<0.0018		
Toxaphene	<0.017	<0.011	<0.011	<0.091		
Chlordane	<0.0068	<0.0044	<0.0044	<0.0036		
Heptachlor	<0.0034	<0.00022	<0.00022	<0.00018		
2,4-D	<0.0080	<0.0063	<0.0071	<0.0128		
2,4,5-TP Silvex	<0.0016	<0.0013	<0.0014	<0.0026		
As	8.84	1.68	6.57	0.178	<0.013	<0.013
Ba	0.373	0.241	0.371	120	1.39	3.8
Cd	0.127	0.035	3.27	0.178	<0.002	0.004
Cr	<0.003	<0.003	<0.003	<0.003	0.012	0.012
Pb	<0.022	<0.022	0.055	0.692	0.035	<0.018
Hg	<0.0002	<0.0002	0.0006	<0.0002	<0.0002	<0.0002
Se	0.055	0.072	0.219	<0.023	<0.019	<0.019
Ag	0.028	<0.004	<0.004	<0.004	<0.004	<0.004

Note: Quarry Soil Results are for material spiked with Nitrobenzene Only

TABLE VII

	MK Ferguson Baseline, Spiked, Treated, 14 Day TCLP Results (ppm)				
Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4	Quarry Soil
Lab ID#	1464C-01	1464C-02	1464C-03	1464C-04	1464E-03
o-Cresol	<0.020	<0.020	<0.020	<0.020	<0.009
m-Cresol	<0.020	<0.020	<0.020	<0.020	<0.009
p-Cresol	<0.020	<0.020	<0.020	<0.020	<0.009
Total Cresol	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	<0.020	<0.020	<0.020	<0.020	<0.009
2,4-Dinitrotoluene	<0.020	<0.020	<0.020	<0.020	0.015
Hexachlorobenzene	<0.020	<0.020	<0.020	<0.020	<0.009
Hexachlorobutadiene	<0.020	<0.020	<0.020	<0.020	<0.009
Hexachloroethane	<0.020	<0.020	<0.020	<0.020	<0.009
Nitrobenzene	<0.020	<0.020	<0.020	<0.020	0.701
Pentachlorophenol	<0.100	<0.100	<0.100	<0.100	<0.047
Pyridine	<0.020	<0.020	<0.020	<0.020	<0.009
2,4,5-Trichlorophenol	<0.100	<0.100	<0.100	<0.100	<0.047
2,4,6-Trichlorophenol	<0.020	<0.020	<0.020	<0.020	<0.009
As	<0.014	0.0163	0.0366	0.0321	<0.013
Ba	1.10	1.87	3.37	12.0	2.22
Cd	<0.001	<0.001	<1.0	0.0018	<0.002
Cr	0.136	0.00590	0.0241	0.0098	0.066
Pb	<0.022	<0.022	<0.022	<0.022	<0.018
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Se	0.0263	0.0259	0.0259	0.0255	<0.019
Ag	<0.004	<0.004	<0.004	<0.004	<0.004

	MK Ferguson Baseline, Spiked, Treated, 28 Day TCLP Results (ppm)				
Sample	Raff Pit#1	Raff Pit#2	Raff Pit#3	Raff Pit#4	Quarry Soil
Lab ID#	1464D-01	1464D-02	1464D-03	1464D-04	1464F-01
o-Cresol	<0.020	<0.020	<0.020	<0.020	<0.010
m-Cresol	<0.020	<0.020	<0.020	<0.020	<0.010
p-Cresol	<0.020	<0.020	<0.020	<0.020	<0.010
Total Cresol	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	<0.020	<0.020	<0.020	<0.020	<0.010
2,4-Dinitrotoluene	<0.020	<0.020	<0.020	<0.020	0.017
Hexachlorobenzene	<0.020	<0.020	<0.020	<0.020	<0.010
Hexachlorobutadiene	<0.020	<0.020	<0.020	<0.020	<0.010
Hexachloroethane	<0.020	<0.020	<0.020	<0.020	<0.010
Nitrobenzene	<0.020	<0.020	<0.020	<0.020	0.813
Pentachlorophenol	<0.100	<0.100	<0.100	<0.100	<0.049
Pyridine	<0.020	<0.020	<0.020	<0.020	<0.010
2,4,5-Trichlorophenol	<0.100	<0.100	<0.100	<0.100	<0.049
2,4,6-Trichlorophenol	<0.020	<0.020	<0.020	<0.020	<0.010
As	0.027	0.036	0.218	0.017	<0.013
Ba	0.911	0.583	1.44	10.9	0.669
Cd	0.003	<0.002	0.003	<0.002	<0.002
Cr	0.126	0.006	0.03	0.013	0.0822
Pb	<0.018	<0.018	<0.018	<0.018	<0.018
Hg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0004
Se	0.026	0.043	0.061	0.034	<0.019
Ag	<0.004	<0.004	0.011	0.012	<0.004

Note: Quarry Soil Results are for material spiked with Nitrobenzene Only

TABLE VIII

MK Ferguson Optimization Test Matrices

Mixture #	Test Matrix I Soil/Sludge Ratio	Binder/Sludge Ratio	Test Matrix II Soil/Sludge Ratio	Binder/Sludge Ratio	Test Matrix III Soil/Sludge Ratio	Binder/Sludge Ratio
1	0	0.6	0	0.4	0	0.2
2	0.2	0.6	0.2	0.4	0.2	0.2
3	0.4	0.6	0.4	0.4	0.4	0.2
4	0.6	0.6	0.6	0.4	0.6	0.2
5	0.8	0.6	0.8	0.4	0.8	0.2
6	1	0.6	1	0.4	1	0.2

Binder is 40% Cement 60% Class F Flyash
Sludge is from raffinate pit #3

Actual Spike Concentrations for Raffinate Pit#3 Optimization Tests

Element	Reagent Fraction	g Reagent	As is (ppm)	Raff Pit #3 Spike (ppm)	Max (ppm)
As	0.757391	21.3	253	1005	1060
Ba	0.525484	7.4	139	316	333
Cd	0.364399	17.42	4	305	321
Cr	0.222139	0.32	31	33	34
Pb	0.625585	17.73	89	611	644
Ni	0.201856	862.84	81	8338	8790
Se	0.711615	2.28	0	77	81
U	0.47404	24.49	1038	1535	1618
Th	0.420269	37.91	979	1685	1776
Water	1	90			

Note: 20000 grams of raffinate pit #3 sludge was spiked for optimization testing

TABLE IX

	MK Ferguson Soil Like TCLP Results (ppm)			
Sample	OP-II-4-1	OP-II-6-1	OP-III-5-1	OP-III-6-1
Lab ID#	1464G-01	1464G-02	1464G-03	1464G-04
o-Cresol	<0.010	<0.009	<0.011	<0.010
m-Cresol	<0.010	<0.009	<0.011	<0.010
p-Cresol	<0.010	<0.009	<0.011	<0.010
Total Cresol	NA	NA	NA	NA
1,4-Dichlorobenzene	<0.010	<0.009	<0.011	<0.010
2,4-Dinitrotoluene	<0.010	<0.009	<0.011	<0.010
Hexachlorobenzene	<0.010	<0.009	<0.011	<0.010
Hexachlorobutadiene	<0.010	<0.009	<0.011	<0.010
Hexachloroethane	<0.010	<0.009	<0.011	<0.010
Nitrobenzene	<0.010	<0.009	<0.011	<0.010
Pentachlorophenol	<0.048	<0.047	<0.054	<0.048
Pyridine	<0.010	<0.009	<0.011	<0.010
2,4,5-Trichlorophenol	<0.048	<0.047	<0.054	<0.048
2,4,6-Trichlorophenol	<0.010	<0.009	<0.011	<0.010
As	2.93	0.346	2.96	3.05
Ba	1.49	1.33	1.25	1.12
Cd	1.14	0.004	2.87	2.82
Cr	0.012	0.0270	0.0169	0.0196
Pb	<0.012	<0.012	0.0207	0.0154
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Se	0.0907	0.0998	0.158	0.168
Ag	<0.025	<0.100	<0.025	<0.025

	MK Ferguson Monolithic TCLP Results (ppm)			
Sample	OP-I-3-2	OP-II-1-2	OP-II-2-2	OP-II-3-2
Lab ID#	1464G-05	1464G-06	1464G-07	1464G-08
o-Cresol	<0.010	<0.010	<0.010	<0.009
m-Cresol	<0.010	<0.010	<0.010	<0.009
p-Cresol	<0.010	<0.010	<0.010	<0.009
Total Cresol	NA	NA	NA	NA
1,4-Dichlorobenzene	<0.010	<0.010	<0.010	<0.009
2,4-Dinitrotoluene	<0.010	<0.010	<0.010	<0.009
Hexachlorobenzene	<0.010	<0.010	<0.010	<0.009
Hexachlorobutadiene	<0.010	<0.010	<0.010	<0.009
Hexachloroethane	<0.010	<0.010	<0.010	<0.009
Nitrobenzene	<0.010	<0.010	<0.010	<0.009
Pentachlorophenol	<0.049	<0.051	<0.050	<0.046
Pyridine	<0.010	<0.010	<0.010	<0.009
2,4,5-Trichlorophenol	<0.049	<0.051	<0.050	<0.046
2,4,6-Trichlorophenol	<0.010	<0.010	<0.010	<0.009
As	0.639	1.25	1.80	3.73
Ba	1.33	1.18	1.19	0.817
Cd	0.0333	0.0879	0.267	1.63
Cr	0.0239	0.0259	0.0205	0.010
Pb	<0.012	<0.012	<0.012	<0.012
Hg	<0.0002	<0.0002	<0.0002	<0.0002
Se	0.0788	0.0482	0.0720	0.105
Ag	<0.025	<0.005	<0.005	<0.005

	ATG Rerun of Soil Like TCLP Results			
Sample	OP-II-6	OP-II-6	OP-III-6	OP-III-6
Cd	1.831	1.835	2.695	2.977

Note: Samples rerun by EcoTek Applied Technology Group
Only 10 grams of sample was utilized in a modified TCLP test

TABLE X

Physical Test Results for Optimization Samples

	Monolithic Product			
Sample ID	OP-I-3	OP-II-1	OP-11-2	OP-II-3
Specific Gravity	1.64	1.51	1.53	1.55
Drainable Water	0	0	0	0
Volume Increase Ratio	1.075	1.209	1.101	1.022
Unconfined Compressive Strength (psi)	335	185	225	125
	Soil Like Product			
Sample ID	OP-II-4	OP-II-6	OP-III-5	OP-III-6
Specific Gravity	1.60	1.67	1.56	1.60
Drainable Water	0	0	0	0
Volume Increase Ratio	0.948	0.853	0.852	0.817
Optimum Moisture Content, %	35.5	32.2	33.2	32.3
Maximum Dry Density (pcf)	81.3	86.6	86.8	86.8
Remolded Moisture Content, %	30.3	30.9	32.9	31.6
Remolded Dry Density (pcf)	81.6	83.2	82.5	84.4
Percent Compaction	100.4	96.1	95.0	97.2
Unconfined Compressive Strength (psi)	59.5	42.6	31.8	35.8

Note: Volume Increase Ratios are based on a surface soil sample density of 1.09 g/cc.
Actual undisturbed soil density values should be higher which will increase the ratios.

TABLE XI

Soil Like Product ANSI 16.1 Test Results for test Matrix OP-III-6

Sample	Initial Rinse	2 hour	7 hour	24 hour	48 hour	72 hour	96 hour	120 hour
Sample ID #	S0	S1	S2	S3	S4	S5	S6	S7
Lab ID#	1464I-02	1464I-04	1464I-06	1464I-08	1464I-10	1464I-12	1464I-14	1464I-16
Alkalinity (ppm)	13.1	11.0	14.6	24.5	25.7	25.3	25.1	23.4
Chloride (ppm)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Fluoride (ppm)	0.57	0.16	0.24	0.43	0.70	0.63	0.65	0.64
Phosphorus (ppm)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrate/Nitrite (ppm)	0.86	96.1	83.4	117	78.1	43.8	27.6	17.3
Sulfate (ppm)	3.2	<1.0	<1.0	2.8	<1.0	<1.0	<1.0	2.5
Ca (ppm)	38.4	90.2	84.4	119	89.2	56.9	40.5	27.9
Fe (ppm)	8.62	0.131	0.0270	0.0400	.0276	0.351	0.0590	0.176
Mg (ppm)	5.28	0.103	<0.030	0.0581	.0483	<0.030	0.0461	0.116
Ni (ppm)	3.08	0.0814	0.0442	0.0680	.0586	0.0493	0.0480	0.0931
K (ppm)	1.59	6.67	6.03	8.27	6.40	3.97	2.69	1.69
Na (ppm)	3.74	35.3	30.8	41.0	26.6	15.0	9.13	5.30
U (pCi/L)	20	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	8.5

Monolithic Product ANSI 16.1 Test Results for test Matrix OP-II-1

Sample	Initial Rinse	2 hour	7 hour	24 hour	48 hour	72 hour	96 hour	120 hour
Sample ID #	M0	M1	M2	M3	M4	M5	M6	M7
Lab ID#	1464I-01	1464I-03	1464I-05	1464I-07	1464I-09	1464I-11	1464I-13	1464I-15
Alkalinity (ppm)	2.4	28.3	49.1	83.0	74.7	63.7	67.4	60.8
Chloride (ppm)	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Fluoride (ppm)	0.10	0.20	0.31	0.62	0.89	0.80	0.72	0.63
Phosphorus (ppm)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nitrate/Nitrite (ppm)	1.38	44.5	48.1	72.9	58.9	37.1	29.3	21.3
Sulfate (ppm)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ca (ppm)	2.18	35.8	45.5	76.9	81.8	61.8	53.3	43.0
Fe (ppm)	0.300	0.0572	0.0335	0.0330	0.0366	0.0226	0.0281	0.0400
Mg (ppm)	0.185	0.0370	0.0310	<0.030	0.0363	0.0355	<0.030	<0.030
Ni (ppm)	0.125	0.0212	0.007	0.008	0.010	0.007	0.008	0.0131
K (ppm)	0.931	21.1	20.9	28.9	21.3	12.0	8.21	5.20
Na (ppm)	0.921	22.3	23.2	32.2	24.1	14.0	9.51	6.14
U (pCi/L)	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4

Table XII

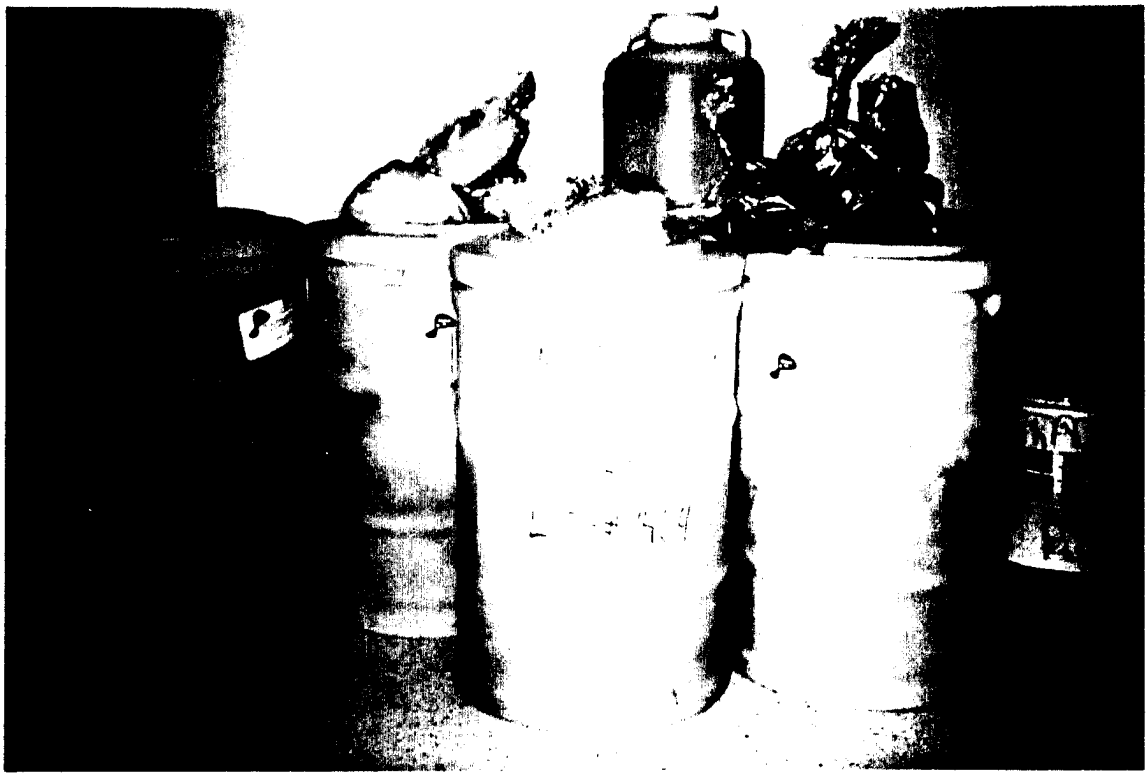
QUARRY SOIL PRODUCT ANS 16.1 TEST RESULTS

Sample	Initial Rinse	2 Hour	7 Hour	24 Hour	48 Hour	72 Hour	96 Hour	120 Hour
Sample ID#	N0	N1	N2	N3	N4	N5	N6	N7
Lab ID#	1464J01	1464J02	1464J03	1464J04	1464J05	1464J06	1464J07	1464J08
Nitrobenzene	<6.0	20.8	24.4	68.9	59.2	53.1	52.1	67.5
2,4-Dinitrotoluene	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0
TNT	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	8.1	11.6

All units are μg/l unless otherwise specified

APPENDIX B

WTG
Waste Technologies Group Inc.



RAW WASTE

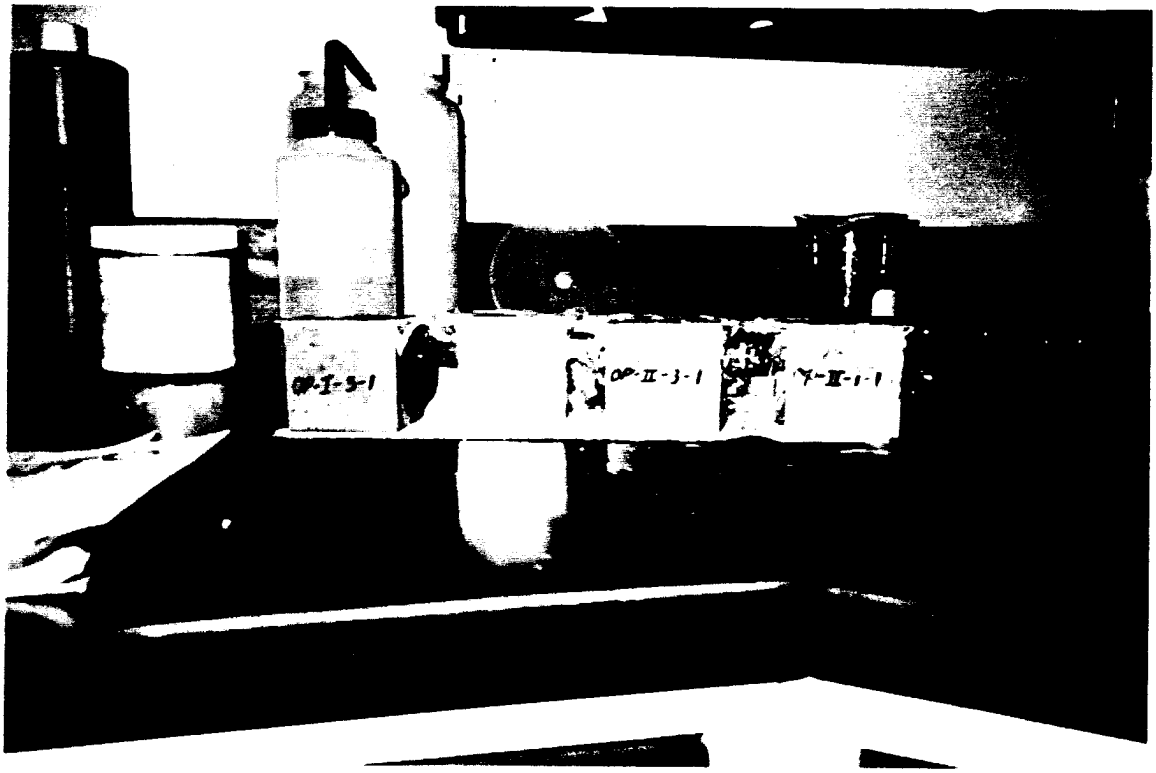
WTG
Waste Technologies Group, Inc.

INITIAL REVIEW OF ALL SAMPLES

WTG
Waste Technologies Group Inc

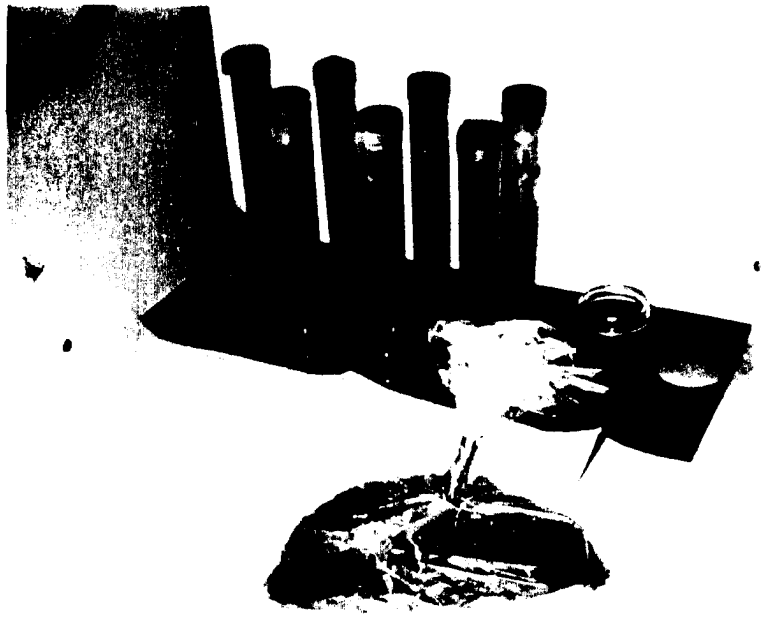
SAMPLE EVALUATION BY MR. GROZESCU

WTG
Waste Technologies Group Inc.



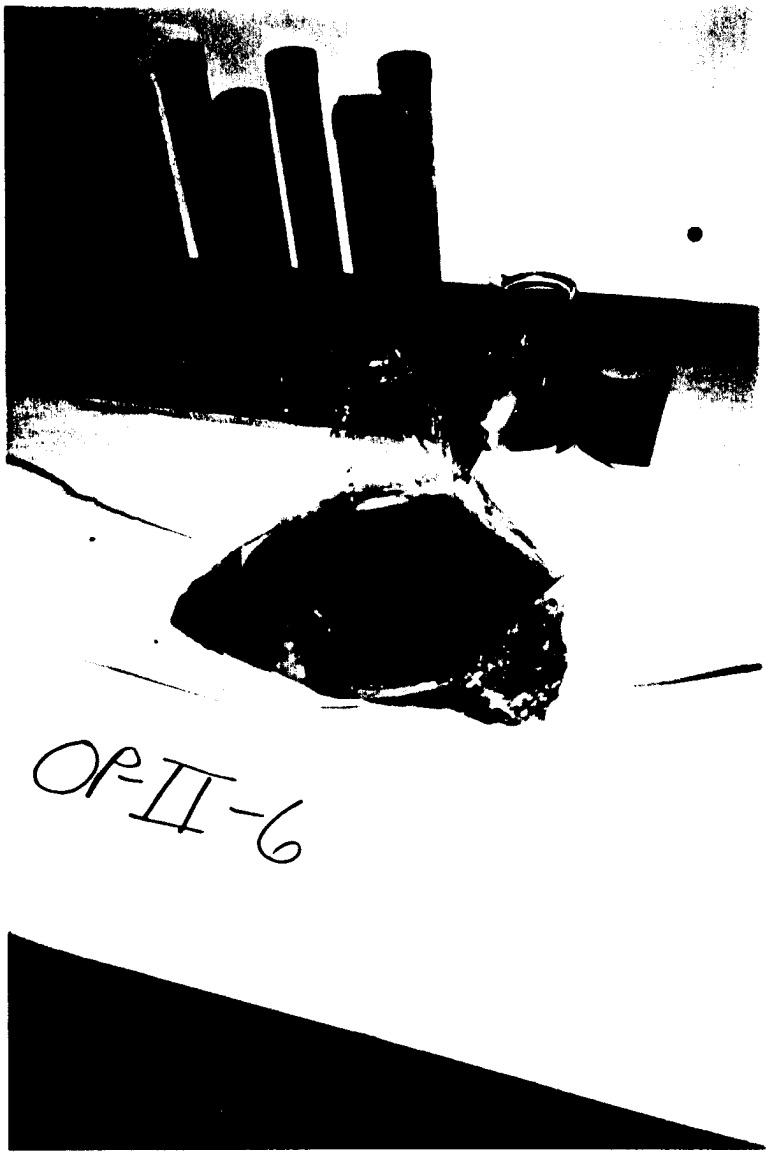
MONOLITHIC SAMPLES SELECTED

WTG
Waste Technologies Group, Inc.



SOIL-LIKE SAMPLE SELECTED

WTG
Waste Technologies Group, Inc.



SOIL-LIKE SAMPLE SELECTED

WTG
Waste Technologies Group, Inc.

SOIL-LIKE SAMPLE SELECTED

WTG
Waste Technologies Group, Inc

SOIL-LIKE SAMPLE SELECTED

APPENDIX C

5.2.11 AMERICAN NUCLEAR SOCIETY LEACH TEST (ANS-16.1, 1986) (ANS 1986)

A "quasi-dynamic" leach test, ANS-16.1, is applied to stabilized/solidified low-level and hazardous wastes. A monolithic cylinder (length:diameter of 0.2 to 5.0) is leached with demineralized water applied at a V/S ratio of 10 cm under ambient temperatures. At the start of the experiment, the sample is rinsed to obtain zero contaminant concentration at the surface of the sample. Afterwards, the sample is immersed in water, which is replaced after 2 hours, 7 hours, 24 hours, 48 hours, 72 hours, 4 days, 5 days, 14 days, 28 days, 43 days, and 90 days.

The results of the leaching test are recorded in terms of cumulative fraction leached over the total mass in the waste form, F. Calculations are then used to derive an effective diffusion coefficient, De (cm^2/s), and a leachability index (LX=-log De). The LX values range from 5(De = 5-10, rapid diffusion) to 15 (De = 10-15, very slow diffusion).

Interpretation of ANS-16.1 results assumes that leaching is diffusion-controlled and that nonequilibrium conditions are maintained during each leaching period. Because leaching rates for hazardous constituents vary widely and may not be diffusion-controlled, the leaching rates under an ANS-16.1 results may be greater than those under the modified ANS-16.1 (Dynamic Leach) test, discussed in the next subsection.

CASE NARRATIVE FOR TCLP VOLATILE ANALYSIS USING SW-846 METHOD 8240

Client:

LSDG:

Sample(s):

* All volatile organics were analyzed by GC/MS on one or more of the instruments listed below.

  Hewlett-Packard MSD---Inst. ID. 7002 Finnigan Mat 4023---Inst. ID. 4000
  Hewlett-Packard MSD---Inst. ID. 7003 Finnigan OWA ---Inst. ID. 10501

* Chromatography was performed on a 2.4m x 2.0mm ID glass column packed with 1% SP 1000 Carbopack B and/or a 75m x 0.53mm DB-624 megabore column. Samples were purged via Tekmar LSC-2/ALS and/or OI 4460A/OIC MPM-16 onto traps composed of silica gel/charcoal/Tenax. Operating temperatures are 220°C, 250°C, 280°C respectively for the injector, jet separator, source/interface.

* Sample purge size was 5 ml for the ZHE extract unless noted otherwise.

* The reports of the target TCLP compounds identified and quantified in the samples are contained in the following sections of the data package. Also included are the appropriate calibration and quality control data where applicable. Data was obtained from HP RTE-A series computer with Aquarius software and/or Nova 4C computer with Finnigan Incos software.

* The following exceptions and/or considerations should be noted for the sample group contained within.

-

CASE NARRATIVE FOR HERBICIDE ANALYSIS USING SW-846 METHOD 8150

CLIENT:

LSDG:

SAMPLE(S):

* All herbicide organics were analyzed on a Hewlett-Packard gas chromatograph equipped with an electron capture detector (ECD).

* Chromatography was performed on a DB-608 and/or RTX-5 capillary column.

* Extraction was performed on approximately 50 gram fractions for soil matrices and 1 liter for aqueous matrices unless stated otherwise.

* Final extract concentration was performed by the nitrogen blowdown technique to a final volume of 10 ml for soil matrices and 10 ml for aqueous matrices unless stated otherwise.

* The reports of the compounds identified and quantified in the samples are contained in the following sections of the data package. Positive hits are confirmed by at least one other method.

* Method detection limits or practical quantitation limits (PQL's) are as stated in SW-846 Method 8150. The PQL's are factored for initial sample weight or volume, final extract volume, sample % moisture (for soils), and any necessary dilution.

* The following exceptions and/or considerations should be noted for the sample group contained within.

CASE NARRATIVE FOR NITROAROMATICS ANALYSIS BY GC/ECD

Client:

LSDG:

Sample(s):

* The sample batch was analyzed using a Hewlett-Packard 5890 gas chromatograph equipped with an electron capture detector.

* Chromatography was performed on a DB-210 column using a temperature program suitable for resolving the target analytes. The instrument was calibrated using a minimum of three concentrations.

* Initial sample volume was 30 ml for aqueous matrices unless noted otherwise.

* Final extract volume was 5.0 ml unless noted otherwise.

* The reports of the target compounds identified and quantified in the samples are contained in the following sections of the data package. Also included are the appropriate calibration and quality control data where applicable. Targets are confirmed by at least one other technique when the concentration level permits.

* Practical Quantitation Limits (PQL) are based upon factored for initial sample volume, final extract volume, and any necessary dilutions.

* A blank was extracted with the sample batch and found to be free of the target analytes.

* The following exceptions and/or considerations should be noted for the sample group contained within.

-

CASE NARRATIVE FOR SEMI-VOLATILE ANALYSIS FOR TCLP COMPOUNDS USING EPA SW-846 METHOD 8270 PROTOCOLS

CLIENT:

LSDG:

SAMPLE(S):

* All semi-volatile organics were analyzed by GC/MS on either or both of the instruments listed below.

  Hewlett-Packard MSDs Inst. ID. 7001 Inst. ID 7004

* Chromatography was performed on a 30m J & W fused silica DB-5 capillary column.

* Extraction was performed on an appropriate volume of the leachate solution to yield a detection level that is significantly below EPA's maximum allowable concentration limits for TCLP compounds unless stated otherwise.

* Final extract concentration was performed by the nitrogen blowdown technique to a final volume of 2.0 ml unless stated otherwise.

* The reports of the semi-volatile TCLP compounds identified and quantified in the samples are contained in the following sections of the data package.

* Detection limits or practical quantitation limits (PQL's) are expressed in the final quantitation report as the minimum value that can be detected with confidence. PQLs are factored for initial sample volume and final extract volume along with any necessary dilution.

* A leachate blank was extracted and analyzed with the sample batch and was found to be free of the TCLP compounds.

* The following exceptions and/or considerations should be noted for the sample group contained within.

CASE NARRATIVE FOR PESTICIDE/PCB ANALYSIS USING SW-846, METHOD 8080

Client:

LSDG:

Samples(s):

* The sample batch was analyzed using a Hewlett-Packard gas chromatograph equipped with an electron capture detector.

* Chromatography was performed on a DB-608 column using a temperature program suitable for resolving the target analytes. Quantitation of sample concentrations was performed using a five level calibration. Tentative identification of compounds is supported by at least one other qualitative analysis (either GC/EC or GC/MS when the concentration of the analytes permits). All appropriate quality control samples were analyzed with the sample batch.

* The initial sample amount was approximately 1000 ml for aqueous samples and/or 30 grams for solid matrices unless noted otherwise.

* The sample was extracted with methylene chloride and exchanged with hexane to a final volume of 10 ml for aqueous and 20 ml for solid matrices.

* Practical Quantitation Limits (PQLs) are those as stated in the method factored for the initial sample amount, final sample extract volume, any necessary dilutions, and percent moisture (for solids).

* The following exceptions and/or considerations should be noted for the sample group contained within:

CASE NARRATIVE FOR METALS ANALYSIS
Method CLP SOW 3/90

Client:

Project/Case:

LSDG:

Sample(s):

- **Analysis** - Metals analysis was performed on ********** samples for TAL metals. The samples were prepared and analyzed according to EPA CLP SOW 3/90. The following methods and instruments were used for analysis:

Analysis	Instrument	Method
ICP	TJA ICAP 61E	200.7
GFAA-As	TJA SH-22	206.2
GFAA-Se	TJA SH-22	270.2
GFAA-Tl	TJA SH-22	279.2
GFAA-Pb	TJA SH-22	239.2
CVAA	TJA CVAA S-12	245.5

- **QA/QC** - All appropriate QC data was within acceptable control limits with the following exceptions:

- **General Discussion -**

- **Analytical Difficulties -**

CASE NARRATIVE FOR GENERAL CHEMISTRY

Client:

LSDG:

* Sulfate, Method 375.4

  Sulfate ion is converted to a barium sulfate suspension and the resulting turbidity is determined by a spectrophotometer as compared to a calibration curve prepared from sulfate standards.

* Chloride, Method 325.2

  Thiocyanate ion (SCN) is liberated from mercuric thiocyanate by the chloride ion to form mercuric chloride. Ferric ion is added to form highly colored ferric thiocyanate in concentration proportional to the original chloride concentration.

* Alkalinity, Method 310.1

  An unaltered sample is titrated to an electrometrically determined endpoint of pH 4.5 with a low normality acid solution.

* Fluoride, Method 340.2

  The fluoride is determined potentiometrically using a fluoride electrode in conjunction with a standard reference electrode and a selective ion meter.

* Nitrate/Nitrite, Method 353.1

  Nitrate is reduced to nitrite with hydrazine sulfate and the nitrite (that originally present plus reduced nitrate) is determined colorimetrically by the formation of a pink color.

CASE NARRATIVE FOR ISOTOPIC THORIUM

Client:

LSDG:

* Aliquots of sample are traced with Thorium-229 and analyzed for isotopic Thorium (228, 230, and 232). The samples are loaded onto an anion exchange column using 9M hydrochloric acid. After rinsing the column, the effluent, containing the thorium, is converted to a nitrate form and loaded on a second column using 8N nitric acid. After rinsing, the thorium is selectively stripped from the column using a solution of 9M hydrochloric acid. The solution is electroplated and analyzed for alpha emitting thorium isotopes using an alpha spectrometry system using pulse height analysis. All alpha spectrometers are calibrated with NIST traceable standards.

* Quantification of each of the alpha emitting isotopes is done by quantifying the observed peak area(s) of the isotope(s) of interest and the peak area of the tracer isotope added to the sample. The observed peak area of the tracer isotope is then used to calculate the chemical recovery of the sample. This chemical recovery is then applied to the peaks of interest, with the detector efficiency, count time, and sample volume/weight to calculate the isotopic concentration of each of the thorium isotopes detected.

* Detection limits of this analysis (MDA) are affected by many analysis parameters, including sample volume/weight, chemical recovery, detector efficiency, sample count time, and instrument background.

* The following exceptions and/or considerations should be noted for the sample group contained within:

CASE NARRATIVE FOR RADIUM-226 AND -228
(planchet method)

Client:

LSDG:

Sample(s):

* The prepared sample is spiked with inactive barium and lead carriers. The radium isotopes are separated from the matrix by co-precipitation with barium and lead sulfates and purified by EDTA-chelation. After an appropriate ingrowth of Ac-228 from Ra-228, the Ac-228 is then separated from the Ra-228 with a yttrium carrier, purified and analyzed for beta activity on a gas flow proportional counter. The Ra-228 is calculated from the measured Ac-228 activity. The supernatant is precipitated as a sulfate, purified and alpha counted on a gas flow proportional counter to determine the Ra-226 concentration.

* The detection limits for this analysis (MDA) are affected by many analysis parameters, including sample size, chemical recovery, detector efficiency, sample count time, and instrument background.

* The following exceptions and/or considerations should be noted for the sample group contained within:

CASE NARRATIVE FOR
TOTAL URANIUM by LASER PHOSPHORIMETRY

Client:

LSDG:

* The sample aliquot is digested and filtered to remove any suspended interferences that may be present in the samples.

* The uranium in the prepared sample is analyzed with a kinetic phosphorescence analyzer. The KPA-11 uses a pulsed laser to phosphoresce the uranium in the sample. The phosphorescence is received by the detector and, over a series of time gates, a decay curve is generated. A linear regression is performed on the data and the uranium concentration is determined.

* The following exceptions and/or considerations should be noted for the sample group contained within.

1991 ANNUAL BOOK OF ASTM STANDARDS

SECTION 4

Construction

VOLUME 04.08

Soil and Rock; Dimension Stone; Geosynthetics

Includes standards of the following committees:

C-18 on Dimension Stone
D-4 on Road and Paving Materials (partial)
D-18 on Soil and Rock
D-35 on Geosynthetics

Publication Code Number (PCN): 01-040891-38

ASTM 1916 Race Street, Philadelphia, PA 19103-1187 USA ■ (215) 299-5400 ■ TWX: 710-670-1037 ■ FAX: 215-977-9679

Designation: D 5084 – 90

Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter[1]

This standard is issued under the fixed designation D 5084; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers laboratory measurement of the hydraulic conductivity (also referred to as *coefficient of permeability*) of water-saturated porous materials with a flexible wall permeameter.

1.2 This test method may be utilized with undisturbed or compacted specimens that have a hydraulic conductivity less than or equal to 1×10^{-5} m/s (1×10^{-3} cm/s).

1.3 The hydraulic conductivity of materials with hydraulic conductivities greater than 1×10^{-5} m/s may be determined by Test Method D 2434.

1.4 The values stated in SI units are to be regarded as the standard, unless other units are specifically given. By tradition in U.S. practice, hydraulic conductivity is reported in centimetres per second, although the common SI units for hydraulic conductivity are metres per second.

1.5 *This standard does not purport to address the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 653 Terminology Relating to Soil, Rock, and Contained Fluids[2]

D 698 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb (2.49-kg) Rammer and 12-in. (305-mm) Drop[2]

D 1557 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in. (457-mm) Drop[2]

D 1587 Practice of Thin-Walled Tube Sampling of Soils[2]

D 2113 Practice for Diamond Core Drilling for Site Investigation[2]

D 2216 Method for Laboratory Determination of Water (Moisture) Content in Soil, Rock, and Soil-Aggregate Mixtures[2]

D 2434 Test Method for Permeability of Granular Soils (Constant Head)[2]

D 4220 Practices for Preserving and Transporting Soil Samples[2]

D 4753 Specification for Evaluating, Selecting and Specifying Balances and Scales for Use in Soil and Rock Testing[2]

D 4767 Test Method for Consolidated-Undrained Triaxial Compression[2]

E 145 Specification for Gravity-Convection and Forced-Ventilation Ovens[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *hydraulic conductivity, k*—the rate of discharge of water under laminar flow conditions through a unit cross-sectional area of a porous medium under a unit hydraulic gradient and standard temperature conditions (20°C).

DISCUSSION—The term *coefficient of permeability* is often used instead of *hydraulic conductivity*, but *hydraulic conductivity* is used exclusively in this test method. A more complete discussion of the terminology associated with Darcy's law is given in the literature.[4]

3.1.2 *pore volume of flow*—the cumulative quantity of flow into a test specimen divided by the volume of voids in the specimen.

3.1.3 For definitions of other terms used in this test method, see Terminology D 653.

4. Significance and Use

4.1 This test method applies to one-dimensional, laminar flow of water within porous materials such as soil and rock.

4.2 The hydraulic conductivity of porous materials generally decreases with an increasing amount of air in the pores of the material. This test method applies to water-saturated porous materials containing virtually no air.

4.3 This test method applies to permeation of porous materials with water. Permeation with other liquids, such as chemical wastes, can be accomplished using procedures similar to those described in this test method. However, this test method is only intended to be used when water is the permeant liquid.

4.4 It is assumed that Darcy's law is valid and that the hydraulic conductivity is essentially unaffected by hydraulic gradient. The validity of Darcy's law may be evaluated by measuring the hydraulic conductivity of the specimen at three hydraulic gradients; if all measured values are similar (within about 25 %), then Darcy's law may be taken as valid. However, when the hydraulic gradient acting on a test

[1] This test method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D18.04 on Hydrologic Properties of Soil and Rocks.

Current edition approved June 29, 1990. Published October 1990.

[2] *Annual Book of ASTM Standards*, Vol 04.08.

[3] *Annual Book of ASTM Standards*, Vol 04.02.

[4] Olson, R. E., and Daniel, D. E., "Measurement of the Hydraulic Conductivity of Fine-Grained Soils," *Symposium on Permeability and Groundwater Contaminant Transport, ASTM STP 746*, ASTM, 1981, pp. 18–64.

specimen is changed, the state of stress will also change, and, [illegible] specimen is compressible, the volume of the specimen [illegible] change. Thus, some change in hydraulic conductivity may occur when the hydraulic gradient is altered, even in cases where Darcy's law is valid.

4.5 This test method provides a means for determining hydraulic conductivity at a controlled level of effective stress. Hydraulic conductivity varies with varying void ratio, which in turn changes when the effective stress changes. If the void ratio is changed, the hydraulic conductivity of the test specimen will likely change. To determine the relationship between hydraulic conductivity and void ratio, the hydraulic conductivity test would have to be repeated at different effective stresses.

4.6 The correlation between results obtained with this test method and the hydraulic conductivities of in-place field materials has not been fully investigated. Experience has sometimes shown that flow patterns in small test specimens do not necessarily follow the same patterns on large field scales and that hydraulic conductivities measured on small test specimens are not necessarily the same as larger-scale values. Therefore, the results should be applied to field situations with caution and by qualified personnel.

5. Apparatus

5.1 *Hydraulic System*—Constant head (Method A), falling head (Methods B and C), or constant rate of flow (Method D) systems may be utilized provided they meet the [illegible]eria outlined as follows:

5.1.1 *Constant Head*—The system must be capable of maintaining constant hydraulic pressures to within ±5 % and shall include means to measure the hydraulic pressures to within the prescribed tolerance. In addition, the head loss across the test specimen must be held constant to within ±5 % and shall be measured with the same accuracy or better. Pressures shall be measured by a pressure gage, electronic pressure transducer, or any other device of suitable accuracy.

5.1.2 *Falling Head*—The system shall allow for measurement of the applied head loss, thus hydraulic gradient, to within 5 % or better at any time. In addition, the ratio of initial head loss divided by final head loss over an interval of time shall be measured such that this computed ratio is accurate to within ±5 %. The head loss shall be measured with a pressure gage, electronic pressure transducer, engineer's scale, graduated pipette, or any other device of suitable accuracy. Falling head tests may be performed with either a constant tailwater elevation (Method B) or a rising tailwater elevation (Method C).

5.1.3 *Constant Rate of Flow*—The system must be capable of maintaining a constant rate of flow through the specimen to within 5 % or better. Flow measurement shall be by calibrated syringe, graduated pipette, or other device of suitable accuracy. The head loss across the specimen shall be measured to an accuracy of 5 % or better using an electronic [illegible]essure transducer or other device of suitable accuracy. [illegible]ore information on testing with a constant rate of flow is given in the literature.[5]

5.1.4 *System De-airing*—The hydraulic system shall be designed to facilitate rapid and complete removal of free air bubbles from flow lines.

5.1.5 *Back Pressure System*—The hydraulic system shall have the capability to apply back pressure to the specimen to facilitate saturation. The system shall be capable of maintaining the applied back pressure throughout the duration of hydraulic conductivity measurements. The back pressure system shall be capable of applying, controlling, and measuring the back pressure to 5 % or better of the applied pressure. The back pressure may be provided by a compressed gas supply, a deadweight acting on a piston, or any other method capable of applying and controlling the back pressure to the tolerance prescribed in this paragraph.

NOTE 1—Application of gas pressure directly to a fluid will dissolve gas in the fluid. A variety of techniques are available to minimize dissolution of gas in the back pressure fluid, including separation of gas and liquid phases with a bladder and frequent replacement of the liquid with de-aired water.

5.2 *Flow Measurement System*—Both inflow and outflow volumes shall be measured unless the lack of leakage, continuity of flow, and cessation of consolidation or swelling can be verified by other means. Flow volumes shall be measured by a graduated accumulator, graduated pipette, vertical standpipe in conjunction with an electronic pressure transducer, or other volume-measuring device of suitable accuracy.

5.2.1 *Flow Accuracy*—Required accuracy for the quantity of flow measured over an interval of time is 5 % or better.

5.2.2 *De-airing and Compliance of the System*—The flow-measurement system shall contain a minimum of dead space and be capable of complete and rapid de-airing. Compliance of the system in response to changes in pressure shall be minimized by using a stiff flow measurement system. Rigid tubing, such as metallic or rigid thermoplastic tubing, shall be used.

5.2.3 *Head Losses*—Head losses in the tubes, valves, porous end pieces, and filter paper may lead to error. To guard against such errors, the permeameter shall be assembled with no specimen inside and then the hydraulic system filled. If a constant or falling head test is to be used, the hydraulic pressures or heads that will be used in testing a specimen shall be applied, and the rate of flow measured with an accuracy of 5 % or better. This rate of flow shall be at least ten times greater than the rate of flow that is measured when a specimen is placed inside the permeameter and the same hydraulic pressures or heads are applied. If a constant rate of flow test is to be used, the rate of flow to be used in testing a specimen shall be supplied to the permeameter and the head loss measured. The head loss without a specimen shall be less than 0.1 times the head loss when a specimen is present.

5.3 *Permeameter Cell Pressure System*—The system for pressurizing the permeameter cell shall be capable of applying and controlling the cell pressure to within 5 % of the applied pressure. However, the effective stress on the test specimen (which is the difference between the cell pressure and the pore water pressure) shall be maintained to the desired value with an accuracy of 10 % or better. The device for pressurizing the cell may consist of a reservoir connected to the permeameter cell and partially filled with de-aired

[5] Olson, H. W., Morin, R. H., and Nichols, R. W., "Flow Pump Applications in Triaxial Testing," *Symposium on Advanced Triaxial Testing of Soil and Rock, ASTM STP 977*, ASTM, 1988, pp. 68–81.

water, with the upper part of the reservoir connected to a compressed gas supply or other source of pressure (see Note 2). The gas pressure shall be controlled by a pressure regulator and measured by a pressure gage, electronic pressure transducer, or any other device capable of measuring to the prescribed tolerance. A hydraulic system pressurized by deadweight acting on a piston or any other pressure device capable of applying and controlling the permeameter cell pressure to the tolerance prescribed in this paragraph may be used.

NOTE 2—De-aired water is commonly used for the cell fluid to minimize potential for diffusion of air through the membrane into the specimen. Other fluids, such as oils, which have low gas solubilities are also acceptable, provided they do not react with components of the permeameter. Also, use of a long (approximately 5 to 7 m) tube connecting the pressurized cell liquid to the cell helps to delay the appearance of air in the cell fluid and to reduce the flux of dissolved air into the cell.

5.4 *Permeameter Cell*—An apparatus shall be provided in which the specimen and porous end pieces, enclosed by a membrane sealed to the cap and base, are subjected to controlled fluid pressures. A schematic diagram of a typical cell is shown in Fig. 1.

5.4.1 The permeameter cell may allow for observation of changes in height of the specimen, either by observation through the cell wall using a cathetometer or other instrument, or by monitoring of either a loading piston or an extensometer extending through the top plate of the cell bearing on the top cap and attached to a dial indicator or other measuring device. The piston or extensometer should pass through a bushing and seal incorporated into the top plate and shall be loaded with sufficient force to compensate for the cell pressure acting over the cross-sectional area of the piston where it passes through the seal. If deformations are measured, the deformation indicator shall be a dial indicator or cathetometer graduated to 0.3 mm (0.01 in.) or better and having an adequate travel range. Any other measuring device meeting these requirements is acceptable.

5.4.2 In order to facilitate gas removal, and thus saturation of the hydraulic system, four drainage lines leading to the specimen, two each to the base and top cap, are recommended. The drainage lines shall be controlled by no-volume-change valves, such as ball valves, and shall be designed to minimize dead space in the lines.

5.5 *Top Cap and Base*—An impermeable, rigid top cap and base shall be used to support the specimen and provide for transmission of permeant liquid to and from the specimen. The diameter or width of the top cap and base shall be equal to the diameter or width of the specimen ±5 %. The base shall prevent leakage, lateral motion, or tilting, and the top cap shall be designed to receive the piston or extensometer, if used, such that the piston-to-top cap contact area is concentric with the cap. The surface of the base and top cap that contacts the membrane to form a seal shall be smooth and free of scratches.

5.6 *Flexible Membranes*—The flexible membrane used to encase the specimen shall provide reliable protection against leakage. The membrane shall be carefully inspected prior to use and if any flaws or pinholes are evident, the membrane shall be discarded. To minimize restrain to the specimen, the diameter or width of the unstretched membrane shall be

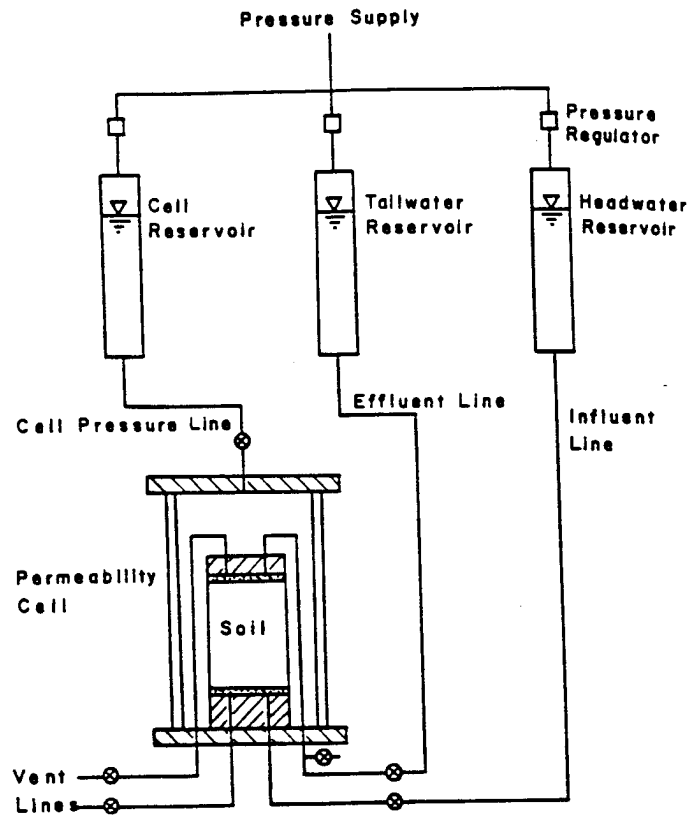


FIG. 1 Permeameter Cell

between 90 and 95 % of that of the specimen. The membrane shall be sealed to the specimen base and cap with rubber O-rings for which the unstressed, inside diameter or width is less than 90 % of the diameter or width of the base and cap, or by any other method that will produce an adequate seal.

NOTE 3—Membranes may be tested for flaws by placing them around a form sealed at both ends with rubber O-rings, subjecting them to a small air pressure on the inside, and then dipping them into water. If air bubbles come up from any point on the membrane, or if any visible flaws are observed, the membrane shall be discarded.

5.7 *Porous End Pieces*—The porous end pieces shall be of silicon carbide, aluminum oxide, or other material that is not attacked by the specimen or permeant liquid. The end pieces shall have plane and smooth surfaces and be free of cracks, chips, and nonuniformities. They shall be checked regularly to ensure that they are not clogged.

5.7.1 The porous end pieces shall be the same diameter or width (±5 %) as the specimen, and the thickness shall be sufficient to prevent breaking.

5.7.2 The hydraulic conductivity of the porous end pieces shall be significantly greater than that of the specimen to be tested. The requirements outlined in 5.2.3 ensure this.

5.8 *Filter Paper*—If necessary to prevent intrusion of material into the pores of the porous end pieces, one or more sheets of filter paper shall be placed between the top and bottom porous end pieces and the specimen. The paper shall have a negligibly small hydraulic impedance. The requirements outlined in 5.2.3 ensure that the impedance is small.

5.9 *Equipment for Compacting a Specimen*—Equipment (including compactor and mold) suitable for the method of compaction specified by the requester shall be used.

5.10 *Sample Extruder*—When the material being tested is soil core, the soil core shall usually be removed from the mpler with an extruder. The sample extruder shall be capable of extruding the soil core from the sampling tube in the same direction of travel in which the sample entered the tube and with minimum disturbance of the sample. If the soil core is not extruded vertically, care should be taken to avoid bending stresses on the core due to gravity. Conditions at the time of sample extrusion may dictate the direction of removal, but the principal concern is to keep the degree of disturbance minimal.

5.11 *Trimming Equipment*—Specific equipment for trimming the specimen to the desired dimensions will vary depending on quality and characteristics of the sample; however, the following items listed may be used: lathe, wire saw with a wire about 0.3 mm (0.01 in.) in diameter, spatulas, knives, steel rasp for very hard clay specimens, cradle or split mold for trimming specimen ends, and steel straight edge for final trimming of specimen ends.

5.12 *Devices for Measuring the Dimensions of the Specimen*—Devices used to measure the dimensions of the specimen shall be capable of measuring to the nearest 0.3 mm (0.01 in.) or better and shall be constructed such that their use will not disturb the specimen.

5.13 *Balances*—The balance shall be suitable for determining the mass of the specimen and shall be selected as discussed in Specification D 4753. The mass of specimens ess than 100 g shall be determined to the nearest 0.01 g. The nass of specimens 100 g or larger shall be determined to the nearest 0.1 g. The mass of specimens >1000 g shall be determined to the nearest 1.0 g.

5.14 *Equipment for Mounting the Specimen*—Equipment for mounting the specimen in the permeameter cell shall include a membrane stretcher or cylinder, and ring for expanding and placing O-rings on the base and top cap to seal the membrane.

5.15 *Vacuum Pump*—To assist with de-airing of permeameter system and saturation of specimens.

5.16 *Temperature Maintaining Device*—The temperature of the permeameter, test specimen, and reservoir of permeant liquid shall not vary more than ±3°C (±5.7°F). Normally, this is accomplished by performing the test in a room with a relatively constant temperature. If such a room is not available, the apparatus shall be placed in a water bath, insulated chamber, or other device that maintains a temperature within the tolerance specified in 5.16. The temperature shall be periodically measured and recorded.

5.17 *Water Content Containers*—The containers shall be in accordance with Method D 2216.

5.18 *Drying Oven*—The oven shall be in accordance with Specification E 145.

6. Reagents

6.1 *Permeant Water:*

6.1.1 The permeant water is the liquid used to permeate the test specimen and is also the liquid used in backpressuring the specimen.

6.1.2 The type of permeant water should be specified by the requestor. If no specification is made, tap water shall be used for the permeant liquid. The type of water utilized shall be indicated in the report.

NOTE 4—Chemical interactions between a permeant liquid and the porous material may lead to variations in hydraulic conductivity. Distilled water can significantly lower the hydraulic conductivity of clayey soils (see the literature).[4] For this reason, distilled water is not usually recommended as a permeant liquid. A permeant liquid used by some is 0.005 N $CaSO_4$, which can be obtained for example, by dissolving 6.8 g of nonhydrated, reagent-grade $CaSO_4$ in 10 L of de-aired, distilled water. This $CaSO_4$ solution is thought to neither increase nor decrease significantly the hydraulic conductivity of clayey soils. In areas with extremely brackish tap water, the $CaSO_4$ solution is recommended.

6.1.3 *Deaired Water*—To aid in removing as much air from the test specimen as possible, deaired water shall be used. The water is usually deaired by boiling, by spraying a fine mist of water into an evacuated vessel attached to a vacuum source, or by forceful agitation of water in a container attached to a vacuum source. If boiling is used, care shall be taken not to evaporate an excessive amount of water, which can lead to a larger salt concentration in the permeant water than desired. To prevent dissolution of air back into the water, deaired water shall not be exposed to air for prolonged periods.

7. Test Specimens

7.1 *Size*—Specimens shall have a minimum diameter of 25 mm (1.0 in.) and a minimum height of 25 mm. The height and diameter of the specimen shall be measured to the nearest 0.3 mm (0.01 in.) or better. The length and diameter shall vary by no more than ±5 %. The surface of the test specimen may be uneven, but indentations must not be so deep that the length or diameter vary by more than ±5 %. The diameter and height of the specimen shall each be at least 6 times greater than the largest particle size within the specimen. If, after completion of a test, it is found based on visual observation that oversized particles are present, that information shall be indicated on the report.

NOTE 5—Most hydraulic conductivity tests are performed on cylindrical test specimens. It is possible to utilize special equipment for testing prismatic test specimens, in which case reference to "diameter" in 7.1 applies to the least width of the prismatic test specimen.

7.2 *Undisturbed Specimens*—Undisturbed test specimens shall be prepared from a representative portion of undisturbed samples secured in accordance with Practice D 1587 or Practice D 2113, and preserved and transported in accordance with requirements for Group C materials in Practice D 4220. Specimens obtained by tube sampling or coring may be tested without trimming except for cutting the end surfaces plane and perpendicular to the longitudinal axis of the specimen, provided soil characteristics are such that no significant disturbance results from sampling. Where the sampling operation has caused disturbance of the soil, the disturbed material shall be trimmed. Where removal of pebbles or crumbling resulting from trimming causes voids on the surface of the specimen that cause the length or diameter to vary by more than ±5 %, the voids shall be filled with remolded material obtained from the trimmings. The ends of the test specimen shall be cut and not troweled (troweling can seal off cracks, slickensides, or other secondary features that might conduct water flow). Specimens shall be trimmed, whenever possible, in an environment where changes in moisture content are minimized. A controlled high-humidity room is usually used for this purpose. The mass and dimensions of the test specimen shall be

determined to the tolerances given in 5.12 and 5.13. The test specimen shall be mounted immediately in the permeameter. The water content of the trimmings shall be determined in accordance with Method D 2216.

7.3 *Laboratory-Compacted Specimens*—The material to be tested shall be prepared and compacted inside a mold in a manner specified by the requestor. If the specimen is placed and compacted in layers, the surface of each previously-compacted layer shall be lightly scarified (roughened) with a fork, ice pick, or other suitable object, unless the requester specifically states that scarification is not to be performed. Test Methods D 698 and D 1557 describe two methods of compaction, but any other method specified by the requestor may be used as long as the method is described in the report. Large clods of material should not be broken down prior to compaction unless it is known that they will be broken in field construction, as well, or the requestor specifically requests that the clod size be reduced. Neither hard clods nor individual particles of the material shall exceed ⅙ of either the height or diameter of the specimen. After compaction, the test specimen shall be removed from the mold, the ends scarified, and the dimensions and weight determined within the tolerances given in 5.12 and 5.13. After the dimensions and mass are determined, the test specimen shall be immediately mounted in the permeameter. The water content of the trimmings shall be determined in accordance with Method D 2216.

7.4 *Other Preparation Methods*—Other methods of preparation of a test specimen are permitted if specifically requested. The method of specimen preparation shall be identified in the report.

7.5 After the height, diameter, mass, and water content of the test specimen have been determined, the dry unit weight shall be calculated. Also, the initial degree of saturation shall be estimated (this information may be used later in the backpressure stage).

8. Procedure

8.1 *Specimen Setup:*

8.1.1 Cut two filter paper sheets to approximately the same shape as the cross section of the test specimen. Soak the two porous end pieces and filter paper sheets, if used, in a container of permeant water.

8.1.2 Place the membrane on the membrane expander. Apply a thin coat of silicon high-vacuum grease to the sides of the end caps. Place one porous end piece on the base and place one filter paper sheet, if used, on the porous end piece, followed by the test specimen. Place the second filter paper sheet, if used, on top of the specimen followed by the second porous end piece and the top cap. Place the membrane around the specimen, and using the membrane expander or other suitable O-ring expander, place one or more O-rings to seal the membrane to the base and one or more additional O-rings to seal the membrane to the top cap.

8.1.3 Attach flow tubing to the top cap, if not already attached, assemble the permeameter cell, and fill it with de-aired water or other cell fluid. Attach the cell pressure reservoir to the permeameter cell line and the hydraulic system to the influent and effluent lines. Fill the cell pressure reservoir with deaired water, or other suitable liquid, and the hydraulic system with deaired permeant water. Apply a small

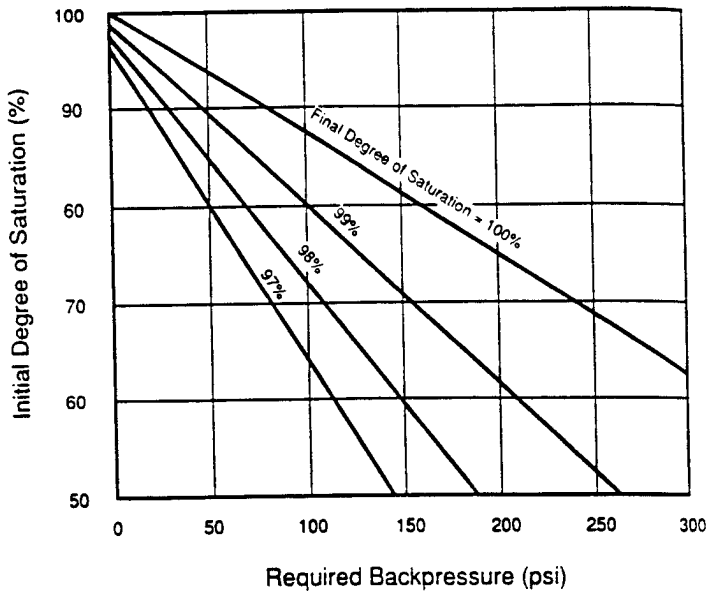


FIG. 2 Back Pressure to Attain Various Degrees of Saturation[6]

confining pressure of 7 to 35 kPa (1 to 5 psi) to the cell and apply a pressure less than the confining pressure to both the influent and effluent systems, and flush permeant water through the flow system. After all visible air has been removed from the flow lines, close the control valves. At no time during saturation of the system and specimen or hydraulic conductivity measurements shall the maximum applied effective stress be allowed to exceed that to which the specimen is to be consolidated.

8.2 *Specimen Soaking (Optional)*—To aid in saturation, specimens may be soaked under partial vacuum applied to the top of the specimen. Atmospheric pressure shall be applied to the specimen base through the influent lines, and the magnitude of the vacuum set to generate a hydraulic gradient across the sample less than that which will be used during hydraulic conductivity measurements.

NOTE 6—Soaking under vacuum is applicable when there are continuous air voids in the specimen. Soaking under vacuum is only recommended for test specimens with initial degrees of saturation below 70 %. The specimen may swell when exposed to water; the effective stress will tend to counteract the swelling. However, for materials that tend to swell, unless the applied effective stress is greater than or equal to the swell pressure, the specimen will swell.

8.3 *Backpressure Saturation*—To saturate the specimen, backpressuring is usually necessary. Figure 2 provides guidance on back pressure required to attain saturation.

NOTE 7—Figure 2 assumes that the water used for back pressure is deaired and that the only source for air to dissolve into the water is air from the test specimen. If air pressure is used to control the back pressure, pressurized air will dissolve into the water, thus reducing the capacity of the water used for back pressure to dissolve air located in the pores of the test specimen. The problem is minimized by using a long (>5 m) tube that is impermeable to air between the air-water interface and test specimen, by separating the back-pressure water from the air by a material or fluid that is relatively impermeable to air, by periodically replacing the back-pressure water with deaired water, or by other means.

[6] Lowe, J., and Johnson, T. C., "Use of Back Pressure to Increase Degree of Saturation of Triaxial Test Specimens," *Proceedings, ASCE Research Conference on Shear Strength of Cohesive Soils*, Boulder, CO, 1960.

8.3.1 Open the flow line valves and flush out of the system any free air bubbles using the procedure outlined in 8.1.3. If an electronic pressure transducer or other measuring device is to be used during the test to measure pore pressures or applied hydraulic gradient, it should be bled of any trapped air. Take and record an initial reading of specimen height, if being monitored.

8.3.2 Adjust the applied confining pressure to the value to be used during saturation of the sample. Apply backpressure by simultaneously increasing the cell pressure and the influent and effluent pressures in increments. The maximum value of an increment in backpressure shall be sufficiently low so that no point in the specimen is exposed to an effective stress in excess of that to which the specimen will be subsequently consolidated. At no time shall a head be applied so that the effective confining stress is <7 kPa (1 psi) because of the danger of separation of the membrane from the test specimen. Maintain each increment of pressure for a period of a few minutes to a few hours, depending upon the characteristics of the specimen. To assist in removal of trapped air, a small hydraulic gradient may be applied across the specimen to induce flow.

8.3.3 Saturation shall be verified with one of the three following techniques:

8.3.3.1 Saturation may be verified by measuring the *B* coefficient as described in Test Method D 4767 (see Note 8). The test specimen shall be considered to be adequately saturated if (*1*) the *B* value is ≥0.95, or (*2*) for relatively incompressible materials, for example, rock, if the *B* value remains unchanged with application of larger values of back pressure. The *B* value may be measured prior to or after completion of the consolidation phase (see 8.4). Accurate *B*-value determination can only be made if no gradient is acting on the specimen and all pore pressure induced by consolidation has dissipated.

NOTE 8—The *B* coefficient is defined for this type of test as the change in pore water pressure in the porous material divided by the change in confining pressure. Compressible materials that are fully saturated with water will have a *B* value of 1.0. Relatively incompressible, saturated materials have *B* values which are somewhat less than 1.0.

8.3.3.2 Saturation of the test specimen may be confirmed at the completion of the test by calculation of the final degree of saturation. The final degree of saturation shall be 100 ± 5 %. However, measurement of the *B* coefficient as described in 8.3.3.1 or use of some other technique (8.3.3.3) is strongly recommended because it is much better to confirm saturation prior to permeation than to wait until after the test to determine if the test was valid.

8.3.3.3 Other means for verifying saturation, such as measurement of the volume change of the specimen when the pore water pressure has been changed, can be used for verifying saturation provided data are available for similar materials to establish that the procedure used confirms saturation as required in 8.3.3.1 or 8.3.3.2.

8.4 *Consolidation*—The specimen shall be consolidated to the effective stress specified by the requestor. Consolidation may be accomplished in stages, if desired.

NOTE 9—The test specimen may be consolidated prior to application of backpressure. Also, the backpressure and consolidation phases may be completed concurrently if backpressures are applied sufficiently slowly to minimize potential for overconsolidation of the specimen.

8.4.1 Record the specimen height, if being monitored, prior to application of consolidation pressure and periodically during consolidation.

8.4.2 Increase the cell pressure to the level necessary to develop the desired effective stress, and begin consolidation. Drainage may be allowed from the base or top of the specimen, or simultaneously from both ends.

8.4.3 (Optional) Record outflow volumes to confirm that primary consolidation has been completed prior to initiation of the hydraulic conductivity test. Alternatively, measurements of the change in height of the test specimen can be used to confirm completion of consolidation.

NOTE 10—The procedure in 8.4.3 is optional because the requirements of 8.5 ensure that the test specimen is adequately consolidated during permeation because if it is not, inflow and outflow volumes will differ significantly. However, for accurate *B*-value determination, completion of consolidation should be confirmed (see 8.3.3.1). It is recommended that outflow volumes or height changes be recorded as a means for verifying the completion of consolidation prior to initialization of permeation. Also, measurements in the change in height of the test specimen, coupled with knowledge of the initial height, provide a means for checking the final height of the specimen.

8.5 *Permeation:*

8.5.1 *Hydraulic Gradient*—When possible, the hydraulic gradient used for hydraulic conductivity measurements should be similar to that expected to occur in the field. In general, hydraulic gradients from <1 to 5 cover most field conditions. However, the use of small hydraulic gradients can lead to very long testing times for materials having low hydraulic conductivity (less than about 1×10^{-6} cm/s). Somewhat larger hydraulic gradients are usually used in the laboratory to accelerate testing, but excessive gradients must be avoided because high seepage pressures may consolidate the material, material may be washed from the specimen, or fine particles may be washed downstream and plug the effluent end of the test specimen. These effects could increase or decrease hydraulic conductivity. If no gradient is specified by the requestor, the following guidelines may be followed:

Hydraulic Conductivity, cm/s	Recommended Maximum Hydraulic Gradient
1×10^{-3} to 1×10^{-4}	2
1×10^{-4} to 1×10^{-5}	5
1×10^{-5} to 1×10^{-6}	10
1×10^{-6} to 1×10^{-7}	20
less than 1×10^{-7}	30

NOTE 11—Seepage pressures associated with large hydraulic gradients can consolidate soft, compressible specimens and reduce their hydraulic conductivity. It may be necessary to use smaller hydraulic gradients (<10) for such specimens.

8.5.2 *Initialization*—Initiate permeation of the specimen by increasing the influent pressure (see 8.3.2). The effluent pressure shall not be decreased because air bubbles that were dissolved by the specimen water during backpressuring may come out of solution if the pressure is decreased. The back pressure shall be maintained throughout the permeation phase.

8.5.3 *Constant Head Test (Method A)*—Measure and record the required head loss across the test specimen to the tolerances stated in 5.1.1 and 5.2.3. The head loss across the specimen shall be kept constant ±5 %. Measure and record periodically the quantity of inflow as well as the quantity of outflow. Also measure and record any changes in height of the test specimen, if being monitored (see Note 11). Con-

tinue permeation until at least four values of hydraulic conductivity are obtained over an interval of time in which: (1) the ratio of outflow to inflow rate is between 0.75 and 1.25, and (2) the hydraulic conductivity is steady. The hydraulic conductivity shall be considered steady if four or more consecutive hydraulic conductivity determinations fall within ±25 % of the mean value for $k \geq 1 \times 10^{-10}$ m/s or within ±50 % for $k < 1 \times 10^{-10}$ m/s, and a plot of the hydraulic conductivity versus time shows no significant upward or downward trend.

8.5.4 *Falling-Head Tests (Methods B and C)*—Measure and record the required head loss across the test specimen to the tolerances stated in 5.1.2. For falling-head tests, at no time shall the applied head loss across the specimen be less than 75 % of the initial (maximum) head loss during each individual hydraulic conductivity determination (see Note 12). Periodically measure and record any changes in the height of the specimen, if being monitored. Continue permeation until at least four values of hydraulic conductivity are obtained over an interval of time in which: (*1*) the ratio of outflow to inflow rate is between 0.75 and 1.25, and (*2*) the hydraulic conductivity is steady (see 8.5.3).

NOTE 12—When the water pressure in a test specimen changes and the applied total stress is constant, the effective stress in the test specimen changes, which can cause volume changes that can invalidate the test results. The requirement that the head loss not decrease very much is intended to keep the effective stress from changing too much. For extremely soft, compressible test specimens, even more restrictive criteria might be needed. Also, when the initial and final head losses across the test specimen do not differ by much, great accuracy is needed to comply with the requirement of 5.1.2 that the ratio of initial to final head loss be determined with an accuracy of ±5 % or better. When the initial and final head loss over an interval of time do not differ very much, it may be possible to comply with the requirements for a constant head test (8.5.3) in which the head loss must not differ by more than ±5 % and to treat the test as a constant head test.

8.5.4.1 *Test with Constant Tailwater Level (Method B)*—If the water pressure at the downstream (tailwater) end of the test specimen is kept constant, periodically measure and record either the quantity of inflow or the level of water in the influent standpipe; measure and record the quantity of outflow from the test specimen.

8.5.4.2 *Test with Increasing Tailwater Level (Method C)*—If the water pressure at the downstream end of the test specimen rises during an interval of time, periodically measure and record either the quantity or inflow and outflow or the changes in water levels in the influent and effluent standpipes.

8.5.5 *Constant Rate of Flow Tests (Method D)*—Initiate permeation of the specimen by imposing a constant flow rate. Choose the flow rate so the hydraulic gradient does not exceed the value specified, or if none is specified, the value recommended in 8.5.1. Periodically measure the rate of inflow, the rate of outflow, and head loss across the test specimen to the tolerances given in 5.1.3. Also, measure and record any changes in specimen height, if being monitored. Continue permeation until at least four values of hydraulic conductivity are obtained over an interval of time in which (*1*) the ratio of inflow to outflow rates is between 0.75 and 1.25, and (*2*) hydraulic conductivity is steady (see 8.5.3).

8.6 *Final Dimensions of the Specimen*—After completion of permeation, reduce the applied confining, influent, and effluent pressures in a manner that does not generate significant volume change of the test specimen. Then carefully disassemble the permeater cell and remove the specimen. Measure and record the final height, diameter, and total mass of the specimen. Then determine the final water content of the specimen by the procedure of Method D 2216. Dimensions and mass of the test specimen shall be measured to the tolerances specified in 5.13 and 7.1.

NOTE 13—The specimen may swell after removal of back pressure as a result of air coming out of solution. A correction may be made for this effect, provided that changes in the length of the specimen are monitored during the test. The strain caused by dismantling the cell is computed from the length of the specimen before and after dismantling the cell. The same strain is assumed to have occurred in the diameter. The corrected diameter and actual length before the back pressure was removed are used to compute the volume of the test specimen prior to dismantling the cell. The volume prior to dismantling the cell is used to determine the final dry density and degree of saturation.

9. Calculation

9.1 *Constant Head and Constant Rate of Flow Tests (Methods A and D)*—Calculate the hydraulic conductivity, k, as follows:

$$k = QL/Ath \tag{1}$$

where:

k = hydraulic conductivity, m/s,
Q = quantity of flow, taken as the average of inflow and outflow, m^3,
L = length of specimen along path of flow, m,
A = cross-sectional area of specimen, m^2,
t = interval of time, s, over which the flow Q occurs, and
h = difference in hydraulic head across the specimen, m of water.

9.2 *Falling-Head Tests:*

9.2.1 *Constant Tailwater Pressure (Method B)*—Calculate the hydraulic conductivity, k, as follows:

$$k = \frac{aL}{At} \ln\left(\frac{h_1}{h_2}\right) \tag{2}$$

where:

a = cross-sectional area of the reservoir containing the influent liquid, m^2,
L = length of the specimen, m,
A = cross-sectional area of the specimen, m^2,
t = elapsed time between determination of h_1 and h_2, s,
h_1 = head loss across the specimen at time t_1, m, and
h_2 = head loss across the specimen at time t_2, m.

9.2.2 *Increasing Tailwater Pressure (Method C)*—Calculate the hydraulic conductivity, k, as follows:

$$k = \frac{a_{in}\, a_{out}\, L}{A\, t\, (a_{in} + a_{out})} \ln(h_1/h_2) \tag{3}$$

where:

a_{in} = cross-sectional area of the reservoir containing the influent liquid, m^2,
a_{out} = cross-sectional area of the reservoir containing the effluent liquid, m^2,
L = length of the specimen, m,
A = cross-sectional area of the specimen, m^2,
t = elapsed time between determination of h_1 and h_2, s,
h_1 = head loss across the specimen at time t, m, and
h_2 = head loss across the specimen at time t_2, m.

NOTE 14—For the case in which $a_{out} = a_{in} = a$, the equation for calculating k for a falling head test with a rising tailwater level is:

$$k = \frac{a\,L}{-2\,A\,t} \ln\left(\frac{h_1}{h_2}\right) \quad (4)$$

9.3 Correct the hydraulic conductivity to that for 20°C (68°F), k_{20}, by multiplying k by the ratio of the viscosity of water at test temperature to the viscosity of water at 20°C (68°F), R_T, from Table 1, as follows:

$$k_{20} = R_T k \quad (5)$$

10. Report

10.1 Report the following information:

10.1.1 Sample identifying information,

10.1.2 Any special selection and preparation process, such as removal of stones or other materials, or indication of their presence, if undisturbed specimen,

10.1.3 Descriptive information on method of compaction,

10.1.4 Initial dimensions of the specimen,

10.1.5 Initial water content and dry unit weight of the specimen,

10.1.6 Type of permeant liquid used,

10.1.7 Magnitude of total back pressure,

10.1.8 Maximum and minimum effective consolidation stress,

NOTE 15—The maximum effective stress exists at the effluent end of the test specimen and the minimum stress at the influent end.

10.1.9 Height of specimen after completion of consolidation, if monitored,

10.1.10 Range of hydraulic gradient used,

10.1.11 Final length, diameter, water content, dry unit weight, and degree of saturation of the test specimen,

10.1.12 Average hydraulic conductivity for the last four determinations of hydraulic conductivity (obtained as described in 8.5.3 to 8.5.5), reported with two significant figures, for example, 7.1×10^{-10} m/s, and reported in units of m/s (plus additional units, if requested or customary),

10.1.13 Graph or table of hydraulic conductivity versus time or pore volumes of flow is recommended.

TABLE 1 Correction Factor R_T for Viscosity of Water at Various Temperatures[A]

Temperature, °C	R_T	Temperature, °C	R_T
0	1.783	25	0.889
1	1.723	26	0.869
2	1.664	27	0.850
3	1.611	28	0.832
4	1.560	29	0.814
5	1.511	30	0.797
6	1.465	31	0.780
7	1.421	32	0.764
8	1.379	33	0.749
9	1.339	34	0.733
10	1.301	35	0.719
11	1.265	36	0.705
12	1.230	37	0.692
13	1.197	38	0.678
14	1.165	39	0.665
15	1.135	40	0.653
16	1.106	41	0.641
17	1.077	42	0.629
18	1.051	43	0.618
19	1.025	44	0.607
20	1.000	45	0.598
21	0.976	46	0.585
22	0.953	47	0.575
23	0.931	48	0.565
24	0.910	49	0.556

[A] $R_T = (-0.02452\,T + 1.495)$ where T is the degrees celsius.

11. Precision and Bias

11.1 *Precision*—Data are being evaluated to determine the precision of this test method. In addition, Subcommittee D18.04 on Hydrologic Properties of Soil and Rocks, is seeking pertinent data from users of this test method.

11.2 *Bias*—There is no accepted reference value for this test method, therefore, bias cannot be determined.

12. Keywords

12.1 coefficient of permeability; hydraulic barriers; hydraulic conductivity; liner; permeameter

The American Society for Testing and Materials takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, 1916 Race St., Philadelphia, PA 19103.

Stabilization/Solidification Testing of Raffinate Pit Sludges and Nitroaromatic Soils

Final Report
Appendix D
Laboratory Reports

for

MK-FERGUSON COMPANY
WELDON SPRING SITE REMEDIAL ACTION PROJECT

May 8, 1992

Waste Technologies Group, Inc.
100 Crescent Centre Parkway
Suite 200
Atlanta (Tucker), Georgia 30084
(404) 723-1600

APPENDIX D

APPENDIX D

SECTION	SUBJECT
1	Baseline Analyses
2	Baseline TCLP
3	14-day Treated TCLP
4	28-day Treated TCLP
5	Optimization Samples TCLP
6	ANS 16.1
7	Explosivity Tests
8	Physical Tests
9	Other Analyses

EcoTek LSI
EcoTek Laboratory Services Incorporated

3342 International Park Drive S.E.
Atlanta, Georgia 30316
(404) 244-0827
Fax # (404) 243-5355

August 22, 1991

Mr. Raphael Soto
Waste Technology Group, Inc.
100 Crescent Centre Parkway
Tucker, GA 30084

Dear Mr. Soto:

Enclosed along with this letter are the hard copy results for the sample(s) received July 30, 1991. The radiochemical analysis on sample S02T01 will follow as soon as possible.

Please contact Craig Johnson at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464 in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Tara L. Pipis for
Donald L. Dihel
Quality Assurance Manager

Mike Buchanan
Laboratory Manager

Federal Express
8/22/91
CJM

Enclosures.
DLD/JMB/cjm

Send disk in Lotus.
cjm

EcoTek LSI
EcoTek Laboratory Services Incorporated

ANALYTICAL RESULTS

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID: 146401
Client Sample ID: SD3701

Analysis	Method	Units	Result	Detection Limit
Fluoride	EPA 340.2	mg/kg	88.7	25.0
Nitrate/Nitrite	EPA 353.1 (IL-2432)	mg/kg	243	12.5
Sulfate	EPA 375.4 (IL-2438)	mg/kg	3018	250
Oil & Grease	413.2	mg/kg	160	33
% Moisture	CLP - SOW 288	%	59.7	N/A
Aroclor-1248	EPA SW846 - 8080	mg/kg	<0.10	0.10
Antimony	SW-846 Method 6010	mg/kg	30.8	21.9
Arsenic	SW-846 Method 6010	mg/kg	483	38.9
Barium	SW-846 Method 6010	mg/kg	216	1.22
Beryllium	SW-846 Method 6010	mg/kg	28.6	1.22
Cadmium	SW-846 Method 6010	mg/kg	17.9	2.43
Chromium	SW-846 Method 6010	mg/kg	40	6.08
Cobalt	SW-846 Method 6010	mg/kg	7.81	8.51
Copper	SW-846 Method 6010	mg/kg	217	6.01
Lead	SW-846 Method 6010	mg/kg	104	34.0
Lithium	SW-846 Method 6010	mg/kg	<12.2	12.2
Manganese	SW-846 Method 6010	mg/kg	636	7.30
Mercury	SW-846 Method 6010	mg/kg	<.05	0.05
Molybdenum	SW-846 Method 6010	mg/kg	2050	9.73
Nickel	SW-846 Method 6010	mg/kg	35.6	63.2
Selenium	SW-846 Method 6010	mg/kg	31.9	7.30
Silver	SW-846 Method 6010	mg/kg	<8.52	8.52
Thallium	SW-846 Method 6010	mg/kg	<6.08	6.08
Vanadium	SW-846 Method 6010	mg/kg	7760	1.22
Zinc	SW-846 Method 6010	mg/kg	1800	0.5

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS
RADIOCHEMISTRY

Lab Sample ID: 146401
Client Sample ID: SD3701

Analysis	Units	Result
Total Uranium		
Uranium	ng/g	2.80E+06
Isotopic Uranium		
U-234	pCi/g	1.3E3±0.3E3
U-238	pCi/g	9.5E2±2.8E2
Isotopic Thorium		
Th-228	pCi/g	62±47
Th-230	pCi/g	5.0E4±0.7E4
Th-232	pCi/g	1.2E2±0.7E2
Radium		
Ra-226	pCi/g	6.9E3±2.1E3
Ra-228	pCi/g	<1.1E4

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID: 146402
Client Sample ID: SD3702

Analysis	Method	Units	Result	Detection Limit
Fluoride	EPA 340.2	mg/kg	25.9	25.0
Nitrate/Nitrite	EPA 353.1 (IL-2432)	mg/kg	<12.5	12.5
Sulfate	EPA 375.4 (IL-2438)	mg/kg	2600	250
Oil & Grease	413.2	mg/kg	370	50
% Moisture	CLP - SOW 288	%	74.1	N/A
Aroclor-1248	EPA SW846 - 8080	mg/kg	<0.81	0.81
Antimony	SW-846 Method 6010	mg/kg	51.2	28.0
Arsenic	SW-846 Method 6010	mg/kg	2250	49.8
Barium	SW-846 Method 6010	mg/kg	281	1.56
Beryllium	SW-846 Method 6010	mg/kg	63.1	1.56
Cadmium	SW-846 Method 6010	mg/kg	27.5	3.11
Chromium	SW-846 Method 6010	mg/kg	102	7.78
Cobalt	SW-846 Method 6010	mg/kg	43.2	10.9
Copper	SW-846 Method 6010	mg/kg	746	7.78
Lead	SW-846 Method 6010	mg/kg	990	43.6
Lithium	SW-846 Method 6010	mg/kg	<15.6	15.6
Manganese	SW-846 Method 6010	mg/kg	5170	9.34
Mercury	SW-846 Method 6010	mg/kg	9.85	0.05
Molybdenum	SW-846 Method 6010	mg/kg	3220	12.4
Nickel	SW-846 Method 6010	mg/kg	114	81.0
Selenium	SW-846 Method 6010	mg/kg	<9.34	9.34
Silver	SW-846 Method 6010	mg/kg	<109	109
Thallium	SW-846 Method 6010	mg/kg	<77.8	77.8
Vanadium	SW-846 Method 6010	mg/kg	16000	1.56
Zinc	SW-846 Method 6010	mg/kg	538	0.5

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS
RADIOCHEMISTRY

Lab Sample ID: 146402
Client Sample ID: SD3702

Analysis	Units	Result
Total Uranium		
Uranium	ng/g	4.04E+06
Isotopic Uranium		
U-234	pCi/g	1.7E3±0.5E3
U-238	pCi/g	1.4E3±0.4E3
Isotopic Thorium		
Th-228	pCi/g	4.6E2±1.6E2
Th-230	pCi/g	8.7E4±1.2E4
Th-232	pCi/g	5.0E2±1.7E2
Radium		
Ra-226	pCi/g	9.7E3±2.9E3
Ra-228	pCi/g	<2.1E4

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID: 146403
Client Sample ID: SD3703

Analysis	Method	Units	Result	Detection Limit
Fluoride	EPA 340.2	mg/kg	63.9	25
Nitrate/Nitrite	EPA 353.1 (IL-2432)	mg/kg	720	12.5
Sulfate	EPA 375.4 (IL-2438)	mg/kg	1800	250
Oil & Grease	413.2	mg/kg	200	36
% Moisture	CLP - SOW 288	%	64.1	N/A
Aroclor-1248	EPA SW846 - 8080	mg/kg	<0.12	0.12
Antimony	SW-846 Method 6010	mg/kg	35.1	25.8
Arsenic	SW-846 Method 6010	mg/kg	706	46.0
Barium	SW-846 Method 6010	mg/kg	386	1.44
Beryllium	SW-846 Method 6010	mg/kg	15.5	1.44
Cadmium	SW-846 Method 6010	mg/kg	10.1	2.87
Chromium	SW-846 Method 6010	mg/kg	85.1	7.18
Cobalt	SW-846 Method 6010	mg/kg	12.0	10.0
Copper	SW-846 Method 6010	mg/kg	629	7.18
Lead	SW-846 Method 6010	mg/kg	249	40.2
Lithium	SW-846 Method 6010	mg/kg	<14.4	14.4
Manganese	SW-846 Method 6010	mg/kg	679	1.44
Mercury	SW-846 Method 6010	mg/kg	10.9	0.05
Molybdenum	SW-846 Method 6010	mg/kg	763	8.61
Nickel	SW-846 Method 6010	mg/kg	227	11.5
Selenium	SW-846 Method 6010	mg/kg	<74.7	74.7
Silver	SW-846 Method 6010	mg/kg	<8.61	8.61
Thallium	SW-846 Method 6010	mg/kg	<100	100
Vanadium	SW-846 Method 6010	mg/kg	4290	7.18
Zinc	SW-846 Method 6010	mg/kg	139	1.44

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS
RADIOCHEMISTRY

Lab Sample ID: 146403
Client Sample ID: SD3703

Analysis	Units	Result
Total Uranium		
Uranium	ng/g	2.89E+06
Isotopic Uranium		
U-234	pCi/g	1.3E3±0.4E3
U-238	pCi/g	9.4E2±3.1E2
Isotopic Thorium		
Th-228	pCi/g	3.1E2±1.4E2
Th-230	pCi/g	1.9E4±0.3E4
Th-232	pCi/g	3.0E2±1.3E2
Radium		
Ra-226	pCi/g	7.8E3±2.3E3
Ra-228	pCi/g	2.3E4±0.7E4

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID: 146404
Client Sample ID: SD3704

Analysis	Method	Units	Result	Detection Limit
Fluoride	EPA 340.2	mg/kg	287	25.0
Nitrate/Nitrite	EPA 353.1 (IL-2432)	mg/kg	20.7	12.5
Sulfate	EPA 375.4 (IL-2438)	mg/kg	3200	250
Oil & Grease	413.2	mg/kg	28	21
% Moisture	CLP - SOW 288	%	36.3	N/A
Aroclor-1248	EPA SW 846 - 8080	mg/kg	<0.063	0.063
Antimony	SW-846 Method 6010	mg/kg	<15.0	15.0
Arsenic	SW-846 Method 6010	mg/kg	41.0	26.7
Barium	SW-846 Method 6010	mg/kg	773	0.835
Beryllium	SW-846 Method 6010	mg/kg	2.86	0.835
Cadmium	SW-846 Method 6010	mg/kg	<1.67	1.67
Chromium	SW-846 Method 6010	mg/kg	25.1	4.18
Cobalt	SW-846 Method 6010	mg/kg	7.78	5.84
Copper	SW-846 Method 6010	mg/kg	34.6	4.18
Lead	SW-846 Method 6010	mg/kg	82.1	23.4
Lithium	SW-846 Method 6010	mg/kg	93.1	8.35
Manganese	SW-846 Method 6010	mg/kg	226	0.835
Mercury	SW-846 Method 6010	mg/kg	<0.0636	0.0636
Molybdenum	SW-846 Method 6010	mg/kg	46.8	5.01
Nickel	SW-846 Method 6010	mg/kg	34.3	6.68
Selenium	SW-846 Method 6010	mg/kg	<43.4	43.4
Silver	SW-846 Method 6010	mg/kg	<5.01	5.01
Thallium	SW-846 Method 6010	mg/kg	<58.4	58.4
Vanadium	SW-846 Method 6010	mg/kg	166	4.18
Zinc	SW-846 Method 6010	mg/kg	97.3	0.835

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS
RADIOCHEMISTRY

Lab Sample ID: 146404
Client Sample ID: SD3704

Analysis	Units	Result
Total Uranium		
Uranium	ng/g	7.59E+06
Isotopic Uranium		
U-234	pCi/g	2.6E3±0.7E3
U-238	pCi/g	2.7E3±0.7E3
Isotopic Thorium		
Th-228	pCi/g	5.6E2±0.9E2
Th-230	pCi/g	5.6E2±0.9E2
Th-232	pCi/g	5.3E2±0.9E2
Radium		
Ra-226	pCi/g	2.1E3±0.6E3
Ra-228	pCi/g	<2.2E4

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID: 146405
Client Sample ID: S01T01

Analysis	Method	Units	Result	Detection Limit
% Moisture	CLP - SOW 288	%	7.6	N/A
Nitrobenzene	OL2510	mg/kg	<0.083	0.083
1,3-dinitrobenzene	OL2510	mg/kg	<1.3	1.3
2,4-dinitrotoluene	OL2510	mg/kg	21	2.6
2,6-dinitrotoluene	OL2510	mg/kg	11	2.4
1,3,5-trinitrobenzene	OL2510	mg/kg	95	22
2,4,6-trinitrotoluene	OL2510	mg/kg	3000	880

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID: 146406
Client Sample ID: S02T01

Analysis	Method	Units	Result	Detection Limit
Fluoride	EPA 340.2	mg/kg	<25.0	25.0
Nitrate/Nitrite	EPA 353.1 (IL-2432)	mg/kg	1752	12.5
Sulfate	EPA 375.4 (IL-2438)	mg/kg	730	250
Oil & Grease	413.2	mg/kg	23	16
% Moisture	CLP - SOW 288	%	18.4	N/A
Aroclor-1248	EPA SW846 - 8080	mg/kg	<0.051	0.051
Nitrobenzene	OL2510	mg/kg	<0.10	0.10
1,3-dinitrobenzene	OL2510	mg/kg	<0.077	0.077
2,4-dinitrotoluene	OL2510	mg/kg	<0.081	0.081
2,6-dinitrotoluene	OL2510	mg/kg	<0.077	0.077
1,3,5-trinitrobenzene	OL2510	mg/kg	<0.071	0.071
2,4,6-trinitrotoluene	OL2510	mg/kg	<0.070	0.070
Antimony	SW-846 Method 6010	mg/kg	<11.1	11.1
Arsenic	SW-846 Method 6010	mg/kg	<19.8	19.8
Barium	SW-846 Method 6010	mg/kg	103.492	0.619
Beryllium	SW-846 Method 6010	mg/kg	0.675	0.619
Cadmium	SW-846 Method 6010	mg/kg	<1.24	1.24
Chromium	SW-846 Method 6010	mg/kg	15.1	3.09
Cobalt	SW-846 Method 6010	mg/kg	7.05	4.33
Copper	SW-846 Method 6010	mg/kg	5.72	3.09
Lead	SW-846 Method 6010	mg/kg	23.9	17.3
Lithium	SW-846 Method 6010	mg/kg	<6.19	6.19
Manganese	SW-846 Method 6010	mg/kg	912	0.619
Mercury	SW-846 Method 6010	mg/kg	<0.084	0.084
Molybdenum	SW-846 Method 6010	mg/kg	<3.71	3.71
Nickel	SW-846 Method 6010	mg/kg	13.6	4.95
Selenium	SW-846 Method 6010	mg/kg	<32.2	32.2
Silver	SW-846 Method 6010	mg/kg	<3.71	3.71
Thallium	SW-846 Method 6010	mg/kg	<43.3	43.3
Vanadium	SW-846 Method 6010	mg/kg	22.2	3.09
Zinc	SW-846 Method 6010	mg/kg	73.5	0.619

EcoTek LSI
EcoTek Laboratory Services Incorporated

GENERAL CHEMISTRY

Sample analysis was performed on 5 samples for LSDG # 1464A. Four of the samples were sludge and one sample was soil. Because the sample matrices varied, QA/QC was performed on each matrix.

Sample Preparation:

The samples were prepared for the analysis of Fluoride and Sulfate using the Distilled Water Extraction (Method 3) from the Corp of Engineers. An extraction using an acidified sample aliquot and heating of the sample was used in the sample preparation for Nitrate/Nitrite.

Sample Analysis:

Fluoride, EPA Method 340.2

Fluoride is determined potentiometrically using a combination fluoride electrode and a pH meter which displays millivolts. The standard concentration (ppm) is plotted on a graph against the millivolt reading (mV) to obtain results.

All the QA/QC requirements for this analysis were acceptable.

Sulfate, EPA Method 375.4 (IL-2438)

The sulfate ion is converted to a barium sulfate suspension and the resulting turbidity is determined using a spectrophotometer and compared to a sulfate standard solutions.

The QA/QC requirements for this analysis were acceptable with the following exception:

Two sample matrix spikes were performed and one of the % recoveries (127%) was slightly out of the normal limits (75-125).

Nitrate/Nitrite, EPA Method 353.1 (IL-2432)

Nitrate is converted to nitrite with hydrazine sulfate and the nitrite (that originally present plus reduced nitrate) is determined colorimetrically using the Technicon Traacs 800 System.

The QA/QC requirements for this analysis were acceptable.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID - ANALYSIS (mg/kg)	146401 SD3T01	Pratical Quantitation Limit (mg/kg)
Fluoride Method: EPA 340.2	88.7	25.0
Nitrate/Nitrite Method: EPA 353.1 (IL-2432)	243	12.5
Sulfate Method: EPA 375.4 (IL-2438)	3018	250

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID ANALYSIS (mg/kg)	146402 SD3702	Pratical Quantitation Limit (mg/kg)
Fluoride Method: EPA 340.2	25.9	25.0
Nitrate/Nitrite Method: EPA 353.1 (IL-2432)	<12.5	12.5
Sulfate Method: EPA 375.4 (IL-2438)	2600	250

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID - ANALYSIS (mg/kg)	146404 SD3704	Pratical Quantitation Limit (mg/kg)
Fluoride Method: EPA 340.2	287	25.0
Nitrate/Nitrite Method: EPA 353.1 (IL-2432)	20.7	12.5
Sulfate Method: EPA 375.4 (IL-2438)	3200	250

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID - ANALYSIS (mg/kg)	146403 SD3703	Pratical Quantitation Limit (mg/kg)
Fluoride Method: EPA 340.2	63.8	25.0
Nitrate/Nitrite Method: EPA 353.1 (IL-2432)	720	12.5
Sulfate Method: EPA 375.4 (IL-2438)	1800	250

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID - ANALYSIS (mg/kg)	146406 S02T01	Pratical Quantitation Limit (mg/kg)
Fluoride Method: EPA 340.2	<25.0	25.0
Nitrate/Nitrite Method: EPA 353.1 (IL-2432)	1752	12.5
Sulfate Method: EPA 375.4 (IL-2438)	730	250

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No: MK Ferguson

Method Blank Analytical Results

Fluoride/ Sulfate/ Nitrate/Nitrite

Method Blank - Analyte	Concentration
Fluoride	0.0 mg/l
Sulfate	0.002 mg/l
Nitrate-Nitrite	<0.05 mg/l

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

Duplicate Analytical Results

Lab Sample ID	Client Sample ID	Analyte	Date of Analysis	Sample Result (mg/kg)	Duplicate Result (mg/kg)	%RPD
146401	SD3701	Fluoride	8/7/91	88.7	88.7	0
146401	SD3701	Sulfate	8/9/91	3018	3656	19.1
146401	SD3701	Nitrate/Nitrite	8/9/91	243	239	1.66

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

Duplicate Analytical Results

Lab Sample ID	Client Sample ID	Analyte	Date of Analysis	Sample Result (mg/kg)	Duplicate Result (mg/kg)	%RPD
146406	S02T01	Fluoride	8/7/91	<25.0	<25.0	0
146406	S02T01	Sulfate	8/9/91	726	669	8.17
146406	S02T01	Nitrate/Nitrite	8/9/91	1752	1647	6.18

EcoTek LSI
Ecotek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: MK Ferguson

LCS/LCSD ANALYTICAL RESULTS

Spike Compound	Spike Amount (mg/l)	Spiked Result (LCS) (mg/l)	% Spike Recovery (LCS)	Duplicate Spike Result (LCSD)(mg/l)	% Spike Recovery (LCSD)	%RPD
Fluoride	5.0	4.8	96.0	4.8	96.0	0.0
Sulfate	352	346	98.3	347	98.6	0.29
Nitrate/Nitrite	1.5	1.50	100	1.52	101	1.32

LCS = Laboratory Control Standard (water matrix spike)
LCSD = Laboratory Control Standard Duplicate (water matrix spike duplicate)

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No: MK Ferguson

MATRIX SPIKE ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	Spike Compound	Spike Amount (mg/l)	Unspiked Sample (mg/l)	Spiked Sample Result (mg/l)	% Spike Recovery
146406	S02T01	Fluoride	1.0	0.1	1.25	115
146406	S02T01	Sulfate	3.0	3.56	7.38	127*
146406	S02T01	Nitrate/Nitrite	5.0	2.14	7.44	106

* See Narrative

EcoTek LSI
Ecotek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No: MK Ferguson

MATRIX SPIKE ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	Spike Compound	Spike Amount (mg/l)	Unspiked Sample (mg/l)	Spiked Sample Result (mg/l)	% Spike Recovery
146401	SD3701	Fluoride	1.0	1.1	2.0	90.0
146401	SD3701	Sulfate	10.0	11.34	20.2	88.6
146401	SD3701	Nitrate/Nitrite	5.0	0.67	5.83	103

* See Narrative

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	% Moisture
146401	SD3701	59.7

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	% Moisture
146402	SD3702	74.1

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	% Moisture
146403	SD3703	64.1

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	% Moisture
146404	SD3704	36.3

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	% Moisture
146405	S01T01	7.6

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	% Moisture
146406	S02T02	18.4

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	% Moisture
146406-Duplicate	S02T02	14.2

EcoTek LSI
EcoTek Laboratory Services Incorporated

OIL AND GREASE (413.2) AND TOTAL PETROLEUM HYDROCARBONS (418.1)

Samples are analyzed for oil and grease using EPA Method 413.2. This method is applicable to the determination of oil and grease in contaminated ground water, sludges and soil extracts. Analyses are performed on an FTIR (Fourier Transform Infrared Spectrophotometer). If requested TPH (Total Petroleum Hydrocarbon) is determined by FTIR after addition of silica gel to the sample extracts.

The following observations were made during the analysis of LSDG 1464:

- All samples calculations are based on sample dry weight.
- Sample SD3T01 7/8/91 Raff Pit #1 contained 60% moisture and was very difficult to obtain homogenous samples. The %RPD for the MS/MSD was very high (53%). The %RPD for the MS/MSD of sample SO2T01 6/27/91 Surface Soil was 1.3%. This sample had a moisture content of 18%.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: Method 413.2

Client Reference No.: M. K. Fergeson

ANALYTICAL RESULTS

OIL & GREASE

Lab Sample ID	Client Sample ID	Oil/Grease (mg/kg)	Detection Limit (mg/kg)
146401	SD3701	160	33

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: Method 413.2

Client Reference No.: M. K. Fergeson

ANALYTICAL RESULTS

OIL & GREASE

Lab Sample ID	Client Sample ID	Oil/Grease (mg/kg)	Detection Limit (mg/kg)
146402	SD3702	370	50

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: Method 413.2

Client Reference No.: M. K. Fergeson

ANALYTICAL RESULTS

OIL & GREASE

Lab Sample ID	Client Sample ID	Oil/Grease (mg/kg)	Detection Limit (mg/kg)
146403	SD3703	200	36

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: Method 413.2

Client Reference No.: M. K. Fergeson

ANALYTICAL RESULTS

OIL & GREASE

Lab Sample ID	Client Sample ID	Oil/Grease (mg/kg)	Detection Limit (mg/kg)
146404	SD3704	28	21

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: Method 413.2

Client Reference No.: M. K. Fergeson

ANALYTICAL RESULTS

OIL & GREASE

Lab Sample ID	Client Sample ID	Oil/Grease (mg/kg)	Detection Limit (mg/kg)
146406	S02T01	23	16

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: Method 413.2

Client Reference No.: M. K. Fergeson

ANALYTICAL RESULTS

OIL & GREASE

Lab Sample ID	Client Sample ID	Oil/Grease (mg/kg)	Detection Limit (mg/kg)
Q1180114	Lab QC	<DL	13

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: Method 413.2

OIL AND GREASE

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Sample ID: 146401
Client Sample ID: SD3701

Compound	Spike Added (mg/kg)	Sample Concentration (mg/kg)	MS Concentration (mg/kg)	MS % Rec #	QC. Limits Rec
Oil and Grease	130	160.0	260	95	60-140

Compound	Spike Added (mg/kg)	MSD Concentration (mg/kg)	MSD % Rec #	QC Limits		
				% RPD #	RPD**	Rec
Oil and Grease	130	450	240	53		60-140

* = See Case Narrative
**=RPD limits not set presently.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: Method 413.2

OIL AND GREASE

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Lab Sample ID: 146406
Client Sample ID: S02T01

Compound	Spike Added (mg/kg)	Sample Concentration (mg/kg)	MS Concentration (mg/kg)	MS % Rec #	QC. Limits Rec
Oil and Grease	64	23.0	90	105	60-140

Compound	Spike Added (mg/kg)	MSD Concentration (mg/kg)	MSD % Rec #	QC Limits		
				% RPD #	RPD**	Rec
Oil and Grease	64	89	104	1.3		60-140

* = See Case Narrative
**=RPD limits not set presently.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: Method 413.2

OIL AND GREASE

BLANK SPIKE/BLANK SPIKE DUPLICATE RECOVERY

Compound	Spike Added (mg/kg)	Sample Concentration (mg/kg)	BS Concentration (mg/kg)	BS % Rec #	QC. Limits Rec
Oil and Grease	52	<DL	57	110	60-140

Compound	Spike Added (mg/kg)	BSD Concentration (mg/kg)	BSD % Rec #	QC Limits		
				% RPD #	RPD**	Rec.
Oil and Grease	52	65	114	4.3		60-140

* = See Case Narrative
**=RPD limits not set presently.

EcoTek LSI
EcoTek Laboratory Services Incorporated

GENERAL CHEMISTRY

Sample analysis was performed on 5 samples for LSDG # 1464A. Four of the samples were sludge and one sample was soil. Because the sample matrices varied, QA/QC was performed on each matrix.

Sample Preparation:

The samples were prepared for the analysis of Fluoride and Sulfate using the Distilled Water Extraction (Method 3) from the Corp of Engineers. An extraction using an acidified sample aliquot and heating of the sample was used in the sample preparation for Nitrate/Nitrite.

Sample Analysis:

Fluoride, EPA Method 340.2

Fluoride is determined potentiometrically using a combination fluoride electrode and a pH meter which displays millivolts. The standard concentration (ppm) is plotted on a graph against the millivolt reading (mV) to obtain results.

All the QA/QC requirements for this analysis were acceptable.

Sulfate, EPA Method 375.4 (IL-2438)

The sulfate ion is converted to a barium sulfate suspension and the resulting turbidity is determined using a spectrophotometer and compared to a sulfate standard solutions.

The QA/QC requirements for this analysis were acceptable with the following exception:

Two sample matrix spikes were performed and one of the % recoveries (127%) was slightly out of the normal limits (75-125).

Nitrate/Nitrite, EPA Method 353.1 (IL-2432)

Nitrate is converted to nitrite with hydrazine sulfate and the nitrite (that originally present plus reduced nitrate) is determined colorimetrically using the Technicon Traacs 800 System.

The QA/QC requirements for this analysis were acceptable.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID - ANALYSIS (mg/kg)	146401 SD3701	Pratical Quantitation Limit (mg/kg)
Fluoride Method: EPA 340.2	88.7	25.0
Nitrate/Nitrite Method: EPA 353.1 (IL-2432)	243	12.5
Sulfate Method: EPA 375.4 (IL-2438)	3018	250

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID - ANALYSIS (mg/kg)	146402 SD3702	Pratical Quantitation Limit (mg/kg)
Fluoride Method: EPA 340.2	25.9	25.0
Nitrate/Nitrite Method: EPA 353.1 (IL-2432)	<12.5	12.5
Sulfate Method: EPA 375.4 (IL-2438)	2600	250

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID - ANALYSIS (mg/kg)	146403 SD3703	Pratical Quantitation Limit (mg/kg)
Fluoride Method: EPA 340.2	63.8	25.0
Nitrate/Nitrite Method: EPA 353.1 (IL-2432)	720	12.5
Sulfate Method: EPA 375.4 (IL-2438)	1800	250

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID - ANALYSIS (mg/kg)	146404 SD3704	Pratical Quantitation Limit (mg/kg)
Fluoride Method: EPA 340.2	287	25.0
Nitrate/Nitrite Method: EPA 353.1 (IL-2432)	20.7	12.5
Sulfate Method: EPA 375.4 (IL-2438)	3200	250

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID - ANALYSIS (mg/kg)	146406 S02T01	Pratical Quantitation Limit (mg/kg)
Fluoride Method: EPA 340.2	<25.0	25.0
Nitrate/Nitrite Method: EPA 353.1 (IL-2432)	1752	12.5
Sulfate Method: EPA 375.4 (IL-2438)	730	250

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No: MK Ferguson

Method Blank Analytical Results

Fluoride/ Sulfate/ Nitrate/Nitrite

Method Blank - Analyte	Concentration
Fluoride	0.0 mg/l
Sulfate	0.002 mg/l
Nitrate-Nitrite	<0.05 mg/l

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

Duplicate Analytical Results

Lab Sample ID	Client Sample ID	Analyte	Date of Analysis	Sample Result (mg/kg)	Duplicate Result (mg/kg)	%RPD
146401	SD3701	Fluoride	8/7/91	88.7	88.7	0
146401	SD3701	Sulfate	8/9/91	3018	3656	19.1
146401	SD3701	Nitrate/Nitrite	8/9/91	243	239	1.66

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

Duplicate Analytical Results

Lab Sample ID	Client Sample ID	Analyte	Date of Analysis	Sample Result (mg/kg)	Duplicate Result (mg/kg)	%RPD
146406	S02T01	Fluoride	8/7/91	<25.0	<25.0	0
146406	S02T01	Sulfate	8/9/91	726	669	8.17
146406	S02T01	Nitrate/Nitrite	8/9/91	1752	1647	6.18

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: MK Ferguson

LCS/LCSD ANALYTICAL RESULTS

Spike Compound	Spike Amount (mg/l)	Spiked Result (LCS) (mg/l)	% Spike Recovery (LCS)	Duplicate Spike Result (LCSD)(mg/l)	% Spike Recovery (LCSD)	%RPD
Fluoride	5.0	4.8	96.0	4.8	96.0	0.0
Sulfate	352	346	98.3	347	98.6	0.29
Nitrate/Nitrite	1.5	1.50	100	1.52	101	1.32

LCS = Laboratory Control Standard (water matrix spike)
LCSD = Laboratory Control Standard Duplicate (water matrix spike duplicate)

EcoTek LSI
Ecotek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No: MK Ferguson

MATRIX SPIKE ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	Spike Compound	Spike Amount (mg/l)	Unspiked Sample (mg/l)	Spiked Sample Result (mg/l)	% Spike Recovery
146406	S02T01	Fluoride	1.0	0.1	1.25	115
146406	S02T01	Sulfate	3.0	3.56	7.38	127*
146406	S02T01	Nitrate/Nitrite	5.0	2.14	7.44	106

* See Narrative

EcoTek LSI
Ecotek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No: MK Ferguson

MATRIX SPIKE ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	Spike Compound	Spike Amount (mg/l)	Unspiked Sample (mg/l)	Spiked Sample Result (mg/l)	% Spike Recovery
146401	SD3701	Fluoride	1.0	1.1	2.0	90.0
146401	SD3701	Sulfate	10.0	11.34	20.2	88.6
146401	SD3701	Nitrate/Nitrite	5.0	0.67	5.83	103

* See Narrative

EcoTek LSI
EcoTek Laboratory Services Incorporated

INORGANICS

Metals analysis was performed on LSDG 1464 using SW-846, Method 6010 ICP-AES and 7470 CVHG yielding the results listed on the attached data table. All method blank, duplicate sample and matrix spike recovery QC data was within acceptable control limits with the following exceptions.

1) Spike recovery was within acceptable limits for all elements excpt for the following: 146404 showed low recovrey for Selenium and Silver and 146406 showed low recovery for Silver, Antimony, Thallium and Manganese. Post digestion spikes were run for these elements with good recovery and these results were reported.

2) The Prep Blank showed traces of Zinc however it was at a level far below that seen in the samples.

3) High %RPD in the sample duplicates for Barium, Beryllium, Lead, Manganese and Cobalt were observed and was due to the non homogenous nature of the soil samples.

4) Software problems interfered with the analysis of Lithium resulting in that element being run manually. All data was entered on the worksheet in the data package.

5) Low spike recovery was seen for Mercury in sample 146406. A prepared Laboratory Control Sample showed good recovery as did sample 146401.

Matrix Spike Duplicate was not Analyzed for these samples.

Detection limits were calculated by taking the instrument detection limit and multiplying it by the sample diution factor and dividing through by the % solids for each sample.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1404

Method: SW-846 Method 6010

Client Reference No.: M. K. Fergeson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID ANALYSIS (mg/kg)	146401 SD3701	Detection Limit (mg/kg)
Antimony	30.8	21.9
Arsenic	483	38.9
Barium	216	1.22
Beryllium	28.6	1.22
Cadmium	17.9	2.43
Chromium	40	6.08
Cobalt	7.81	8.51
Copper	217	6.01
Lead	104	34.0
Lithium	<12.2	12.2
Manganese	636	7.30
Mercury	<.05	0.05
Molybdenum	2050	9.73
Nickel	35.6	63.2
Selenium	31.9	7.30
Silver	<8.52	8.52
Thallium	<6.08	6.08
Vanadium	7760	1.22
Zinc	1800	0.5

* Analysis by GFAA

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M.K. Ferguson

QUALITY CONTROL DATA

MATRIX SPIKE

Metals	Spike Value (mg/kg)	146406	146406 Matrix Spike	% Rec.
Antimony	619	<11.1	558	90.1
Arsenic	619	<19.8	634	102.4
Barium	619	103	851	120.8
Beryllium	619	0.619	579	93.4
Cadmium	619	1.24	616	99.3
Chromium	619	15.5	626	98.6
Cobalt	619	6.81	615	98.3
Copper	619	5.57	603	96.5
Lead	619	24.1	635	98.7
Lithium	3095	142	3255	100.6
Manganese	1857	910	2596	90.8
Mercury	0.001	<.084	0.236	58.5
Molybdenum	619	371	588	94.4
Nickel	619	13.6	624	98.6
Selenium	619	<32.1	618	99.8
Silver	619	<3.71	543	87.7
Thallium	619	<43.3	492	79.8
Vanadium	619	22.3	601	93.5
Zinc	619	73.7	797	116.8

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M.K. Ferguson

QUALITY CONTROL DATA

MATRIX SPIKE

Metals	Spike Value (mg/kg)	146404	146404 Matrix Spike	% Rec.
Antimony	835	<15.0	719	86.1
Arsenic	835	40.9	833	94.9
Barium	835	773	1742	116
Beryllium	835	2.51	748	89.3
Cadmium	835	0.835	803	96.1
Chromium	835	25.1	796	92.3
Cobalt	835	7.52	789	93.4
Copper	835	34.2	812	93.1
Lead	835	81.8	817	88.0
Lithium	4175	337	4392	97.1
Manganese	835	226	1015	94.5
Mercury	0.001	<.05	0.237	85.8
Molybdenum	835	46.8	818	92.4
Nickel	835	34.2	809	92.8
Selenium	835	<43.4	622	74.5
Silver	835	<5.01	696	83.4
Thallium	835	<58.5	649	77.7
Vanadium	835	166	907	88.7
Zinc	835	97.7	901	96.2

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Gourp

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M.K. Ferguson

QUALITY CONTROL DATA
DUPLICATE

Metals	146406 (mg/kg)	146406 Duplicate (mg/kg)	% RPD
Antimony	<10.9	<11.1	0
Arsenic	<19.4	<19.8	0
Barium	103	120	15.2
Beryllium	0.675	0.849	22.8
Cadmium	1.21	<1.24	2.4
Chromium	15.1	13.2	13.4
Cobalt	7.04	11.9	51.3
Copper	5.72	5.6	2.1
Lead	23.9	7.42	105
Lithium	<.123	<.123	0
Manganese	912	995	8.7
Mercury	<.103	<.099	0
Molybdenum	<1.5	<3.71	0
Nickel	13.6	12.5	8.4
Selenium	<31.5	<32.2	0
Silver	<3.64	<3.71	0
Thallium	<42.5	<43.3	0
Vanadium	22.2	26.3	16.9
Zinc	73.5	85	14.5

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Gourp

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M.K. Ferguson

QUALITY CONTROL DATA
DUPLICATE

Metals	146404 (mg/kg)	146404 Duplicate (mg/kg)	% RPD
Antimony	<15	<15.0	0
Arsenic	41	36.2	12.4
Barium	772	1165	40.6
Beryllium	2.86	2.26	23.4
Cadmium	<1.06	<1.41	0
Chromium	25.1	24.2	3.7
Cobalt	7.79	8.38	7.3
Copper	34.5	38.3	10.4
Lead	82.1	40.8	67.2
Lithium	0.634	0.548	14.6
Manganese	226	333	38.2
Mercury	<.078	<.092	0
Molybdenum	46.8	45.7	2.4
Nickel	34.4	36.7	6.5
Selenium	<43.5	<36.7	0
Silver	<5.01	<4.23	0
Thallium	58.4	<49.5	16.5
Vanadium	166	166	0
Zinc	97.3	114	15.8

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: SW-846 Method 6010

Client Reference No.: M. K. Fergeson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID ANALYSIS (mg/kg)	146402 SD3702	Detection Limit (mg/kg)
Antimony	51.2	28.0
Arsenic	2250	49.8
Barium	281	1.56
Beryllium	63.1	1.56
Cadmium	27.5	3.11
Chromium	102	7.78
Cobalt	43.2	10.9
Copper	746	7.78
Lead	990	43.6
Lithium	<15.6	15.6
Manganese	5170	9.34
Mercury	9.85	0.05
Molybdenum	3220	12.4
Nickel	114	81.0
Selenium	<9.34	9.34
Silver	<109	109
Thallium	<77.8	77.8
Vanadium	16000	1.56
Zinc	538	0.5

* Analysis by GFAA

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: SW-846 Method 6010

Client Reference No.: M. K. Fergeson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID ANALYSIS (mg/kg)	146403 SD3703	Detection Limit (mg/kg)
Antimony	35.1	25.8
Arsenic	706	46.0
Barium	386	1.44
Beryllium	15.5	1.44
Cadmium	10.1	2.87
Chromium	85.1	7.18
Cobalt	12.0	10.0
Copper	629	7.18
Lead	249	40.2
Lithium	<14.4	14.4
Manganese	679	1.44
Mercury	10.9	0.05
Molybdenum	763	8.61
Nickel	227	11.5
Selenium	<74.7	74.7
Silver	<8.61	8.61
Thallium	<100	100
Vanadium	4290	7.18
Zinc	139	1.44

* Analysis by GFAA

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: SW-846 Method 6010

Client Reference No.: M. K. Fergeson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID ANALYSIS (mg/kg)	146404 SD3704	Detection Limit (mg/kg)
Antimony	<15.0	15.0
Arsenic	41.0	26.7
Barium	773	0.835
Beryllium	2.86	0.835
Cadmium	<1.67	1.67
Chromium	25.1	4.18
Cobalt	7.78	5.84
Copper	34.6	4.18
Lead	82.1	23.4
Lithium	93.1	8.35
Manganese	226	0.835
Mercury	<0.0636	0.0636
Molybdenum	46.8	5.01
Nickel	34.3	6.68
Selenium	<43.4	43.4
Silver	<5.01	5.01
Thallium	<58.4	58.4
Vanadium	166	4.18
Zinc	97.3	0.835

* Analysis by GFAA

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: SW-846 Method 6010

Client Reference No.: M. K. Fergeson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID ANALYSIS (mg/kg)	146406 S02701	Detection Limit (mg/kg)
Antimony	<11.1	11.1
Arsenic	<19.8	19.8
Barium	103.492	0.619
Beryllium	0.675	0.619
Cadmium	<1.24	1.24
Chromium	15.1	3.09
Cobalt	7.05	4.33
Copper	5.72	3.09
Lead	23.9	17.3
Lithium	<6.19	6.19
Manganese	912	0.619
Mercury	<0.084	0.084
Molybdenum	<3.71	3.71
Nickel	13.6	4.95
Selenium	<32.2	32.2
Silver	<3.71	3.71
Thallium	<43.3	43.3
Vanadium	22.2	3.09
Zinc	73.5	0.619

* Analysis by GFAA

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: SW-846 Method 6010

Client Reference No.: MK Ferguson

ANALYTICAL RESULTS: Lithium

Sample	Absorbance	Concentration	% Recovery	Time
10ppm Standard	1.09	N/A	N/A	1:20
Blank	0	N/A	N/A	1:22
ICV (5ppm)	0.543	4.98	99.6	1:23
ICB	0.001	0.009	N/A	1:24
50ppm Al	-0.001	0	N/A	1:25
200ppm Ca	0.004	0.037	N/A	1:30
50ppm Fe	0.001	0.009	N/A	1:31
200ppm Mg	-0.003	0	N/A	1:32
10ppm Std	1.108	10.17	101.7	1:33
PBS	0.003	0.028	N/A	1:34
LCS*	0.526	4.82	96.4	1:50
LCSD*	0.624	5.72	114.4	1:51
146401	0.002	0.018	N/A	1:55
146402	0.008	0.073	N/A	1:56
CCV1	0.467	4.28	85.6	1:57
CCV!rerun	0.494	4.53	90.6	1:58
CCV1rerun	0.504	4.62	92.4	1:59
CCB1	0.004	0.037	N/A	2:00
146403	0.055	0.504	N/A	2:01
146404	0.044	0.404	N/A	2:02
146404D	0.038	0.349	N/A	2:03
146404S*	0.573	5.26	97.1	2:04
146406	0.005	0.046	N/A	2:05
146406D	0.003	0.028	N/A	2:06
146406S*	0.503	4.61	91.3	2:07
ICSABF	0.001	0.009	N/A	2:08
CCV2	0.521	4.78	95.6	2:09
CCB2	0.002	0.018	N/A	2:10

EcoTek LSI
EcoTek Laboratory Services Incorporated

3342 International Park Drive, S.E.
Atlanta, Georgia 30316
(404) 244-0827
Fax # (404) 243-5355

Baseline
Total
WASTE (Analysis
VOA, Hubbards/Pesticides)

September 10, 1991

Mr. Raphael Soto
Waste Technology Group
100 Crescent Centre Parkway
Suite 200
Tucker, GA 30084

Dear Mr. Soto:

Enclosed along with this letter are the results for the sample(s) received July 30, 1991.

Please contact Craig Johnson at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464A in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Tara L. Lipio for
Donald L. Dihel
Quality Assurance Manager

Mike Buchanan
Laboratory Manager

Enclosures.
DLD/JMB/cjm

EcoTek LSI
EcoTek Laboratory Services Incorporated

ANALYTICAL RESULTS

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464A

Client Reference No.: M. K. Ferguson

Pesticide / Herbicide Results

Lab Sample ID: 146401
Client Sample ID: SD3701

TCLP Analyte	Method	Units	Result	Detection Limit
PESTICIDE				
Endrin	SW-846 Method 8080	mg/kg	<0.0082	0.0082
Lindane	SW-846 Method 8080	mg/kg	<0.0041	0.0041
Methoxychlor	SW-846 Method 8080	mg/kg	<0.082	0.082
Toxaphene	SW-846 Method 8080	mg/kg	<0.41	0.41
Chlordane	SW-846 Method 8080	mg/kg	<0.16	0.16
Heptachlor	SW-846 Method 8080	mg/kg	<0.0082	0.0082
Alpha-BHC	SW-846 Method 8080	mg/kg	<0.0041	0.0041
Beta-BHC	SW-846 Method 8080	mg/kg	<0.016	0.016
Delta-BHC	SW-846 Method 8080	mg/kg	<0.0082	0.0082
Aldrin	SW-846 Method 8080	mg/kg	<0.0082	0.0082
Heptachlor Epoxide	SW-846 Method 8080	mg/kg	<0.0082	0.0082
Endosulfan I	SW-846 Method 8080	mg/kg	<0.0082	0.0082
4,4'-DDE	SW-846 Method 8080	mg/kg	<0.049	0.049
Dieldrin	SW-846 Method 8080	mg/kg	<0.057	0.057
4,4'-DDT	SW-846 Method 8080	mg/kg	<0.20	0.20
4,4'-DDD	SW-846 Method 8080	mg/kg	<0.0082	0.0082
Endosulfan II	SW-846 Method 8080	mg/kg	<0.14	0.14
Endosulfan Sulfate	SW-846 Method 8080	mg/kg	<0.16	0.16
HERBICIDE				
2,4-D	SW-846 Method 8150	mg/kg	<0.020	0.02
2,4,5-TP Silvex	SW-846 Method 8150	mg/kg	<0.0041	0.0041

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Organic Analytical Results
SW-846 Method 8240

Client:	WTG	Client Sample No.:	SD3701
Lab Sample ID:	1464A01	Client Reference No.:	M.K. Ferguson
Matrix:	Soil	Date Received:	July 30, 1991
Dilution Factor:	1	Date Analyzed:	August 27, 1991

CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
74873	Chloromethane	BQL	25	
74839	Bromomethane	BQL	25	
75014	Vinyl Chloride	BQL	25	
75003	Chloroethane	BQL	25	
75092	Methylene Chloride	89	12	B
67641	Acetone	62	250	*
75150	Carbon Disulfide	BQL	12	
75354	1,1-Dichloroethene	BQL	12	
75343	1,1-Dichloroethane	BQL	12	
156605	1,2-Dichloroethene (total)	BQL	12	
67663	Chloroform	BQL	12	
107062	1,2-Dichloroethane	BQL	12	
78933	2-Butanone	34	250	*
71556	1,1,1-Trichloroethane	BQL	12	
56235	Carbon Tetrachloride	BQL	12	
108054	Vinyl Acetate	BQL	120	
75274	Bromodichloromethane	BQL	12	
78875	1,2-Dichloropropane	BQL	12	
10061015	cis-1,3-Dichloropropene	BQL	12	
79016	Trichloroethene	BQL	12	
124481	Dibromochloromethane	BQL	12	
79005	1,1,2-Trichloroethane	BQL	12	

EcoTek LSI
EcoTek Laboratory Services Incorporated

Lab Sample ID: 1464A01		Client Sample No.: SD3701		
CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
71432	Benzene	BQL	12	
10061026	Trans-1,3-Dichloropropene	BQL	12	
75252	Bromoform	BQL	12	
108101	4-methyl-2-pentanone	BQL	120	
591786	2-hexanone	BQL	120	
127184	Tetrachloroethene	BQL	12	
79345	1,1,2,2-Tetrachloroethane	BQL	12	
108883	Toluene	BQL	12	
108907	Chlorobenzene	BQL	12	
100414	Ethylbenzene	BQL	12	
100425	Styrene	BQL	12	
1330207	Xylene (total)	BQL	12	
110758	2-Chloroethyl vinyl ether	BQL	25	

PQL = Practical Quantitation Limit

BQL = Below Quantitation Limit

* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

B = This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464A

Client Reference No.: M. K. Ferguson

Pesticide / Herbicide Results

Lab Sample ID: 146402
Client Sample ID: SD3702

TCLP Analyte	Method	Units	Result	Detection Limit
PESTICIDE				
Endrin	SW-846 Method 8080	mg/kg	<0.013	0.013
Lindane	SW-846 Method 8080	mg/kg	<0.0065	0.0065
Methoxychlor	SW-846 Method 8080	mg/kg	<0.13	0.13
Toxaphene	SW-846 Method 8080	mg/kg	<0.65	0.65
Chlordane	SW-846 Method 8080	mg/kg	<0.26	0.26
Heptachlor	SW-846 Method 8080	mg/kg	<0.013	0.013
Alpha-BHC	SW-846 Method 8080	mg/kg	<0.0065	0.0065
Beta-BHC	SW-846 Method 8080	mg/kg	<0.026	0.026
Delta-BHC	SW-846 Method 8080	mg/kg	<0.013	0.013
Aldrin	SW-846 Method 8080	mg/kg	<0.013	0.013
Heptachlor Epoxide	SW-846 Method 8080	mg/kg	<0.013	0.013
Endosulfan I	SW-846 Method 8080	mg/kg	<0.013	0.013
4,4'-DDE	SW-846 Method 8080	mg/kg	<0.077	0.077
Dieldrin	SW-846 Method 8080	mg/kg	<0.090	0.090
4,4'-DDT	SW-846 Method 8080	mg/kg	<0.32	0.32
4,4'-DDD	SW-846 Method 8080	mg/kg	<0.013	0.013
Endosulfan II	SW-846 Method 8080	mg/kg	<0.22	0.22
Endosulfan Sulfate	SW-846 Method 8080	mg/kg	<0.25	0.25
HERBICIDE				
2,4-D	SW-846 Method 8150	mg/kg	<0.029	0.029
2,4,5-TP Silvex	SW-846 Method 8150	mg/kg	<0.0058	0.0058

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Organic Analytical Results
SW-846 Method 8240

Client:	WTG	Client Sample No.:	SD3702
Lab Sample ID:	1464A02	Client Reference No.:	M.K. Ferguson
Matrix:	Soil	Date Received:	July 30, 1991
Dilution Factor:	1	Date Analyzed:	August 27, 1991

CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
74873	Chloromethane	BQL	39	
74839	Bromomethane	BQL	39	
75014	Vinyl Chloride	BQL	39	
75003	Chloroethane	BQL	39	
75092	Methylene Chloride	150	19	B
67641	Acetone	54	390	*
75150	Carbon Disulfide	BQL	19	
75354	1,1-Dichloroethene	BQL	19	
75343	1,1-Dichloroethane	BQL	19	
156605	1,2-Dichloroethene (total)	BQL	19	
67663	Chloroform	BQL	19	
107062	1,2-Dichloroethane	BQL	19	
78933	2-Butanone	45	390	*
71556	1,1,1-Trichloroethane	BQL	19	
56235	Carbon Tetrachloride	BQL	19	
108054	Vinyl Acetate	BQL	190	
75274	Bromodichloromethane	BQL	19	
78875	1,2-Dichloropropane	BQL	19	
10061015	cis-1,3-Dichloropropene	BQL	19	
79016	Trichloroethene	BQL	19	
124481	Dibromochloromethane	BQL	19	
79005	1,1,2-Trichloroethane	BQL	19	

005A

EcoTek LSI
EcoTek Laboratory Services Incorporated

Lab Sample ID: 1464A02		Client Sample No.: SD3702		
CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
71432	Benzene	BQL	19	
10061026	Trans-1,3-Dichloropropene	BQL	19	
75252	Bromoform	BQL	19	
108101	4-methyl-2-pentanone	BQL	190	
591786	2-hexanone	BQL	190	
127184	Tetrachloroethene	BQL	19	
79345	1,1,2,2-Tetrachloroethane	BQL	19	
108883	Toluene	BQL	19	
108907	Chlorobenzene	BQL	19	
100414	Ethylbenzene	BQL	19	
100425	Styrene	BQL	19	
1330207	Xylene (total)	BQL	19	
110758	2-Chloroethyl vinyl ether	BQL	39	

PQL = Practical Quantitation Limit

BQL = Below Quantitation Limit

* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

B = This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464A

Client Reference No.: M. K. Ferguson

Pesticide / Herbicide Results

Lab Sample ID: 146403
Client Sample ID: SD3703

TCLP Analyte	Method	Units	Result	Detection Limit
PESTICIDE				
Endrin	SW-846 Method 8080	mg/kg	<0.0088	0.0088
Lindane	SW-846 Method 8080	mg/kg	<0.0044	0.0044
Methoxychlor	SW-846 Method 8080	mg/kg	<0.088	0.088
Toxaphene	SW-846 Method 8080	mg/kg	<0.44	0.44
Chlordane	SW-846 Method 8080	mg/kg	<0.18	0.18
Heptachlor	SW-846 Method 8080	mg/kg	<0.0088	0.0088
Alpha-BHC	SW-846 Method 8080	mg/kg	<0.0044	0.0044
Beta-BHC	SW-846 Method 8080	mg/kg	<0.018	0.018
Delta-BHC	SW-846 Method 8080	mg/kg	<0.0088	0.0088
Aldrin	SW-846 Method 8080	mg/kg	<0.0088	0.0088
Heptachlor Epoxide	SW-846 Method 8080	mg/kg	<0.0088	0.0088
Endosulfan I	SW-846 Method 8080	mg/kg	<0.0088	0.0088
4,4'-DDE	SW-846 Method 8080	mg/kg	<0.053	0.053
Dieldrin	SW-846 Method 8080	mg/kg	<0.062	0.062
4,4'-DDT	SW-846 Method 8080	mg/kg	<0.22	0.22
4,4'-DDD	SW-846 Method 8080	mg/kg	<0.0088	0.0088
Endosulfan II	SW-846 Method 8080	mg/kg	<0.15	0.15
Endosulfan Sulfate	SW-846 Method 8080	mg/kg	<0.17	0.17
HERBICIDE				
2,4-D	SW-846 Method 8150	mg/kg	<0.023	0.023
2,4,5-TP Silvex	SW-846 Method 8150	mg/kg	<0.0045	0.0045

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Organic Analytical Results
SW-846 Method 8240

Client:	WTG	Client Sample No.:	SD3703
Lab Sample ID:	1464A03	Client Reference No.:	M.K. Ferguson
Matrix:	Soil	Date Received:	July 30, 1991
Dilution Factor:	1	Date Analyzed:	August 27, 1991

CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
74873	Chloromethane	BQL	28	
74839	Bromomethane	BQL	28	
75014	Vinyl Chloride	BQL	28	
75003	Chloroethane	BQL	28	
75092	Methylene Chloride	100	14	B
67641	Acetone	40	280	*
75150	Carbon Disulfide	BQL	14	
75354	1,1-Dichloroethene	BQL	14	
75343	1,1-Dichloroethane	BQL	14	
156605	1,2-Dichloroethene (total)	BQL	14	
67663	Chloroform	BQL	14	
107062	1,2-Dichloroethane	BQL	14	
78933	2-Butanone	30	280	*
71556	1,1,1-Trichloroethane	BQL	14	
56235	Carbon Tetrachloride	BQL	14	
108054	Vinyl Acetate	BQL	140	
75274	Bromodichloromethane	BQL	14	
78875	1,2-Dichloropropane	BQL	14	
10061015	cis-1,3-Dichloropropene	BQL	14	
79016	Trichloroethene	110	14	
124481	Dibromochloromethane	BQL	14	
79005	1,1,2-Trichloroethane	BQL	14	

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile QC Spike Data

Client: WTG
Lab Sample ID: 1464D01
Method: TCLP, 8270

Client Sample ID: ORNL RP #1-2
Client Reference No.: M.K. Ferguson

Compound	Matrix Spike % Recovery	Matrix Spike Duplicate % Recovery	% Recovery QC Lmits *	Relative Percent Difference RPD
Total Cresol*, mg/L	51.0	38.6	NA	27.7
1,4-Dichlorobenzene, mg/L	66.7	48.7	37-106	31.2
2.4-Dinitrotoluene, mg/L	64.8	52.3	48-127	21.3
Hexachlorobenzene, mg/L	81.3	65.4	8-142	21.7
Hexachlorobutadiene, mg/L	66.1	49.6	38-102	28.5
Hexachloroethane, mg/L	67.6	48.3	55-100	33.3
Nitrobenzene, mg/L	74.2	57.9	54-158	24.7
Pentachlorophenol, mg/L	80.2	62.2	38-152	25.3
Pyridine, mg/L	57.2	40.6	NA	33.8
2,4,5-Trichlorophenol, mg/L	67.7	54.3	NA	22.0
2,4,6-Trichlorophenol, mg/L	73.7	58.7	52-129	22.6

* Based upon SW-846, Method 8270, Table 6
D = Detected
NA= Not available

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: September 23, 1991

LSDG: 1464D

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	Q1192401 TCLP Blank
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020

* = If the o-, m-, p-Cresol isomers cannot be differentiated, the Total Cresol is used.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Lab Sample ID: 1464A03		Client Sample No.: SD3703		
CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
71432	Benzene	BQL	14	
10061026	Trans-1,3-Dichloropropene	BQL	14	
75252	Bromoform	BQL	14	
108101	4-methyl-2-pentanone	BQL	140	
591786	2-hexanone	BQL	140	
127184	Tetrachloroethene	BQL	14	
79345	1,1,2,2-Tetrachloroethane	BQL	14	
108883	Toluene	BQL	14	
108907	Chlorobenzene	BQL	14	
100414	Ethylbenzene	BQL	14	
100425	Styrene	BQL	14	
1330207	Xylene (total)	BQL	14	
110758	2-Chloroethyl vinyl ether	BQL	28	

PQL = Practical Quantitation Limit

BQL = Below Quantitation Limit

* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

B = This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464A

Client Reference No.: M. K. Ferguson

Pesticide / Herbicide Results

Lab Sample ID: 146404
Client Sample ID: SD3704

TCLP Analyte	Method	Units	Result	Detection Limit
PESTICIDE				
Endrin	SW-846 Method 8080	mg/kg	<0.0050	0.0050
Lindane	SW-846 Method 8080	mg/kg	<0.0025	0.0025
Methoxychlor	SW-846 Method 8080	mg/kg	<0.050	0.050
Toxaphene	SW-846 Method 8080	mg/kg	<0.25	0.25
Chlordane	SW-846 Method 8080	mg/kg	<0.10	0.10
Heptachlor	SW-846 Method 8080	mg/kg	<0.0050	0.0050
Alpha-BHC	SW-846 Method 8080	mg/kg	<0.0025	0.0025
Beta-BHC	SW-846 Method 8080	mg/kg	<0.10	0.10
Delta-BHC	SW-846 Method 8080	mg/kg	<0.0050	0.0050
Aldrin	SW-846 Method 8080	mg/kg	<0.0050	0.0050
Heptachlor Epoxide	SW-846 Method 8080	mg/kg	<0.0050	0.0050
Endosulfan I	SW-846 Method 8080	mg/kg	<0.0050	0.0050
4,4'-DDE	SW-846 Method 8080	mg/kg	<0.030	0.030
Dieldrin	SW-846 Method 8080	mg/kg	<0.035	0.035
4,4'-DDT	SW-846 Method 8080	mg/kg	<0.12	0.12
4,4'-DDD	SW-846 Method 8080	mg/kg	<0.0050	0.0050
Endosulfan II	SW-846 Method 8080	mg/kg	<0.085	0.085
Endosulfan Sulfate	SW-846 Method 8080	mg/kg	<0.095	0.095
HERBICIDE				
2,4-D	SW-846 Method 8150	mg/kg	<0.022	0.022
2,4,5-TP Silvex	SW-846 Method 8150	mg/kg	<0.0044	0.0044

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Organic Analytical Results
SW-846 Method 8240

Client:	WTG	Client Sample No.:	SD3704
Lab Sample ID:	1464A04	Client Reference No.:	M.K. Ferguson
Matrix:	Soil	Date Received:	July 30, 1991
Dilution Factor:	1	Date Analyzed:	August 27, 1991

CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
74873	Chloromethane	BQL	16	
74839	Bromomethane	BQL	16	
75014	Vinyl Chloride	BQL	16	
75003	Chloroethane	BQL	16	
75092	Methylene Chloride	62	8	B
67641	Acetone	37	160	*
75150	Carbon Disulfide	BQL	8	
75354	1,1-Dichloroethene	BQL	8	
75343	1,1-Dichloroethane	BQL	8	
156605	1,2-Dichloroethene (total)	BQL	8	
67663	Chloroform	BQL	8	
107062	1,2-Dichloroethane	BQL	8	
78933	2-Butanone	28	160	*
71556	1,1,1-Trichloroethane	BQL	8	
56235	Carbon Tetrachloride	BQL	8	
108054	Vinyl Acetate	BQL	78	
75274	Bromodichloromethane	BQL	8	
78875	1,2-Dichloropropane	BQL	8	
10061015	cis-1,3-Dichloropropene	BQL	8	
79016	Trichloroethene	BQL	8	
124481	Dibromochloromethane	BQL	8	
79005	1,1,2-Trichloroethane	BQL	8	

EcoTek LSI
EcoTek Laboratory Services Incorporated

Lab Sample ID: 1464A04		Client Sample No.: SD3704		
CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
71432	Benzene	BQL	8	
10061026	Trans-1,3-Dichloropropene	BQL	8	
75252	Bromoform	BQL	8	
108101	4-methyl-2-pentanone	BQL	78	
591786	2-hexanone	BQL	78	
127184	Tetrachloroethene	BQL	8	
79345	1,1,2,2-Tetrachloroethane	BQL	8	
108883	Toluene	2	8	*
108907	Chlorobenzene	BQL	8	
100414	Ethylbenzene	BQL	8	
100425	Styrene	BQL	8	
1330207	Xylene (total)	BQL	8	
110758	2-Chloroethyl vinyl ether	BQL	16	

PQL = Practical Quantitation Limit

BQL = Below Quantitation Limit

* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

B = This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464A

Client Reference No.: M. K. Ferguson

Pesticide / Herbicide Results

Lab Sample ID: 146405
Client Sample ID: S01T01

TCLP Analyte	Method	Units	Result	Detection Limit
PESTICIDE				
Endrin	SW-846 Method 8080	mg/kg	<0.0036	0.0036
Lindane	SW-846 Method 8080	mg/kg	<0.018	0.018
Methoxychlor	SW-846 Method 8080	mg/kg	<0.036	0.036
Toxaphene	SW-846 Method 8080	mg/kg	<0.18	0.18
Chlordane	SW-846 Method 8080	mg/kg	<0.072	0.072
Heptachlor	SW-846 Method 8080	mg/kg	<0.0036	0.0036
Alpha-BHC	SW-846 Method 8080	mg/kg	<0.018	0.018
Beta-BHC	SW-846 Method 8080	mg/kg	<0.072	0.072
Delta-BHC	SW-846 Method 8080	mg/kg	<0.036	0.036
Aldrin	SW-846 Method 8080	mg/kg	<0.036	0.036
Heptachlor Epoxide	SW-846 Method 8080	mg/kg	<0.0036	0.0036
Endosulfan I	SW-846 Method 8080	mg/kg	<0.0036	0.0036
4,4'-DDE	SW-846 Method 8080	mg/kg	<0.022	0.022
Dieldrin	SW-846 Method 8080	mg/kg	<0.025	0.025
4,4'-DDT	SW-846 Method 8080	mg/kg	<0.090	0.090
4,4'-DDD	SW-846 Method 8080	mg/kg	<0.0036	0.0036
Endosulfan II	SW-846 Method 8080	mg/kg	<0.061	0.061
Endosulfan Sulfate	SW-846 Method 8080	mg/kg	<0.068	0.068
HERBICIDE				
2,4-D	SW-846 Method 8150	mg/kg	<0.208	0.208
2,4,5-TP Silvex	SW-846 Method 8150	mg/kg	<0.042	0.042

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Organic Analytical Results
SW-846 Method 8240

Client:	WTG	Client Sample No.:	S01T01
Lab Sample ID:	1464A05	Client Reference No.:	M.K. Ferguson
Matrix:	Soil	Date Received:	July 30, 1991
Dilution Factor:	1	Date Analyzed:	August 26, 1991

CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
74873	Chloromethane	BQL	11	
74839	Bromomethane	BQL	11	
75014	Vinyl Chloride	BQL	11	
75003	Chloroethane	BQL	11	
75092	Methylene Chloride	59	5	B
67641	Acetone	130	110	
75150	Carbon Disulfide	BQL	5	
75354	1,1-Dichloroethene	BQL	5	
75343	1,1-Dichloroethane	BQL	5	
156605	1,2-Dichloroethene (total)	BQL	5	
67663	Chloroform	1	5	*
107062	1,2-Dichloroethane	BQL	5	
78933	2-Butanone	9	110	* B
71556	1,1,1-Trichloroethane	BQL	5	
56235	Carbon Tetrachloride	BQL	5	
108054	Vinyl Acetate	BQL	54	
75274	Bromodichloromethane	BQL	5	
78875	1,2-Dichloropropane	BQL	5	
10061015	cis-1,3-Dichloropropene	BQL	5	
79016	Trichloroethene	1	5	*
124481	Dibromochloromethane	BQL	5	
79005	1,1,2-Trichloroethane	BQL	5	

EcoTek LSI
EcoTek Laboratory Services Incorporated

Lab Sample ID: 1464A05		Client Sample No.: S01T01		
CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
71432	Benzene	BQL	5	
10061026	Trans-1,3-Dichloropropene	BQL	5	
75252	Bromoform	BQL	5	
108101	4-methyl-2-pentanone	12	54	*
591786	2-hexanone	BQL	54	
127184	Tetrachloroethene	BQL	5	
79345	1,1,2,2-Tetrachloroethane	BQL	5	
108883	Toluene	3	5	*
108907	Chlorobenzene	BQL	5	
100414	Ethylbenzene	BQL	5	
100425	Styrene	BQL	5	
1330207	Xylene (total)	BQL	5	
110758	2-Chloroethyl vinyl ether	BQL	11	

PQL = Practical Quantitation Limit

BQL = Below Quantitation Limit

* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

B = This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464A

Client Reference No.: M. K. Ferguson

Pesticide / Herbicide Results

Lab Sample ID: 146406
Client Sample ID: S02T01

TCLP Analyte	Method	Units	Result	Detection Limit
PESTICIDE				
Endrin	SW-846 Method 8080	mg/kg	<0.0041	0.0041
Lindane	SW-846 Method 8080	mg/kg	<0.0020	0.0020
Methoxychlor	SW-846 Method 8080	mg/kg	<0.041	0.041
Toxaphene	SW-846 Method 8080	mg/kg	<0.20	0.20
Chlordane	SW-846 Method 8080	mg/kg	<0.082	0.082
Heptachlor	SW-846 Method 8080	mg/kg	<0.0041	0.0041
Alpha-BHC	SW-846 Method 8080	mg/kg	<0.0020	0.0020
Beta-BHC	SW-846 Method 8080	mg/kg	<0.0082	0.0082
Delta-BHC	SW-846 Method 8080	mg/kg	<0.0041	0.0041
Aldrin	SW-846 Method 8080	mg/kg	<0.0041	0.0041
Heptachlor Epoxide	SW-846 Method 8080	mg/kg	<0.0041	0.0041
Endosulfan I	SW-846 Method 8080	mg/kg	<0.0041	0.0041
4,4'-DDE	SW-846 Method 8080	mg/kg	<0.025	0.025
Dieldrin	SW-846 Method 8080	mg/kg	<0.029	0.029
4,4'-DDT	SW-846 Method 8080	mg/kg	<0.10	0.01
4,4'-DDD	SW-846 Method 8080	mg/kg	<0.0041	0.0041
Endosulfan II	SW-846 Method 8080	mg/kg	<0.069	0.069
Endosulfan Sulfate	SW-846 Method 8080	mg/kg	<0.078	0.078
HERBICIDE				
2,4-D	SW-846 Method 8150	mg/kg	<0.021	0.021
2,4,5-TP Silvex	SW-846 Method 8150	mg/kg	<0.0042	0.0042

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Organic Analytical Results
SW-846 Method 8240

Client:	WTG	Client Sample No.:	S02T01
Lab Sample ID:	1464A06	Client Reference No.:	M.K. Ferguson
Matrix:	Soil	Date Received:	July 30, 1991
Dilution Factor:	1	Date Analyzed:	August 26, 1991

CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
74873	Chloromethane	BQL	12	
74839	Bromomethane	BQL	12	
75014	Vinyl Chloride	BQL	12	
75003	Chloroethane	BQL	12	
75092	Methylene Chloride	130	6	B
67641	Acetone	BQL	120	
75150	Carbon Disulfide	BQL	6	
75354	1,1-Dichloroethene	BQL	6	
75343	1,1-Dichloroethane	BQL	6	
156605	1,2-Dichloroethene (total)	2	6	*
67663	Chloroform	BQL	6	
107062	1,2-Dichloroethane	BQL	6	
78933	2-Butanone	BQL	120	
71556	1,1,1-Trichloroethane	BQL	6	
56235	Carbon Tetrachloride	BQL	6	
108054	Vinyl Acetate	BQL	61	
75274	Bromodichloromethane	BQL	6	
78875	1,2-Dichloropropane	BQL	6	
10061015	cis-1,3-Dichloropropene	BQL	6	
79016	Trichloroethene	2	6	*
124481	Dibromochloromethane	BQL	6	
79005	1,1,2-Trichloroethane	BQL	6	

EcoTek LSI
EcoTek Laboratory Services Incorporated

Lab Sample ID: 1464A06		Client Sample No.: S02T01		
CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
71432	Benzene	BQL	6	
10061026	Trans-1,3-Dichloropropene	BQL	6	
75252	Bromoform	BQL	6	
108101	4-methyl-2-pentanone	BQL	61	
591786	2-hexanone	BQL	61	
127184	Tetrachloroethene	BQL	6	
79345	1,1,2,2-Tetrachloroethane	BQL	6	
108883	Toluene	7	6	
108907	Chlorobenzene	BQL	6	
100414	Ethylbenzene	2	6	*
100425	Styrene	BQL	6	
1330207	Xylene (total)	2	6	*
110758	2-Chloroethyl vinyl ether	BQL	12	

PQL = Practical Quantitation Limit

BQL = Below Quantitation Limit

* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

B = This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

EcoTek LSI
Ecotek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS
RADIOCHEMISTRY

Lab Sample ID: 146406
Client Sample ID: S02T01

Analysis	Units	Result
Total Uranium		
Uranium	ng/g	*
Isotopic Uranium		
U-234	pCi/g	3.7±0.7
U-238	pCi/g	3.6±0.7
Isotopic Thorium		
Th-228	pCi/g	1.5±0.3
Th-230	pCi/g	20±3
Th-232	pCi/g	1.3±0.2
Radium		
Ra-226	pCi/g	*
Ra-228	pCi/g	*

* = Analysis is in progress

EcoTek LSI
EcoTek Laboratory Services Incorporated

NARRATIVES

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR VOLATILE ANALYSIS USING SW-846 METHOD 8240

Client: WTG

LSDG: 1464A

* All volatile organics were analyzed by GC/MS on one or more of the instruments listed below.

  Hewlett-Packard MSD---Inst. ID. 7002 Finnigan Mat 4023---Inst. ID. 4000
  Hewlett-Packard MSD---Inst. ID. 7003 Finnigan OWA ---Inst. ID. 10501

* Chromatography was performed on a 2.4m x 2.0mm ID glass column packed with 1% SP 1000 Carbopack B and/or a 75m x 0.53mm DB-624 megabore column. Samples were purged via Tekmar LSC-2/ALS and/or OI 4460A/OIC MPM-16 onto traps composed of silica gel/charcoal/Tenax. Operating temperatures are 220°C, 250°C, 280°C respectively for the injector, jet separator, source/interface.

* Sample purge size was 5 grams for soil/sludge matrices unless noted otherwise.

* The reports of the target compounds identified and quantified in the samples are contained in the following sections of the data package. Also included are the appropriate calibration and quality control data where applicable. Data was obtained from HP RTE-A series computer with Aquarius software and/or Nova 4C computer with Finnigan Incos software.

* Practical Quantitation Limits (PQL) are based on those listed in SW846 Method 8240 factored for percent moisture and any necessary dilutions.

* The following exceptions and/or considerations should be noted for the sample group contained within.

  - Method blanks were analyzed with the sample group. Samples S01T01 and S02T01 were analyzed August 26; VBLKOA is the blank associated with these samples. The remaining samples were analyzed August 27; VBLKOB is associated with these samples.

  - Surrogate recoveries were within acceptable QC limits for the blanks and the samples.

EcoTek LSI
EcoTek Laboratory Services Incorporated

METHOD SUMMARY FOR SW846 - 8150

Samples are analyzed according to SW846 method 8150 which is suitable for detecting ppb (parts per billion) levels of chlorinated herbicides. Acid herbicides are extracted and esterified; the extracts are then analyzed using a gas chromatograph equipped with an ECD (electron capture detector). Standards are prepared from the methyl esters of the compounds of interest at five concentrations. Quantitation of the samples includes a correction for the difference in the molecular weight of the methyl ester versus the acid herbicide. Tentative identification of compounds is supported by at least one other qualitative analysis, and all appropriate quality control samples are analyzed with the sample extracts.

- The samples were analyzed for TCLP compounds only as reflected by the result forms.
- The surrogate recovery for sample SO1TO1 6/27/91 QUARRY SOIL (1464A-05) was very high (>600%) probably due to interfering peaks (the sample was diluted 10X). A second dilution of 100X did not improve the recovery value (>200%). The sample was given to the GC/MS Section to determine if the Herbicides 2,4-D or 2,4,5-TP (Silvex) were present. The data from GC/MS indicates that neither of the these Herbicides is present in the extracts.

EcoTek LSI
EcoTek Laboratory Services Incorporated

METHOD SUMMARY FOR SW846 - 8080

Samples are analyzed according to SW846 method 8080 which is suitable for detecting ppb (parts per billion) levels of chlorinated pesticides and polychlorinated biphenyls. A gas chromatograph equipped with an ECD (electron capture detector) is used to analyze samples. Tentative identification of compounds is supported by at least one other qualitative analysis (either GC/EC or GC/MS when the concentration of the analytes permit). Quantitation of sample concentrations is performed using a five level calibration. All appropriate quality control samples are analyzed with the sample extracts.

The following observations were made during the analysis of LSDG 1464A:

- INDA, INDB, and Toxaphene curves are based on 4 point calibrations. The %RSD's for all analytes were less than 20% except for Methoxychlor which had a correlation coefficient of 0.9999. The detection limits were not affected.
- The recovery for Heptachlor was above the QC limits (133% vs. 111%) in the blank spike, however the blank spike was also spiked with Chlordane which contributes a small amound of Heptachlor. All other recoveries were within limits for the blank spike.
- The recovery of Chlordane in the matrix spike of sample 1464A-06 was above QC limits. The recovery of Chlordane in the Blank Spike was within limits which indicates a matrix effect in the sample spike.

- The %D's were above 15% for the following continuing standards:

  INDA (5i08669) DDT - 15.5% (ended sequence)

  INDB (5i08670) Alpha-BHC 18.3% : Endrin Ketone 15.3% (ended sequence)

  INDB (5i08682) Endrin Ketone 17.7%

- Several samples required GC/MS confirmation for Pesticide analytes (SO2T01 and SO2T01). The data for these confirmation shows no Pesticide compounds present in the extracts.

EcoTek LSI
EcoTek Laboratory Services Incorporated

VOLATILE
QC

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Organic Analytical Results
SW-846 Method 8240

Client:	WTG	Client Sample No.:	Method Blank
Lab Sample ID:	VBLKOA	Client Reference No.:	M.K. Ferguson
Matrix:	Soil	Date Received:	NA
Dilution Factor:	1	Date Analyzed:	August 26, 1991

CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
74873	Chloromethane	BQL	10	
74839	Bromomethane	BQL	10	
75014	Vinyl Chloride	BQL	10	
75003	Chloroethane	BQL	10	
75092	Methylene Chloride	27	5	
67641	Acetone	BQL	100	
75150	Carbon Disulfide	BQL	5	
75354	1,1-Dichloroethene	BQL	5	
75343	1,1-Dichloroethane	BQL	5	
156605	1,2-Dichloroethene (total)	BQL	5	
67663	Chloroform	BQL	5	
107062	1,2-Dichloroethane	BQL	5	
78933	2-Butanone	11	100	*
71556	1,1,1-Trichloroethane	BQL	5	
56235	Carbon Tetrachloride	BQL	5	
108054	Vinyl Acetate	BQL	50	
75274	Bromodichloromethane	BQL	5	
78875	1,2-Dichloropropane	BQL	5	
10061015	cis-1,3-Dichloropropene	BQL	5	
79016	Trichloroethene	BQL	5	
124481	Dibromochloromethane	BQL	5	
79005	1,1,2-Trichloroethane	BQL	5	

EcoTek LSI
EcoTek Laboratory Services Incorporated

Lab Sample ID: VBLKOA		Client Sample No.: Method Blank		
CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
71432	Benzene	BQL	5	
10061026	Trans-1,3-Dichloropropene	BQL	5	
75252	Bromoform	BQL	5	
108101	4-methyl-2-pentanone	BQL	50	
591786	2-hexanone	BQL	50	
127184	Tetrachloroethene	BQL	5	
79345	1,1,2,2-Tetrachloroethane	BQL	5	
108883	Toluene	BQL	5	
108907	Chlorobenzene	BQL	5	
100414	Ethylbenzene	BQL	5	
100425	Styrene	BQL	5	
1330207	Xylene (total)	BQL	5	
110758	2-Chloroethyl vinyl ether	BQL	10	

PQL = Practical Quantitation Limit

BQL = Below Quantitation Limit

* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

B = This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Organic Analytical Results
SW-846 Method 8240

Client:	WTG	Client Sample No.:	Method Blank
Lab Sample ID:	VBLKOB	Client Reference No.:	M.K. Ferguson
Matrix:	Soil	Date Received:	NA
Dilution Factor:	1	Date Analyzed:	August 27, 1991

CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
74873	Chloromethane	BQL	10	
74839	Bromomethane	BQL	10	
75014	Vinyl Chloride	BQL	10	
75003	Chloroethane	BQL	10	
75092	Methylene Chloride	26	5	
67641	Acetone	BQL	100	
75150	Carbon Disulfide	BQL	5	
75354	1,1-Dichloroethene	BQL	5	
75343	1,1-Dichloroethane	BQL	5	
156605	1,2-Dichloroethene (total)	BQL	5	
67663	Chloroform	BQL	5	
107062	1,2-Dichloroethane	BQL	5	
78933	2-Butanone	BQL	100	
71556	1,1,1-Trichloroethane	BQL	5	
56235	Carbon Tetrachloride	BQL	5	
108054	Vinyl Acetate	BQL	50	
75274	Bromodichloromethane	BQL	5	
78875	1,2-Dichloropropane	BQL	5	
10061015	cis-1,3-Dichloropropene	BQL	5	
79016	Trichloroetnene	BQL	5	
124481	Dibromochloromethane	BQL	5	
79005	1,1,2-Trichloroethane	BQL	5	

EcoTek LSI
EcoTek Laboratory Services Incorporated

Lab Sample ID: VBLKOB		Client Sample No.: Method Blank		
CAS Number	Compound Name	Result ug/kg	PQL ug/kg	Note
71432	Benzene	BQL	5	
10061026	Trans-1,3-Dichloropropene	BQL	5	
75252	Bromoform	BQL	5	
108101	4-methyl-2-pentanone	BQL	50	
591786	2-hexanone	BQL	50	
127184	Tetrachloroethene	BQL	5	
79345	1,1,2,2-Tetrachloroethane	BQL	5	
108883	Toluene	BQL	5	
108907	Chlorobenzene	BQL	5	
100414	Ethylbenzene	BQL	5	
100425	Styrene	BQL	5	
1330207	Xylene (total)	BQL	5	
110758	2-Chloroethyl vinyl ether	BQL	10	

PQL = Practical Quantitation Limit

BQL = Below Quantitation Limit

* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

B = This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable contamination and warns the data user to take appropriate action.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Surrogate Recovery Data

Lab Sample ID: 1464A01 Client Sample No.: SD3701

Surrogate Compound	% Recovery	QC Limits	Notes
Toluene-d8	97	81-117	
Bromofluorobenzene	93	74-121	
1,2-Dichloroethane-d4	91	70-121	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to purging to monitor the purge efficiency. Lower surrogate recoveries may indicate possible matrix effect and/or lower purge efficiency.

Attachment A

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Surrogate Recovery Data

Lab Sample ID: 1464A02 Client Sample No.: SD3702

Surrogate Compound	% Recovery	QC Limits	Notes
Toluene-d8	98	81-117	
Bromofluorobenzene	95	74-121	
1,2-Dichloroethane-d4	93	70-121	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to purging to monitor the purge efficiency.
Lower surrogate recoveries may indicate possible matrix effect and/or lower purge efficiency.

Attachment A

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Surrogate Recovery Data

Lab Sample ID: 1464A03 Client Sample No.: SD3703

Surrogate Compound	% Recovery	QC Limits	Notes
Toluene-d8	99	81-117	
Bromofluorobenzene	101	74-121	
1,2-Dichloroethane-d4	101	70-121	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to purging to monitor the purge efficiency. Lower surrogate recoveries may indicate possible matrix effect and/or lower purge efficiency.

Attachment A

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Surrogate Recovery Data

Lab Sample ID: 1464A04 Client Sample No.: SD3704

Surrogate Compound	% Recovery	QC Limits	Notes
Toluene-d8	99	81-117	
Bromofluorobenzene	93	74-121	
1,2-Dichloroethane-d4	99	70-121	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to purging to monitor the purge efficiency. Lower surrogate recoveries may indicate possible matrix effect and/or lower purge efficiency.

Attachment A

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Surrogate Recovery Data

Lab Sample ID: 1464A05 Client Sample No.: S01T01

Surrogate Compound	% Recovery	QC Limits	Notes
Toluene-d8	102	81-117	
Bromofluorobenzene	96	74-121	
1,2-Dichloroethane-d4	109	70-121	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to purging to monitor the purge efficiency.
Lower surrogate recoveries may indicate possible matrix effect and/or lower purge efficiency.

Attachment A

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Surrogate Recovery Data

Lab Sample ID: 1464A06 Client Sample No.: S02T01

Surrogate Compound	% Recovery	QC Limits	Notes
Toluene-d8	107	81-117	
Bromofluorobenzene	96	74-121	
1,2-Dichloroethane-d4	101	70-121	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to purging to monitor the purge efficiency. Lower surrogate recoveries may indicate possible matrix effect and/or lower purge efficiency.

Attachment A

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Surrogate Recovery Data

Lab Sample ID: VBLKOB

Client Sample No.: Method Blank

Surrogate Compound	% Recovery	QC Limits	Notes
Toluene-d8	97	81-117	
Bromofluorobenzene	97	74-121	
1,2-Dichloroethane-d4	93	70-121	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to purging to monitor the purge efficiency. Lower surrogate recoveries may indicate possible matrix effect and/or lower purge efficiency.

Attachment A

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile Surrogate Recovery Data

Lab Sample ID: VBLKOA Client Sample No.: Method Blank

Surrogate Compound	% Recovery	QC Limits	Notes
Toluene-d8	97	81-117	
Bromofluorobenzene	103	74-121	
1,2-Dichloroethane-d4	88	70-121	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to purging to monitor the purge efficiency. Lower surrogate recoveries may indicate possible matrix effect and/or lower purge efficiency.

Attachment A

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile QC Spike Data

Client: WTG

Client Sample ID: S02T01

Lab Sample ID: 1464A06

Client Reference No.: MK Ferguson

Method: SW-846, Method 8240

Compound	Matrix Spike % Recovery	Matrix Spike Duplicate % Recovery	% Recovery QC Limits *	Relative Percent Difference RPD
Benzene	115	108	37-151	6.3
Carbon Tetrachloride	126	105	70-140	18.2
Chlorobenzene	107	102	37-160	4.8
Chloroform	110	101	51-138	8.5
1,2-Dichloroethane	118	113	49-155	4.3
1,1-Dichloroethylene	130	106	D-234	20.3
Methyl ethyl ketone	202	189	NA	6.6
Tetrachloroethylene	114	101	64-148	12.1
Trichloroethylene	115	105	71-157	9.1
Vinyl Chloride	92	77	D-251	17.8

* These limits are based upon Table 6, SW-846, Method 8240.

NA = Not Applicable; no limits in Table 6.

EcoTek LSI
EcoTek Laboratory Services Incorporated

HERBICIDE
QC

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464A

LSDG NO.: 1464A01

Sample Receipt Date: July 30, 1991

Method: EPA SW-846 - 8150

Client Sample ID: SD3701

HERBICIDE

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Compound	Spike Added (mg/l)	Sample Concentration (mg/l)	MS Concentration (mg/l)	MS % Recovery
2,4-D	0.0249	<0.020	0.0308	123
SILVEX	0.005	<0.0041	0.0058	116

Compound	Spike Added (mg/l)	MSD Concentration (mg/l)	MSD % Recovery	RPD
2,4-D	0.0249	0.0252	101	20
SILVEX	0.005	0.0067	134	14

QC Limits	
% RPD	% Spike Recovery
*	50 - 150

* = Not established

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464A

Sample Receipt Date: July 30, 1991

Client Reference No.: M.K. Ferguson

ANALYTICAL RESULTS
HERBICIDE SURROGATE RECOVERY

Lab Sample ID	Client Sample ID	2,4,5-T (% Recovery)	QC Limits
1464A-01	SD3701	120	50 - 150
1464A-02	SD3702	83	50 - 150
1464A-03	SD3703	110	50 - 150
1464A-04	SD3704	118	50 - 150
1464A-05	S01T01	675#	50 - 150

See Case Narrative

EcoTek LSI
EcoTek Laboratory Services Incorporated

PESTICIDE QC

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS
TCLP PESTICIDE SURROGATE RECOVERY

Lab Sample ID	Client Sample ID	DBC (% Recovery)	QC Limits
146401	SD3701	107	24 - 150
146402	SD3702	94	24 - 150
146403	SD3703	100	24 - 150
146404	SD3704	106	24 - 150
146405	SO1T01	116	24 - 150
146406	S02T01	121	24 - 150
Blank	N/A	128	24 - 150
Blank Spike	N/A	125	24 - 150
Blank Spike Dup	N/A	128	24 - 150
146401MS	SD3701	120	24 - 150
146401MSD	SD3701	99	24 - 150
146406MS	S02T01	121	24 - 150
146406MSD	S02T01	99	24 - 150

DBC = Dibutylchlorendate

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: SW-846 Method 8080

TCLP PESTICIDES
BLANK SPIKERECOVERY

Compound	Spike Added (mg/kg)	Blank Concentration (mg/kg)	BS Concentration (mg/kg)	BS % Recovery	QC. Limits
Lindane	0.0083	<0.0017	0.0076	91	19-140
Heptachlor	0.0083	<0.0033	0.011	133	34-111
Endrin	0.017	<0.0033	0.015	92	30-147
Methoxychlor	0.083	<0.033	0.10	122	*
Toxaphene	0.83	<0.17	0.784	94	41-126
Chlordane	0.083	<0.067	0.084	101	45-119

* = Not established

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: SW-846 Method 8080

- TCLP PESTICIDES
MATRIX SPIKE RECOVERY

Lab Sample No, : 1464A01

Client Sample ID: SD3701

Compound	Spike Added (mg/kg)	Sample Concentration (mg/kg)	MS Concentration (mg/kg)	MS % Recovery	QC. Limits
Lindane	0.021	<0.0041	0.025	122	19-140
Heptachlor	0.021	<0.0082	0.025	121	34-111
Endrin	0.041	<0.0082	0.049	120	30-147
Methoxychlor	0.21	<0.082	0.21	102	*
Chlordane	0.21	<0.16	0.18	89	45-119
Toxaphene	2.0	<0.041	1.8	86	41-126

* = Not established

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Method: SW-846 Method 8080

TCLP PESTICIDES
MATRIX SPIKE RECOVERY

LSDG No, : 1464A06

Client Sample ID: S02T01

Compound	Spike Added (mg/kg)	Sample Concentration (mg/kg)	MS Concentration (mg/kg)	MS % Recovery	QC. Limits
Lindane	0.010	<0.0020	0.0069	68	19-140
Heptachlor	0.010	<0.0041	0.0060	59	34-111
Endrin	0.020	<0.0041	0.022	107	30-147
Methoxychlor	0.10	<0.041	0.10	97	*
Chlordane	0.10	<0.082	0.18	179**	45-119
Toxaphene	1.0	<0.20	0.91	89	41-126

* = Not established
** = Outside QC limits

EcoTek LSI
EcoTek Laboratory Services Incorporated

September 24, 1991

Mr. Raphael Soto
Waste Technology Group
100 Crescent Centre Parkway
Suite 200
Tucker, GA 30084

Dear Mr. Soto:

Enclosed along with this letter are the total uranium results for the sample(s) received July 30, 1991.

Please contact Craig Johnson at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464A in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Donald L. Dihel
Quality Assurance Manager

Mike Buchanan
Laboratory Manager

Enclosures.
DLD/JMB/cjm

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS
RADIOCHEMISTRY

Lab Sample ID: 146406
Client Sample ID: S02T01

Analysis	Units	Result
Total Uranium		
Uranium	ng/g	5.0E+03
Isotopic Uranium		
U-234	pCi/g	3.7±0.7
U-238	pCi/g	3.6±0.7
Isotopic Thorium		
Th-228	pCi/g	1.5±0.3
Th-230	pCi/g	20±3
Th-232	pCi/g	1.3±0.2
Radium		
Ra-226	pCi/g	*
Ra-228	pCi/g	*

* = Analysis is in progress

EcoTek LSI
EcoTek Laboratory Services Incorporated

5542 International Park Drive, S.E.
Atlanta, Georgia 30316
(404) 244-0827
Fax # (404) 243-5355

October 14, 1991

Mr. Raphael Soto
Waste Technology Group
100 Crescent Centre Parkway
Suite 200
Tucker, GA 30084

Dear Mr. Soto:

Enclosed along with this letter please find the Radium 226/228 (by Gamma) analysis for the sample(s) received July 27, 1991.

Please contact Craig Johnson at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464A in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Donald L. Dihel
Quality Assurance Manager

Mike Buchanan
Laboratory Manager

Enclosures.
DLD/JMB/crb

EcoTek LSI
EcoTek Laboratory Services Incorporated

LSDG 1464

Ra-226/228 by Gamma Spec.

Four samples were analyzed for Radium 226/228 by Gamma Spectroscopy. The samples were dried and loaded into petri dishes (standard counting geometry), and counted for 1000 minutes. The calculated Ra-226 (186Kev) activity was corrected for interference by U-235 (185Kev). The U-235 activity from the 163 Kev energy line was used to calculate to relative interference with the Ra-226 (186 Kev) energy line. The U-235 contribution was subtracted and the Ra-226 activity recalculated. The Ra-228 activity is based upon the Ac-228 Gamma activity.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS
RADIOCHEMISTRY
Radium 226/228 - By Gamma

Lab Sample ID: 1464A01
Client Sample ID: SD3701

Analysis	Units	Result
Radium		
Ra-226	pCi/g	2.6E3±0.3E3
Ra-228	pCi/g	36±5

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS
RADIOCHEMISTRY
Radium 226/228 - By Gamma

Lab Sample ID: 1464A02
Client Sample ID: SD3702

Analysis	Units	Result
Radium		
Ra-226	pCi/g	3.8E3±0.4E3
Ra-228	pCi/g	3.4E+2±0.4E+2

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS
RADIOCHEMISTRY
Radium 226/228 - By Gamma

Lab Sample ID: 1464A03
Client Sample ID: SD3703

Analysis	Units	Result
Radium		
Ra-226	pCi/g	1.4E3±0.1E3
Ra-228	pCi/g	2.3E+2±0.3E+2

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS
RADIOCHEMISTRY
Radium 226/228 - By Gamma

Lab Sample ID: 1464A04
Client Sample ID: SD3704

Analysis	Units	Result
Radium		
Ra-226	pCi/g	81±8
Ra-228	pCi/g	6.9E+2±0.9E+2

Ext. [illegible]

EcoTek LSI
EcoTek Laboratory Services Incorporated

3342 International Park Drive, S.E.
Atlanta, Georgia 30316
(404) 244-0827
Fax # (404) 243-5355

October 29, 1991

Mr. Raphael Soto
Waste Technology Group
100 Crescent Centre Parkway
Suite 200
Tucker, GA 30084

Dear Mr. Soto:

Enclosed along with this letter are the radiochemistry results for sample S01T01 (1464A05) which was received July 30, 1991.

Please contact Craig Johnson at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464A in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Donald L. Dihel

Donald L. Dihel
Quality Assurance Manager

Mike Buchanan
Laboratory Manager

Enclosures.
DLD/JMB/cjm

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS
RADIOCHEMISTRY

Lab Sample ID: 146405
Client Sample ID: S01T01

Analysis	Units	Result
Total Uranium		
Uranium	ng/g	4.90E+03
Isotopic Uranium		
U-234	pCi/g	15±5
U-235	pCi/g	<2.2
U-238	pCi/g	6.8±3.2
Isotopic Thorium		
Th-228	pCi/g	3.1±1.3
Th-230	pCi/g	54±9
Th-232	pCi/g	1.2±0.8
Radium		
Ra-226	pCi/g	65±16
Ra-228	pCi/g	<2.2E+2

EcoTek LSI
EcoTek Laboratory Services Incorporated

3342 International Park Drive, S.E.
Atlanta, Georgia 30316
(404) 244-0827
Fax # (404) 243-5355

Disable
TCLP

September 10, 1991

Mr. Raphael Soto
Waste Technology Group
100 Crescent Centre Parkway
Suite 200
Tucker, GA 30084

Dear Mr. Soto:

Enclosed along with this letter are the results for the sample(s) received July 30, 1991. The metals results will follow as soon as possible.

Please contact Craig Johnson at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464B in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Tara L. Lipis
Donald L. Dihel
Quality Assurance Manager

Mike Buchanan
Laboratory Manager

Enclosures.
DLD/JMB/cjm

EcoTek LSI
EcoTek Laboratory Services Incorporated

ANALYTICAL RESULTS

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: August 27, 1991

LSDG: 1464B

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146401 SD3701
Benzene, mg/L	0.5	< 0.005
Carbon Tetrachloride, mg/L	0.5	< 0.005
Chlorobenzene, mg/L	100.0	< 0.005
Chloroform, mg/L	6.0	< 0.005
1,2-Dichloroethane, mg/L	0.5	< 0.005
1,1-Dichloroethylene, mg/L	0.7	< 0.005
Methyl ethyl ketone, mg/L	200.0	< 0.100
Tetrachloroethylene, mg/L	0.7	< 0.005
Trichloroethylene, mg/L	0.5	< 0.005
Vinyl Chloride, mg/L	0.2	<0.010
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020

EcoTek LSI
EcoTek Laboratory Services Incorporated

HAZARDOUS WASTE CHARACTERISTICS (cont.)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146401 SD3701
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Endrin, mg/L	0.02	<0.00034
Lindane, mg/L	0.4	<0.00017
Methoxychlor, mg/L	10.0	<0.0034
Toxaphene, mg/L	0.5	<0.017
Chlordane, mg/L	0.03	<0.0068
Heptachlor, mg/L	0.008	<0.00034
2,4-D, mg/L	10.0	<0.0080
2,4,5-TP Silvex, mg/L	1.0	<0.0016

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: August 27, 1991

LSDG: 1464B

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146402 SD3702
Benzene, mg/L	0.5	< 0.005
Carbon Tetrachloride, mg/L	0.5	< 0.005
Chlorobenzene, mg/L	100.0	< 0.005
Chloroform, mg/L	6.0	< 0.005
1,2-Dichloroethane, mg/L	0.5	< 0.005
1,1-Dichloroethylene, mg/L	0.7	< 0.005
Methyl ethyl ketone, mg/L	200.0	< 0.100
Tetrachloroethylene, mg/L	0.7	< 0.005
Trichloroethylene, mg/L	0.5	< 0.005
Vinyl Chloride, mg/L	0.2	<0.010
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020

EcoTek LSI
EcoTek Laboratory Services Incorporated

HAZARDOUS WASTE CHARACTERISTICS (cont.)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146402 SD3702
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Endrin, mg/L	0.02	<0.00022
Lindane, mg/L	0.4	<0.00011
Methoxychlor, mg/L	10.0	<0.0022
Toxaphene, mg/L	0.5	<0.011
Chlordane, mg/L	0.03	<0.0044
Heptachlor, mg/L	0.008	<0.00022
2,4-D, mg/L	10.0	<0.0063
2,4,5-TP Silvex, mg/L	1.0	<0.0013

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: August 27, 1991

LSDG: 1464B

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146403 SD3703
Benzene, mg/L	0.5	< 0.005
Carbon Tetrachloride, mg/L	0.5	< 0.005
Chlorobenzene, mg/L	100.0	< 0.005
Chloroform, mg/L	6.0	< 0.005
1,2-Dichloroethane, mg/L	0.5	< 0.005
1,1-Dichloroethylene, mg/L	0.7	< 0.005
Methyl ethyl ketone, mg/L	200.0	< 0.100
Tetrachloroethylene, mg/L	0.7	< 0.005
Trichloroethylene, mg/L	0.5	< 0.005
Vinyl Chloride, mg/L	0.2	<0.010
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020

EcoTek LSI
EcoTek Laboratory Services Incorporated

HAZARDOUS WASTE CHARACTERISTICS (cont.)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146403 SD3703
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Endrin, mg/L	0.02	<0.00022
Lindane, mg/L	0.4	<0.00011
Methoxychlor, mg/L	10.0	<0.0022
Toxaphene, mg/L	0.5	<0.011
Chlordane, mg/L	0.03	<0.0044
Heptachlor, mg/L	0.008	<0.00022
2,4-D, mg/L	10.0	<0.0071
2,4,5-TP Silvex, mg/L	1.0	<0.0014

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: August 27, 1991

LSDG: 1464B

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146404 SD3704
Benzene, mg/L	0.5	< 0.005
Carbon Tetrachloride, mg/L	0.5	< 0.005
Chlorobenzene, mg/L	100.0	< 0.005
Chloroform, mg/L	6.0	< 0.005
1,2-Dichloroethane, mg/L	0.5	< 0.005
1,1-Dichloroethylene, mg/L	0.7	< 0.005
Methyl ethyl ketone, mg/L	200.0	< 0.100
Tetrachloroethylene, mg/L	0.7	< 0.005
Trichloroethylene, mg/L	0.5	< 0.005
Vinyl Chloride, mg/L	0.2	<0.010
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1.4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020

EcoTek LSI
EcoTek Laboratory Services Incorporated

HAZARDOUS WASTE CHARACTERISTICS (cont.)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146404 SD3704
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Endrin, mg/L	0.02	<0.00018
Lindane, mg/L	0.4	<0.000091
Methoxychlor, mg/L	10.0	<0.0018
Toxaphene, mg/L	0.5	<0.0091
Chlordane, mg/L	0.03	<0.0036
Heptachlor, mg/L	0.008	<0.00018
2,4-D, mg/L	10.0	<0.0128
2,4,5-TP Silvex, mg/L	1.0	<0.0026

EcoTek LSI
EcoTek Laboratory Services Incorporated

NARRATIVES

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR TCLP VOLATILE ANALYSIS USING SW-846 METHOD 8240

Client: WTG

LSDG: 1464B

Sample(s): SD3701, SD3702, SD3703, SD3704

* All volatile organics were analyzed by GC/MS on one or more of the instruments listed below.

  Hewlett-Packard MSD---Inst. ID. 7002 Finnigan Mat 4023---Inst. ID. 4000
  Hewlett-Packard MSD---Inst. ID. 7003 Finnigan OWA ---Inst. ID. 10501

* Chromatography was performed on a 2.4m x 2.0mm ID glass column packed with 1% SP 1000 Carbopack B and/or a 75m x 0.53mm DB-624 megabore column. Samples were purged via Tekmar LSC-2/ALS and/or OI 4460A/OIC MPM-16 onto traps composed of silica gel/charcoal/Tenax. Operating temperatures are 220°C, 250°C, 280°C respectively for the injector, jet separator, source/interface.

* Sample purge size was 5 ml for the ZHE extract unless noted otherwise.

* The reports of the target TCLP compounds identified and quantified in the samples are contained in the following sections of the data package. Also included are the appropriate calibration and quality control data where applicable. Data was obtained from HP RTE-A series computer with Aquarius software and/or Nova 4C computer with Finnigan Incos software.

* The following exceptions and/or considerations should be noted for the sample group contained within.

  - A blank was analyzed with the sample group and found to be free of the TCLP target compounds.

EcoTek LSI
EcoTek Laboratory Services Incorporated

METHOD SUMMARY FOR SW846 - 8080

Samples are analyzed according to SW846 method 8080 which is suitable for detecting ppb (parts per billion) levels of chlorinated pesticides and polychlorinated biphenyls. A gas chromatograph equipped with an ECD (electron capture detector) is used to analyze samples. Tentative identification of compounds is supported by at least one other qualitative analysis (either GC/EC or GC/MS when the concentration of the analytes permit). Quantitation of sample concentrations is performed using a five level calibration. All appropriate quality control samples are analyzed with the sample extracts.

The following observations were made during the sample analyses:

- The samples were analyzed for TCLP compounds only as reflected by the report forms.
- For some compounds, a four point calibration curve was used to calculate %RSD instead of a five point curve. This did not affect the detection limit of any of the compounds. The compound Methoxychlor had an %RSD of greater than 20%; therefore, as per the method protocol, a linear regression curve was constructed with a resulting correlation coefficient of 0.9999.
- Several compounds in the MS (matrix spike) sample were outside QC limits for the recovery of these compounds; however, neither of these compounds were found in the samples above the detection limits. The recovery of the compounds was high (greater than the upper limit); therefore, we would expect the sample results to be biased high.

EcoTek LSI
EcoTek Laboratory Services Incorporated

METHOD SUMMARY FOR SW846 - 8150

Samples are analyzed according to SW846 method 8150 which is suitable for detecting ppb (parts per billion) levels of chlorinated herbicides. Acid herbicides are extracted and esterified; the extracts are then analyzed using a gas chromatograph equipped with an ECD (electron capture detector). Standards are prepared from the methyl esters of the compounds of interest at five concentrations. Quantitation of the samples includes a correction for the difference in the molecular weight of the methyl ester versus the acid herbicide. Tentative identification of compounds is supported by at least one other qualitative analysis, and all appropriate quality control samples are analyzed with the sample extracts.

- The samples were analyzed for TCLP compounds only as indicated by the result forms.
- All initial and continuing standards were within acceptable QC criteria as were surrogate recoveries. Matrix spike recoveries were within the limits set by the laboratory (50-150%)*.

* No method limits are specified by EPA SW846 Method 8150.

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR SEMI-VOLATILE ANALYSIS FOR TCLP COMPOUNDS USING EPA SW-846 METHOD 8270 PROTOCOLS

CLIENT: **W.T.G.**

LSDG: **1464B**

SAMPLE(S): **SD3701 7/8/91 Raffinate Pit # 1**
SD3702 7/8/91 Raffinate Pit # 2
SD3703 7/11/91 Raffinate Pit # 3
SD3704 7/11/91 Raffinate Pit # 4

* All semi-volatile organics were analyzed by GC/MS on either or both of the instruments listed below.

Hewlett-Packard MSD	Inst. ID. 7001
Hewlett-Packard MSD	Inst. ID. 7004

* Chromatography was performed on a 30m J & W fused silica DB-5 capillary column.

* Extraction was performed on an appropriate volume of the leachate solution to yield a detection level that is significantly below EPA's maximum allowable concentration limits for TCLP compounds unless stated otherwise.

* Final extract concentration was performed by the nitrogen blowdown technique to a final volume of 2.0 ml unless stated otherwise.

* The reports of the semi-volatile TCLP compounds identified and quantified in the samples are contained in the following sections of the data package.

* Detection limits or practical quantitation limits (PQL's) are expressed in the final quantitation report as the minimum value that can be detected with confidence and are documented as < a stated value. Detection limits are factored for initial sample volume and final extract volume along with any necessary dilution.

* Two method blanks and one leachate blank were extracted and analyzed with the sample batch and was found to be free of the TCLP compounds.

* The following exceptions and/or considerations should be noted for the sample group contained within.

  - Samples SD3702 and SD3704 had acid surrogate below acceptable QC limits on the initial extraction and analysis. Both of these samples were reextracted and reanalyzed where upon the acid surrogates remained below acceptable QC limits thus indicating a probable matrix effect.

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR SEMI-VOLATILE ANALYSIS FOR TCLP COMPOUNDS USING EPA SW-846 METHOD 8270 PROTOCOLS

CLIENT: W.T.G.

LSDG: 1464B

SAMPLE(S): SD3701 7/8/91 Raffinate Pit # 1
SD3702 7/8/91 Raffinate Pit # 2
SD3703 7/11/91 Raffinate Pit # 3
SD3704 7/11/91 Raffinate Pit # 4

- Note: Matrix spike and matrix spike duplicate recoveries for hexachloroethane were below the lower limit established in SW-846 Method 8270, however, they were within the internally established limits of 14-82 % recovery. The MSD recoveries for 2,4,6-Trichlorophenol and 2,4-Dinitrotoluene were slightly below those listed in Table 6 of SW-846 Method 8270 but were within internally established QC limits of 17-95 % recovery and 8-98 % recovery respectively.

EcoTek LSI
EcoTek Laboratory Services Incorporated

VOLATILE
QC

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464B

Client Reference No.: M.K. Ferguson

Lab Sample ID: 1464B01

Client Sample ID: SD3701

Volatile Surrogate Recovery Data

TCLP - Volatile

Surrogate Compound	Percent Recovery	QC Limits
Toluene-d8	102	88-110
Bromofluorobenzene	107	86-115
1,2-Dichloroethane-d4	109	76-114

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to purging to monitor the purge efficiency. Lower surrogate recoveries may indicate possible matrix effect and/or lower purge efficiency.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464B

Lab Sample ID: 1464B02

Sample Receipt Date: July 30, 1991

Client Reference No.: M.K. Ferguson

Client Sample ID: SD3702

Volatile Surrogate Recovery Data

TCLP - Volatile

Surrogate Compound	Percent Recovery	QC Limits
Toluene-d8	103	88-110
Bromofluorobenzene	110	86-115
1,2-Dichloroethane-d4	112	76-114

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to purging to monitor the purge efficiency. Lower surrogate recoveries may indicate possible matrix effect and/or lower purge efficiency.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464B

Client Reference No.: M.K. Ferguson

Lab Sample ID: 1464B03

Client Sample ID: SD3703

Volatile Surrogate Recovery Data

TCLP - Volatile

Surrogate Compound	Percent Recovery	QC Limits
Toluene-d8	98	88-110
Bromofluorobenzene	95	86-115
1,2-Dichloroethane-d4	111	76-114

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to purging to monitor the purge efficiency. Lower surrogate recoveries may indicate possible matrix effect and/or lower purge efficiency.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464B

Client Reference No.: M.K. Ferguson

Lab Sample ID: 1464B04

Client Sample ID: SD3704

Volatile Surrogate Recovery Data

TCLP - Volatile

Surrogate Compound	Percent Recovery	QC Limits
Toluene-d8	99	88-110
Bromofluorobenzene	110	86-115
1,2-Dichloroethane-d4	111	76-114

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to purging to monitor the purge efficiency. Lower surrogate recoveries may indicate possible matrix effect and/or lower purge efficiency.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464B

Client Reference No.: M.K. Ferguson

Lab Sample ID: Q1182702

Client Sample ID: ZHE Blank

Volatile Surrogate Recovery Data

TCLP - Volatile

Surrogate Compound	Percent Recovery	QC Limits
Toluene-d8	102	88-110
Bromofluorobenzene	114	86-115
1,2-Dichloroethane-d4	112	76-114

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to purging to monitor the purge efficiency. Lower surrogate recoveries may indicate possible matrix effect and/or lower purge efficiency.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464B

Client Reference No.: M.K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

TCLP - Volatile

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	Q1182702 ZHE Blank
Benzene, mg/L	0.5	< 0.005
Carbon Tetrachloride, mg/L	0.5	< 0.005
Chlorobenzene, mg/L	100.0	< 0.005
Chloroform, mg/L	6.0	< 0.005
1,2-Dichloroethane, mg/L	0.5	< 0.005
1,1-Dichloroethylene, mg/L	0.7	< 0.005
Methyl ethyl ketone, mg/L	200.0	< 0.100
Tetrachloroethylene, mg/L	0.7	< 0.005
Trichloroethylene, mg/L	0.5	< 0.005
Vinyl Chloride, mg/L	0.2	<0.010

EcoTek LSI
EcoTek Laboratory Services Incorporated

Volatile QC Spike Data

Client: WTG

Client Sample ID: SD3701

Lab Sample ID: 1464B01

Client Reference No.: M.K. Ferguson

Compound	Matrix Spike % Recovery	Matrix Spike Duplicate % Recovery	% Recovery QC Limits *	Relative Percent Difference RPD
Benzene	102	105	37-151	3.2
Carbon Tetrachloride	102	107	70-140	5.1
Chlorobenzene	101	105	37-160	3.3
Chloroform	105	109	51-138	4.5
1,2-Dichloroethane	112	117	49-155	4.6
1,1-Dichloroethylene	91	95	D-234	4.7
Methyl ethyl ketone	157	149	NA	4.7
Tetrachloroethylene	94	98	64-148	4.1
Trichloroethylene	96	98	71-157	2.3
Vinyl Chloride	80	83	D-251	4.2

* These limits are based upon Table 6, SW-846, Method 8240.

NA = Not Applicable; no limits in Table 6.

EcoTek LSI
EcoTek Laboratory Services Incorporated

SEMI-VOLATILE QC

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Analysis Date: September 3,1991

LSDG: 1464B

Client Reference No.: M.K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

TCLP - Semi-Volatile

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	Q1183006 Method Blank
o-Cresol, mg/L	200.0	<0.02
m-Cresol, mg/L	200.0	<0.02
p-Cresol, mg/L	200.0	<0.02
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	<0.02
2,4-Dinitrotoluene, mg/L	0.13	<0.02
Hexachlorobenzene, mg/L	0.13	<0.02
Hexachlorobutadiene, mg/L	0.5	<0.02
Hexachloroethane, mg/L	3.0	<0.02
Nitrobenzene, mg/L	2.0	<0.02
Pentachlorophenol, mg/L	100.0	<0.10
Pyridine, mg/L	5.0	<0.02
2,4,5-Trichlorophenol, mg/L	400.0	<0.10
2,4,6-Trichlorophenol, mg/L	2.0	<0.02

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Analysis Date: September 3,1991

LSDG: 1464B

Client Reference No.: M.K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

TCLP - Semi-Volatile

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	Q1182701T Leachate Blank
o-Cresol, mg/L	200.0	<0.02
m-Cresol, mg/L	200.0	<0.02
p-Cresol, mg/L	200.0	<0.02
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	<0.02
2,4-Dinitrotoluene, mg/L	0.13	<0.02
Hexachlorobenzene, mg/L	0.13	<0.02
Hexachlorobutadiene, mg/L	0.5	<0.02
Hexachloroethane, mg/L	3.0	<0.02
Nitrobenzene, mg/L	2.0	<0.02
Pentachlorophenol, mg/L	100.0	<0.10
Pyridine, mg/L	5.0	<0.02
2,4,5-Trichlorophenol, mg/L	400.0	<0.10
2,4,6-Trichlorophenol, mg/L	2.0	<0.02

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Client: WTG
Client Ref. No.: M.K. Ferguson
Lab Sample ID: 1464B01
Client Sample No.: SD3701

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	59	35-114	
2-Fluorobiphenyl	56	43-116	
Terphenyl-d14	87	33-141	
Phenol-d6	36	10-94	
2-Fluorophenol	38	21-100	
2,4,6-Tribromophenol	49	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

Attachment A

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Client: WTG
Client Ref. No.: M.K. Ferguson
Lab Sample ID: 1464B02
Client Sample No.: SD3702

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	56	35-114	
2-Fluorobiphenyl	58	43-116	
Terphenyl-d14	76	33-141	
Phenol-d6	0	10-94	***
2-Fluorophenol	0	21-100	***
2,4,6-Tribromophenol	4	10-123	***

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Client: WTG
Client Ref. No.: M.K. Ferguson
Lab Sample ID: 1464B03
Client Sample No.: SD3703

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	59	35-114	
2-Fluorobiphenyl	60	43-116	
Terphenyl-d14	74	33-141	
Phenol-d6	25	10-94	
2-Fluorophenol	29	21-100	
2,4,6-Tribromophenol	43	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

Attachment A

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Client: WTG
Client Ref. No.: M.K. Ferguson
Lab Sample ID: 1464B04
Client Sample No.: SD3704

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	54	35-114	
2-Fluorobiphenyl	54	43-116	
Terphenyl-d14	61	33-141	
Phenol-d6	9	10-94	***
2-Fluorophenol	10	21-100	***
2,4,6-Tribromophenol	31	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

Attachment A

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile QC Spike Data

Client: WTG
Lab Sample ID: 1464B01
Method: 8270

Client Sample ID: SD3701
Client Reference No.: M.K.Ferguson

Compound	Matrix Spike % Recovery	Matrix Spike Duplicate % Recovery	% Recovery QC Limits *	Relative Percent Difference RPD
Total Cresol*, mg/L	42.8	31.8	NA	29.4
1,4-Dichlorobenzene, mg/L	45.8	42.2	37-106	8.1
2,4-Dinitrotoluene, mg/L	49.3	44.2	48-127	10.9
Hexachlorobenzene, mg/L	67.3	59.9	8-142	11.6
Hexachlorobutadiene, mg/L	43.7	41.8	38-102	4.4
Hexachloroethane, mg/L	44.3	40.2	55-100	9.6
Nitrobenzene, mg/L	60.0	56.0	54-158	6.9
Pentachlorophenol, mg/L	65.2	51.2	38-152	24.0
Pyridine, mg/L	42.0	40.7	NA	3.3
2,4,5-Trichlorophenol, mg/L	36.0	28.9	NA	21.7
2,4,6-Trichlorophenol, mg/L	60.4	48.7	52-129	21.5

* Based upon SW-846, Method 8270, Table 6
D = Detected
NA= Not available

EcoTek LSI
EcoTek Laboratory Services Incorporated

PESTICIDE QC

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464B

Method: SW-846 Method 8080

TCLP PESTICIDES
MATRIX SPIKE RECOVERY

LSDG No: 1464B01

Client Sample ID: SD3701

Compound	Spike Added (mg/kg)	Sample Concentration (mg/kg)	MS Concentration (mg/kg)	MS % Recovery	QC. Limits
Lindane	0.0020	<0.00017	0.0020	99	19-140
Heptachlor	0.0020	<0.00034	0.0027	136#	34-111
Endrin	0.0040	<0.00034	0.0047	118	30-147
Methoxychlor	0.020	<0.0034	0.025	124	*
Chlordane	0.020	<0.0068	0.0042	212#	45-119
Toxaphene	0.13	<0.017	0.14	107	41-126

* = Not established
# = Outside QC Limits

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: July 30, 1991

LSDG: 1464B

Method: SW-846 Method 8080

TCLP PESTICIDES
BLANK SPIKE RECOVERY

Compound	Spike Added (mg/kg)	Blank Concentration (mg/kg)	BS Concentration (mg/kg)	BS % Recovery	QC. Limits
Lindane	0.0083	<0.0017	0.0076	91	19-140
Heptachlor	0.0083	<0.0033	0.011	133#	34-111
Endrin	0.017	<0.0033	0.015	92	30-147
Methoxychlor	0.083	<0.033	10	122	*
Toxaphene	0.83	<0.17	0.784	94	41-126
Chlordane	0.083	<0.067	0.084	101	45-119

* = Not established
# = Outside QC Limits

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464B

Sample Receipt Date: July 30, 1991

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS
TCLP PESTICIDE SURROGATE RECOVERY

Lab Sample ID	Client Sample ID	DBC (% Recovery)	QC Limits
146401	SD3701	132	24 - 150
146402	SD3702	129	24 - 150
146403	SD3703	127	24 - 150
146404	SD3704	139	24 - 150
Blank	N/A	122	24 - 150
Leaching Blank	N/A	134	24 - 150
Blank Spike	N/A	126	24 - 150
Blank Spike Dup	N/A	131	24 - 150
146401 MS	SD3701	118	24 - 150
146401MSD	SD3701	128	24 - 150

DBC = Dibutylchlorendate

EcoTek LSI
EcoTek Laboratory Services Incorporated

HERBICIDE QC

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: August 27, 1991

LSDG: 1464B

Method: EPA SW-846 - 8150

Lab Sample ID: 1464B01

Client Sample ID: SD3701

HERBICIDE

MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

Compound	Spike Added (mg/l)	Sample Concentration (mg/l)	MS Concentration (mg/l)	MS % Recovery
2,4-D	0.031	<0.013	0.039	126
SILVEX	0.0063	<0.0025	0.0046	74

Compound	Spike Added (mg/l)	MSD Concentration (mg/l)	MSD % Recovery	RPD
2.4-D	0.038	0.02	52	83
SILVEX	0.0077	0.0045	58	24

QC Limits	
% RPD	% Spike Recovery
*	50 - 150

* = Not established

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

LSDG: 1464B

Sample Receipt Date: August 27, 1991

Client Reference No.: M.K. Ferguson

ANALYTICAL RESULTS
HERBICIDE SURROGATE RECOVERY

Lab Sample ID	Client Sample ID	2,4,5-T (% Recovery)	QC Limits
1464B-01	SD3701	100	50 - 150
1464B-02	SD3702	110	50 - 150
1464B-03	SD3703	60	50 - 150
1464B-04	SD3704	115	50 - 150

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: August 27, 1991

LSDG: 1464B

Method: EPA SW-846 - 8150

HERBICIDE

BLANK SPIKE/BLANK SPIKE DUPLICATE RECOVERY

Compound	Spike Added (mg/l)	Blank Concentration (mg/l)	BS Concentration (mg/l)	BS % Recovery
2,4-D	0.0025	<0.0063	0.0041	165
SILVEX	0.0005	<0.0013	0.0007	132

Compound	Spike Added (mg/l)	BSD Concentration (mg/l)	BSD % Recovery	RPD
2,4-D	0.0025	0.0043	172	4
SILVEX	0.0005	0.0008	158	19

QC Limits	
% RPD	% Spike Recovery
*	50 -150

* = Not established

EcoTek LSI
EcoTek Laboratory Services Incorporated

3542 International Park Drive, S.E.
Atlanta, Georgia 30316
(404) 244-0827
Fax # (404) 243-5355

September 11, 1991

Mr. Raphael Soto
Waste Technology Group
100 Crescent Centre Parkway
Suite 200
Tucker, GA 30084

Dear Mr. Soto:

Enclosed along with this letter please find the completed analytical results, which includes the metals analysis, for the sample(s) received July 27, 1991.

Please contact Craig Johnson at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464B in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Donald L. Dihel
Quality Assurance Manager

Mike Buchanan
Laboratory Manager

Enclosures.
DLD/JMB/crb

EcoTek LSI
EcoTek Laboratory Services Incorporated

ANALYTICAL RESULTS

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: August 27, 1991

LSDG: 1464B

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146401 SD3701
Benzene, mg/L	0.5	< 0.005
Carbon Tetrachloride, mg/L	0.5	< 0.005
Chlorobenzene, mg/L	100.0	< 0.005
Chloroform, mg/L	6.0	< 0.005
1,2-Dichloroethane, mg/L	0.5	< 0.005
1,1-Dichloroethylene, mg/L	0.7	< 0.005
Methyl ethyl ketone, mg/L	200.0	< 0.100
Tetrachloroethylene, mg/L	0.7	< 0.005
Trichloroethylene, mg/L	0.5	< 0.005
Vinyl Chloride, mg/L	0.2	<0.010
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020

EcoTek LSI
EcoTek Laboratory Services Incorporated

HAZARDOUS WASTE CHARACTERISTICS (cont.)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146401 SD3701
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Endrin, mg/L	0.02	<0.00034
Lindane, mg/L	0.4	<0.00017
Methoxychlor, mg/L	10.0	<0.0034
Toxaphene, mg/L	0.5	<0.017
Chlordane, mg/L	0.03	<0.0068
Heptachlor, mg/L	0.008	<0.00034
2,4-D, mg/L	10.0	<0.0080
2,4,5-TP Silvex, mg/L	1.0	<0.0016
Arsenic, mg/L As	5.0	8.84
Barium, mg/L Ba	100.0	0.373
Cadmium, mg/L Cd	1.0	0.127
Chromium, mg/L Cr	5.0	<0.003
Lead, mg/L Pb	5.0	<0.022
Mercury, mg/L Hg	0.2	<0.0002
Selenium, mg/L Se	1.0	0.055
Silver, mg/L Ag	5.0	0.028

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: August 27, 1991

LSDG: 1464B

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146402 SD3702
Benzene, mg/L	0.5	< 0.005
Carbon Tetrachloride, mg/L	0.5	< 0.005
Chlorobenzene, mg/L	100.0	< 0.005
Chloroform, mg/L	6.0	< 0.005
1,2-Dichloroethane, mg/L	0.5	< 0.005
1,1-Dichloroethylene, mg/L	0.7	< 0.005
Methyl ethyl ketone, mg/L	200.0	< 0.100
Tetrachloroethylene, mg/L	0.7	< 0.005
Trichloroethylene, mg/L	0.5	< 0.005
Vinyl Chloride, mg/L	0.2	<0.010
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020

EcoTek LSI
EcoTek Laboratory Services Incorporated

HAZARDOUS WASTE CHARACTERISTICS (cont.)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146402 SD3702
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Endrin, mg/L	0.02	<0.00022
Lindane, mg/L	0.4	<0.00011
Methoxychlor, mg/L	10.0	<0.0022
Toxaphene, mg/L	0.5	<0.011
Chlordane, mg/L	0.03	<0.0044
Heptachlor, mg/L	0.008	<0.00022
2,4-D, mg/L	10.0	<0.0063
2,4,5-TP Silvex, mg/L	1.0	<0.0013
Arsenic, mg/L As	5.0	1.68
Barium, mg/L Ba	100.0	0.241
Cadmium, mg/L Cd	1.0	0.035
Chromium, mg/L Cr	5.0	<0.003
Lead, mg/L Pb	5.0	<0.022
Mercury, mg/L Hg	0.2	<0.0002
Selenium, mg/L Se	1.0	0.072
Silver, mg/L Ag	5.0	<0.004

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: August 27, 1991

LSDG: 1464B

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146403 SD3703
Benzene, mg/L	0.5	< 0.005
Carbon Tetrachloride, mg/L	0.5	< 0.005
Chlorobenzene, mg/L	100.0	< 0.005
Chloroform, mg/L	6.0	< 0.005
1,2-Dichloroethane, mg/L	0.5	< 0.005
1,1-Dichloroethylene, mg/L	0.7	< 0.005
Methyl ethyl ketone, mg/L	200.0	< 0.100
Tetrachloroethylene, mg/L	0.7	< 0.005
Trichloroethylene, mg/L	0.5	< 0.005
Vinyl Chloride, mg/L	0.2	<0.010
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020

EcoTek LSI
EcoTek Laboratory Services Incorporated

HAZARDOUS WASTE CHARACTERISTICS (cont.)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146403 SD3703
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Endrin, mg/L	0.02	<0.00022
Lindane, mg/L	0.4	<0.00011
Methoxychlor, mg/L	10.0	<0.0022
Toxaphene, mg/L	0.5	<0.011
Chlordane, mg/L	0.03	<0.0044
Heptachlor, mg/L	0.008	<0.00022
2,4-D, mg/L	10.0	<0.0071
2,4,5-TP Silvex, mg/L	1.0	<0.0014
Arsenic, mg/L As	5.0	6.57
Barium, mg/L Ba	100.0	0.371
Cadmium, mg/L Cd	1.0	3.27
Chromium, mg/L Cr	5.0	<0.003
Lead, mg/L Pb	5.0	0.055
Mercury, mg/L Hg	0.2	0.0006
Selenium, mg/L Se	1.0	0.219
Silver, mg/L Ag	5.0	<0.004

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: August 27, 1991

LSDG: 1464B

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146404 SD3704
Benzene, mg/L	0.5	< 0.005
Carbon Tetrachloride, mg/L	0.5	< 0.005
Chlorobenzene, mg/L	100.0	< 0.005
Chloroform, mg/L	6.0	< 0.005
1,2-Dichloroethane, mg/L	0.5	< 0.005
1,1-Dichloroethylene, mg/L	0.7	< 0.005
Methyl ethyl ketone, mg/L	200.0	< 0.100
Tetrachloroethylene, mg/L	0.7	< 0.005
Trichloroethylene, mg/L	0.5	< 0.005
Vinyl Chloride, mg/L	0.2	<0.010
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020

EcoTek LSI
EcoTek Laboratory Services Incorporated

HAZARDOUS WASTE CHARACTERISTICS (cont.)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	146404 SD3704
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Endrin, mg/L	0.02	<0.00018
Lindane, mg/L	0.4	<0.000091
Methoxychlor, mg/L	10.0	<0.0018
Toxaphene, mg/L	0.5	<0.0091
Chlordane, mg/L	0.03	<0.0036
Heptachlor, mg/L	0.008	<0.00018
2,4-D, mg/L	10.0	<0.0128
2,4,5-TP Silvex, mg/L	1.0	<0.0026
Arsenic, mg/L As	5.0	0.178
Barium, mg/L Ba	100.0	120
Cadmium, mg/L Cd	1.0	0.178
Chromium, mg/L Cr	5.0	<0.003
Lead, mg/L Pb	5.0	0.692
Mercury, mg/L Hg	0.2	<0.0002
Selenium, mg/L Se	1.0	<0.023
Silver, mg/L Ag	5.0	<0.004

EcoTek LSI
EcoTek Laboratory Services Incorporated

NARRATIVES

EcoTek LSI
EcoTek Laboratory Services Incorporated

INORGANICS

Metals analysis was performed on LSDG 1464B using SW-846, Method 6010 ICP-AES and 7470 CVHG yielding the results listed on the attached data table. All method blank, duplicate sample and matrix spike recovery QC data was within acceptable control limits with the following exceptions.

1) Matrix spike recovery was within acceptable limits for all elements except for the following: Arsenic, Barium Lead and Silver. Matrix blank spike sample was within acceptable control limits for all elements.

2) The metals spiked sample was within acceptable control limits for all elements except Lead. A post-digestion spike for Lead was within acceptable control limits.

3) Matrix spike recovery for mercury was below acceptable control limits. Prepared spike gave a recovery of 98.5%.

EcoTek LSI
EcoTek Laboratory Services Incorporated

METALS
QC

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: August 27, 1991

LSDG: 1464B

Client Reference No.: M.K. Ferguson

Duplicate Analytical Results

TCLP - Metals

Lab Sample ID	Client Sample ID	Analyte	Date of Analysis	Sample Result (mg/l)	Duplicate Result (mg/l)	%RPD
1464B01	SD3701	Arsenic	9/10/91	8.84	8.72	1.4
1464B01	SD3701	Barium	9/10/91	0.373	0.370	0.7
1464B01	SD3701	Cadmium	9/10/91	0.127	0.126	1.2
1464B01	SD3701	Chromium	9/10/91	<0.003	<0.003	0.0
1464B01	SD3701	Lead	9/10/91	<0.022	<0.022	0.0
1464B02	SD3702	Mercury	9/5/91	<0.0002	<0.0002	0.0
1464B01	SD3701	Selenium	9/10/91	0.0547	0.035	47.8
1464B01	SD3701	Silver	9/10/91	<0.022	<0.022	0.0

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: August 27, 1991

LSDG: 1464B

Client Reference No.: M. K. Ferguson

BLANK ANALYTICAL RESULTS

TCLP - Metals

Preparation Blank	Concentration (mg/l)
Arsenic	<0.014
Barium	<0.002
Cadmium	<0.001
Chromium	<0.003
Lead	<0.022
Mercury	<0.0002
Selenium	<0.023
Silver	<0.004

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

LSDG: 1464B

Sample Receipt Date: August 27, 1991

Client Reference No.: M.K. Ferguson

LCS/LCSD ANALYTICAL RESULTS

TCLP - Metals

Spike Compound	Spike Amount (mg/l)	Spiked Result (LCS) (mg/l)	% Spike Recovery (LCS)	Duplicate Spike Result (LCSD) (mg/l)	% Spike Recovery (LCSD)	%RPD
Arsenic	1.0	0.946	94.6	0.953	95.3	0.7
Barium	1.0	0.968	96.8	0.951	95.1	1.8
Cadmium	1.0	0.936	93.6	0.929	92.9	0.8
Chromium	1.0	0.941	94.1	0.933	93.3	0.9
Lead	1.0	0.918	91.8	0.920	93.0	0.2
Mercury	0.004	0.00443	110.8	0.0045	112.5	1.6
Selenium	1.0	0.939	93.9	0.946	94.6	0.7
Silver	1.0	0.966	96.6	0.954	95.4	1.2

LCS = Laboratory Control Standard (water matrix spike)
LCSD = Laboratory Control Standard Duplicate (water matrix spike duplicate)

EcoTek LSI
EcoTek Laboratory Services Incorporated

016

Client: Waste Technology Group

LSDG: 1464B

Sample Receipt Date: August 27, 1991

Client Reference No.: M.K. Ferguson

MS/MSD ANALYTICAL RESULTS

TCLP - Metals

Lab Sample ID: 1464B01
Client Sample ID: SD3701

Spike Compound	Spike Amount (mg/l)	Unspiked Sample Result (mg/l)	Spiked Sample Result (MS) (mg/l)	% Spike Recovery (MS)	Duplicate Spike Sample Result (MSD) (mg/l)	% Spike Recovery (MSD)	%RPD
Arsenic	1	8.84	9.41	57.2	9.50	65.9	1.0
Barium	1	0.373	0.687	31.4	0.609	23.6	12
Cadmium	1	0.127	0.926	79.9	0.920	79.3	0.1
Chromium	1	<0.003	0.75	75.0	0.741	74.1	1.2
Lead	1	<0.022	0.585	58.5	0.54	54.0	8
Mercury	0.001	<0.0002	0.0002	20	0.0002	20	0
Selenium	1	0.0547	0.896	84.2	0.869	81.5	3.1
Silver	1	<0.022	0.475	47.5	0.449	44.9	5.6

EcoTek LSI
EcoTek Laboratory Services Incorporated

3342 International Park Drive, SE
Atlanta, Georgia 30316
(404) 244-0827
Fax (404) 243-5555

November 8, 1991

Mr. Rafael Soto
Waste Technology Group
100 Crescent Centre Parkway
Suite 200
Tucker, GA 30084

Dear Mr. Soto:

The attached LSDG 1464E includes data for sample analyses that were not previously requested under completed milestone LSDG's (B&C). Samples 1464B-05 and 1464B-06 are baseline TCLP analysis for quarry soil and surface soil samples, respectively. Sample 1464C-05 is the solidified quarry soil sample after 14 days stabilization. For laboratory administrative purposes, the samples being analyzed have been assigned the following designators:

Client Sample No.:	Lab Sample ID:
1464B-05	1464E-01
1464B-06	1464E-02
1464C-05	1464E-03

Both sample ID's are included on each page of the report.

Please contact Skip Cloninger at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464E in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Donald L. Dihel
Quality Assurance Manager

Mike Buchanan
Laboratory Manager

Enclosures.
DLD/JMB/cjm

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR SEMI-VOLATILE ANALYSIS FOR TCLP COMPOUNDS USING EPA SW-846 METHOD 8270 PROTOCOLS

CLIENT: WTG

LSDG: 1464E

SAMPLE(S): 1464B-05, 1464B-06, 1464C-05

* All semi-volatile organics were analyzed by GC/MS on one or more of the instruments listed below.

  Hewlett-Packard MSD Inst. ID. 7001
  Hewlett-Packard MSD Inst. ID. 7004

* Chromatography was performed on a 30m J & W fused silica DB-5 capillary column.

* Extraction was performed on an appropriate volume of the leachate solution to yield a detection level that is significantly below EPA's maximum allowable concentration limits for TCLP compounds unless stated otherwise.

* Final extract concentration was performed by the nitrogen blowdown technique to a final volume of 1.0 ml unless stated otherwise.

* The reports of the semi-volatile TCLP compounds identified and quantified in the samples are contained in the following sections of the data package.

* Detection limits or practical quantitation limits (PQL's) are expressed in the final quantitation report as the minimum value that can be detected with confidence and are documented as < a stated value. Detection limits are factored for initial sample volume and final extract volume along with any necessary dilution.

* A leachate blank was extracted and analyzed with the sample batch and was found to be free of the TCLP compounds.

* The following exceptions and/or considerations should be noted for the sample group contained within.

  - Samples 1464B-05 and ORNL-QS-1 were reanalyzed using a 20x and 5x dilution respectively in order to get the Nitrobenzene concentration within the calibration range (for sample 1464B-05; 2,4-Dinitrotoluene was initially over the calibration range in addition to Nitrobenzene). For this reason, the PQL has been elevated by the respective factor for the analyte(s).

CASE NARRATIVE FOR SEMI-VOLATILE ANALYSIS FOR TCLP COMPOUNDS USING EPA SW-846 METHOD 8270 PROTOCOLS

CLIENT: WTG **LSDG:** 1464E

- The 2-Fluorophenol surrogate recovery was below the QC limit for sample 1464B-05. Upon reanalysis, the surrogate was diluted out. All other surrogate recoveries were within acceptable QC limits.

- Levels of 1,3,5-Trinitrobenzene (TNB) and 2,4,6-Trinitrotoluene (TNT) and 1,3-Dinitrobenzene (DNB) were detected in sample 1464B-05; sample ORNL-QS-1 showed levels of TNB and DNB as well. Other non-TCLP target analytes were detected in the samples but not reported.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results
40 CFR 261, June 29,1990

Client:	WTG	Client Sample No.:	1464B-05
Lab Sample ID:	1464E01	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	October 21, 1991
Dilution Factor:	1	Date Extracted:	October 25, 1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.010	7.5	
95487	2-Methylphenol	BQL	0.010	200	
108394	3-Methylphenol	BQL	0.010	200	
106445	4-Methylphenol	BQL	0.010	200	
NA	Total-Methylphenol	BQL	0.010	200	
67721	Hexachloroethane	BQL	0.010	3.0	
98953	Nitrobenzene	3.010	0.194	2.0	
87683	Hexachlorobutadiene	BQL	0.010	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.010	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.049	400	
121142	2,4-Dinitrotoluene	0.953	0.194	0.13	
118741	Hexachlorobenzene	BQL	0.010	0.13	
87865	Pentachlorophenol	BQL	0.049	100	
110861	Pyridine	BQL	0.010	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: 1464E01 Client Sample No.: 1464B-05

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	55	35-114	
2-Fluorobiphenyl	78	43-116	
Terphenyl-d14	79	33-141	
Phenol-d6	17	10- 94	
2-Fluorophenol	13	21-100	***
2,4,6-Tribromophenol	50	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results

40 CFR 261, June 29,1990

Client:	WTG	Client Sample No.:	1464B-06
Lab Sample ID:	1464E02	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	October 21, 1991
Dilution Factor:	1	Date Extracted:	October 25, 1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.010	7.5	
95487	2-Methylphenol	BQL	0.010	200	
108394	3-Methylphenol	BQL	0.010	200	
106445	4-Methylphenol	BQL	0.010	200	
NA	Total-Methylphenol	BQL	0.010	200	
67721	Hexachloroethane	BQL	0.010	3.0	
98953	Nitrobenzene	0.003	0.010	2.0	*
87683	Hexachlorobutadiene	BQL	0.010	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.010	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.049	400	
121142	2,4-Dinitrotoluene	BQL	0.010	0.13	
118741	Hexachlorobenzene	BQL	0.010	0.13	
87865	Pentachlorophenol	BQL	0.049	100	
110861	Pyridine	BQL	0.010	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: 1464E02 Client Sample No.: 1464B-06

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	53	35-114	
2-Fluorobiphenyl	58	43-116	
Terphenyl-d14	71	33-141	
Phenol-d6	36	10- 94	
2-Fluorophenol	35	21-100	
2,4,6-Tribromophenol	44	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

Brian Carlson

EcoTek LSI
EcoTek Laboratory Services Incorporated

3342 International Park Drive, S.E.
Atlanta, Georgia 30316
(404) 244-0827
Fax # (404) 243-5355

FAX [illegible]

Rott 14 day
TCLP

September 23, 1991

Mr. Raphael Soto
[illegible] Technology Group
[illegible]00 Crescent Centre Parkway
[illegible]00
[illegible]ucker, GA 30084

Dear Mr. Soto:

Enclosed along with this letter are the results for the sample(s) received September 9, 1991.

Please contact Craig Johnson at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464C in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Tara L. Pipes
Donald L. Dihel
Quality Assurance Manager

[illegible] Buchanan
Laboratory Manager

Enclosures.
[illegible]/MB/cjm

EcoTek LSI
EcoTek Laboratory Services Incorporated

ANALYTICAL RESULTS

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464C

Sample Receipt Date: September 9, 1991

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	1464C01 ORNL RP# 1-1
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Arsenic, mg/L As	5.0	<0.014
Barium, mg/L Ba	100.0	1.10
Cadmium, mg/L Cd	1.0	<0.001
Chromium, mg/L Cr	5.0	0.136
Lead, mg/L Pb	5.0	<0.022
Mercury, mg/L Hg	0.2	<0.0002
Selenium, mg/L Se	1.0	0.0263
Silver, mg/L Ag	5.0	<0.004

* = If the o-, m-, p-Cresol isomers cannot be differentiated, the Total Cresol is used.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Analyst: WTG

LSDG: 1464C

Sample Receipt Date: September 9, 1991

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	1464C02 ORNL RP# 2-1
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Arsenic, mg/L As	5.0	0.0163
Barium, mg/L Ba	100.0	1.87
Cadmium, mg/L Cd	1.0	<0.001
Chromium, mg/L Cr	5.0	0.00590
Lead, mg/L Pb	5.0	<0.022
Mercury, mg/L Hg	0.2	0.0002
Selenium, mg/L Se	1.0	0.0259
Silver, mg/L Ag	5.0	<0.004

* = If the o-, m-, p-Cresol isomers cannot be differentiated, the Total Cresol is used.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: September 9, 1991

LSDG: 1464C

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	1464C03 ORNL RP# 3-1
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Arsenic, mg/L As	5.0	0.0366
Barium, mg/L Ba	100.0	3.37
Cadmium, mg/L Cd	1.0	<1.0
Chromium, mg/L Cr	5.0	0.0241
Lead, mg/L Pb	5.0	<0.022
Mercury, mg/L Hg	0.2	<0.0002
Selenium, mg/L Se	1.0	0.0259
Silver, mg/L Ag	5.0	<0.004

* = If the o-, m-, p-Cresol isomers cannot be differentiated, the Total Cresol is used.

EcoTek LSI
EcoTek Laboratory Services Incorporated

WTG

LSDG. 1464C

Sample Receipt Date: September 9, 1991

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	1464C04 ORNL RP# 4-1
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Arsenic, mg/L As	5.0	0.0321
Barium, mg/L Ba	100.0	12.0
Cadmium, mg/L Cd	1.0	0.0018
Chromium, mg/L Cr	5.0	0.0098
Lead, mg/L Pb	5.0	<0.022
Mercury, mg/L Hg	0.2	<0.0002
Selenium, mg/L Se	1.0	0.0255
Silver, mg/L Ag	5.0	<0.004

* = If the o-, m-, p-Cresol isomers cannot be differentiated, the Total Cresol is used.

EcoTek LSI
EcoTek Laboratory Services Incorporated

NARRATIVES

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR SEMI-VOLATILE ANALYSIS FOR TCLP COMPOUNDS USING EPA SW-846 METHOD 8270 PROTOCOLS

CLIENT: W.T.G.

LSDG: 1464C

SAMPLE(S): ORNL RP #1-1, #2-1, #3-1, #4-1,

* All semi-volatile organics were analyzed by GC/MS on the instrument listed below.

  Hewlett-Packard MSD Inst. ID. 7001

* Chromatography was performed on a 30m J & W fused silica DB-5 capillary column.

* Extraction was performed on an appropriate volume of the leachate solution to yield a detection level that is significantly below EPA's maximum allowable concentration limits for TCLP compounds unless stated otherwise.

* Final extract concentration was performed by the nitrogen blowdown technique to a final volume of 1.0 or 2.0 ml to achieve the necessary PQL unless stated otherwise.

The reports of the semi-volatile TCLP compounds identified and quantified in the samples are contained in the following sections of the data package.

* Detection limits or practical quantitation limits (PQL's) are expressed in the final quantitation report as the minimum value that can be detected with confidence and are documented as < a stated value. Detection limits are factored for initial sample volume and final extract volume along with any necessary dilution.

One method blank and one leachate blank were extracted and analyzed with the sample batch and was found to be free of the TCLP compounds.

The following exceptions and/or considerations should be noted for the sample group contained within.

Matrix spike (MS) and matrix spike duplicate (MSD) recoveries for Hexachloroethane and 2,4-Dinitrotoluene were below the lower limit established in SW-846 Method 8270; however, they were within the internally established limits of 14-82 % and 6-99 % recovery respectively. The MS and MSD recoveries for Pentachlorophenol were outside the SW-846 limits. The MS recovery was within the laboratory limits of 3-63 % recovery; however, the MSD recovery was still outside acceptable limits. 2,4,6-Trichlorophenol MSD recovery was below those listed in Table 6 of SW-846 Method 8270 but were within internally established QC limits of 23-76 % recovery.

EcoTek LSI
EcoTek Laboratory Services Incorporated

INORGANICS

Metals analysis was performed on LSDG 1464C using SW-846, Method 6010 ICP-AES and 7470 CVAA yielding the results listed on the attached data table. All method blank duplicate sample and matrix spike recovery QC data was within acceptable control limits with the following exceptions.

1) The LCSMS and LCSMSD exhibited low recoveries for Silver, at 47.3% and 46.5% respectively. However, the spike sample recovery for Silver was within acceptable limits.

2) The recovery for Mercury in the extraction spike and extraction spike duplicate failed low at 22.9% and 23.1% respectively.* The recovery for Barium in the extraction spike, 1464C01MS, failed low, at 72.0%. The extraction spike duplicate, 1464C01MSD, was within acceptable control limits.

* THE SAMPLE SPIKE FOR MERCURY HOWEVER, WAS WITHIN ACCEPTABLE CONTROL LIMITS.

EcoTek LSI
EcoTek Laboratory Services Incorporated

SEMI-VOLATILE QC

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464C

SEMIVOLATILE SURROGATE PERCENT RECOVERY

Lab Sample ID Client Sample ID ----------		1464C01 ORNL RP#1-1	1464C02 ORNL RP#2-1	1464C03 ORNL RP#3-1	1464C04 ORNL RP#4-1	1464C01MS ORNL RP#1-1	1464C01MSD ORNL RP#1-1	Q1190916T TCLP Blank
Surrogate	QC Limits							
Nitrobenzene-d5	35-114	66	87	78	87	64	54	59
2-Fluorobiphenyl	43-116	53	77	71	83	54	54	55
Terphenyl-d14	33-141	66	89	81	87	63	58	61
Phenol-d6	10- 94	39	45	37	45	37	32	31
2-Fluorophenol	21-100	44	59	51	61	43	39	38
2,4,6-Tribromophenol	10-123	48	81	66	81	55	39	44

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency.
Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile QC Spike Data

Client: WTG
Lab Sample ID: 1464C01
Method: TCLP, 8270

Client Sample ID: ORNL RP #1-1
Client Reference No.: M.K. Ferguson

Compound	Matrix Spike % Recovery	Matrix Spike Duplicate % Recovery	% Recovery QC Lmits *	Relative Percent Difference RPD
[illegible] mg/L	53.7	44.3	NA	19.3
1,4-Dichlorobenzene, mg/L	53.2	46.2	37-106	14.1
2,4-Dinitrotoluene, mg/L	47.2	40.0	48-127	16.3
Hexachlorobenzene, mg/L	70.0	62.7	8-142	10.9
Hexachlorobutadiene, mg/L	45.9	39.1	38-102	16.1
Hexachloroethane, mg/L	43.5	37.2	55-100	15.6
Nitrobenzene, mg/L	64.8	55.0	54-158	16.2
[illegible] phenol, mg/L	29.3	0.0	38-152	200.0
[illegible] mg/L	37.0	42.5	NA	13.9
[illegible] phenol, mg/L	47.2	51.7	NA	9.1
2,4,6-Trichlorophenol, mg/L	55.8	48.9	52-129	13.1

Based upon SW-846, Method 8270, Table 6
D = Detected
NA = Not available

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: September 9, 1991

LSDG: 1464C

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	Q1190916T TCLP Blank
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4 Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020

* = If the o-, m-, p-Cresol isomers cannot be differentiated, the Total Cresol is used.

EcoTek LSI
EcoTek Laboratory Services Incorporated

METALS
QC

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: September 9, 1991

LSDG: 1464C

Client Reference No.: M.K. Ferguson

SAMPLE ~~MATRIX~~ SPIKE ANALYTICAL RESULTS

TCLP - Metals

Lab Sample ID: 1464C01 (1464C02 for Mercury)
Client Sample ID: ORNL RP# 1-1 (ORNL RP# 2-1 for Mercury)

Spike Compound	Spike Amount (mg/l)	Unspiked Sample Result (mg/l)	Spiked Sample Result (S) (mg/l)	% Spike Recovery (MS)
Arsenic	1	<0.014	0.937	93.7
Barium	1	1.10	1.91	81.0
Cadmium	1	<0.001	0.912	91.2
Chromium	1	0.136	0.994	85.8
Lead	1	<0.022	0.874	87.4
Mercury	0.001	<0.0002	1.05	105
Selenium	1	0.0263	0.987	96.1
Silver	1	<0.004	0.862	86.2

Client: Waste Technology Group

Sample Receipt Date: September 9, 1991

LSDG: 1464C

Client Reference No.: M.K. Ferguson

EXTRACTION SPIKE
MS/MSD ANALYTICAL RESULTS

TCLP - Metals

Lab Sample ID: 1464C01
Client Sample ID: ORNL RP #1-1

Spike Compound	Spike Amount (mg/l)	Unspiked Sample Result (mg/l)	Spiked Sample Result (MS) (mg/l)	% Spike Recovery (MS)	Duplicate Spike Sample Result (MSD) (mg/l)	% Spike Recovery (MSD)	%RPD
Arsenic	1	<0.014	0.863	86.3	0.894	89.4	3.5
Barium	1	1.10	1.82	72.0	1.85	75.0	1.6
Cadmium	1	<0.001	0.839	83.9	0.868	86.8	3.4
Chromium	1	0.136	0.918	78.2	0.948	81.2	3.2
Lead	1	<0.022	0.818	81.8	0.869	86.9	6.0
Mercury	0.001	<0.0002	0.000229	28.7	0.000231	23.1	0.9
Selenium	1	0.0263	0.900	87.37	0.953	92.7	5.7
Silver	1	<0.004	0.778	77.8	0.810	81.000	4.0

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: September 9, 1991

LSDG: 1464C

Client Reference No.: M. K. Ferguson

BLANK ANALYTICAL RESULTS

TCLP - Metals

Preparation Blank	Concentration (mg/l)
Arsenic	<0.014
Barium	<0.002
Cadmium	0.00120
Chromium	<0.003
Lead	<0.022
Mercury	<0.0002
Selenium	<0.023
Silver	<0.004

Ecotek LS
Ecotek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: September 9, 1991

LSDG: 1464C

Client Reference No.: M.K. Ferguson

LCS/LCSD ANALYTICAL RESULTS

TCLP - Metals

Spike Compound	Spike Amount (mg/l)	Spiked Result (LCS) (mg/l)	% Spike Recovery (LCS)	Duplicate Spike Result (LCSD) (mg/l)	% Spike Recovery (LCSD)	%RPD
Arsenic	1.0	0.988	98.8	0.999	99.9	1.1
Barium	1.0	1	100	1	100	0.0
Cadmium	1.0	0.994	99.4	0.995	99.5	0.1
Chromium	1.0	0.988	98.8	0.986	98.6	0.2
Lead	1.0	0.978	97.8	0.974	97.4	0.4
Mercury	0.004	4.50	112.5	NA	NA	NR
Selenium	1.0	0.983	98.3	0.962	96.2	2.2
Silver	1.0	0.473	47.3	0.465	46.5	1.7

LCS = Laboratory Control Standard (water matrix spike)
LCSD = Laboratory Control Standard Duplicate (water matrix spike duplicate)
NA = Not Analyzed
NR = Not Reported

9Y

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: September 9, 1991

LSDG: 1464C

Client Reference No.: M.K. Ferguson

Duplicate Analytical Results
TCLP - Metals

Lab Sample ID	Client Sample ID	Analyte	Date of Analysis	Sample Result (mg/l)	Duplicate Result (mg/l)	%RPD
1464C01	ORNL RP#1-1	Arsenic	9/20/91	<0.014	<0.014	0
1464C01	ORNL RP#1-1	Barium	9/20/91	1.10	1.09	0.9
1464C01	ORNL RP#1-1	Cadmium	9/20/91	<0.001	<0.001	0
1464C01	ORNL RP#1-1	Chromium	9/20/91	0.136	0.136	0
1464C01	ORNL RP#1-1	Lead	9/20/91	<0.022	<0.022	0
1464C01	ORNL RP#1-1	Mercury	9/18/91	<0.0002	<0.0002	0
1464C01	ORNL RP#1-1	Selenium	9/20/91	0.0263	<0.023	NC
1464C01	ORNL RP#1-1	Silver	9/20/91	<0.004	<0.004	0

NC = Not Calculable

EcoTek LSI
EcoTek Laboratory Services Incorporated

3342 International Park Drive, S.E.
Atlanta, Georgia 30316
(404) 244-0827
Fax (404) 243-5355

November 8, 1991

Mr. Rafael Soto
Waste Technology Group
100 Crescent Centre Parkway
Suite 200
Tucker, GA 30084

Dear Mr. Soto:

The attached LSDG 1464E includes data for sample analyses that were not previously requested under completed milestone LSDG's (B&C). Samples 1464B-05 and 1464B-06 are baseline TCLP analysis for quarry soil and surface soil samples, respectively. Sample 1464C-05 is the solidified quarry soil sample after 14 days stabilization. For laboratory administrative purposes, the samples being analyzed have been assigned the following designators:

Client Sample No.:	Lab Sample ID:
1464B-05	1464E-01
1464B-06	1464E-02
1464C-05	1464E-03

Both sample ID's are included on each page of the report.

Please contact Skip Cloninger at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464E in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Donald L. Dihel
Quality Assurance Manager

Mike Buchanan
Laboratory Manager

Enclosures.
DLD/JMB/cjm

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR SEMI-VOLATILE ANALYSIS FOR TCLP COMPOUNDS USING EPA SW-846 METHOD 8270 PROTOCOLS

CLIENT: WTG

LSDG: 1464E

SAMPLE(S): 1464B-05, 1464B-06, 1464C-05

* All semi-volatile organics were analyzed by GC/MS on one or more of the instruments listed below.

Hewlett-Packard MSD	Inst. ID. 7001
Hewlett-Packard MSD	Inst. ID. 7004

* Chromatography was performed on a 30m J & W fused silica DB-5 capillary column.

* Extraction was performed on an appropriate volume of the leachate solution to yield a detection level that is significantly below EPA's maximum allowable concentration limits for TCLP compounds unless stated otherwise.

* Final extract concentration was performed by the nitrogen blowdown technique to a final volume of 1.0 ml unless stated otherwise.

* The reports of the semi-volatile TCLP compounds identified and quantified in the samples are contained in the following sections of the data package.

* Detection limits or practical quantitation limits (PQL's) are expressed in the final quantitation report as the minimum value that can be detected with confidence and are documented as < a stated value. Detection limits are factored for initial sample volume and final extract volume along with any necessary dilution.

* A leachate blank was extracted and analyzed with the sample batch and was found to be free of the TCLP compounds.

* The following exceptions and/or considerations should be noted for the sample group contained within.

  - Samples 1464B-05 and ORNL-QS-1 were reanalyzed using a 20x and 5x dilution respectively in order to get the Nitrobenzene concentration within the calibration range (for sample 1464B-05; 2,4-Dinitrotoluene was initially over the calibration range in addition to Nitrobenzene). For this reason, the PQL has been elevated by the respective factor for the analyte(s).

CASE NARRATIVE FOR SEMI-VOLATILE ANALYSIS FOR TCLP COMPOUNDS USING EPA SW-846 METHOD 8270 PROTOCOLS

CLIENT: WTG **LSDG:** 1464E

- The 2-Fluorophenol surrogate recovery was below the QC limit for sample 1464B-05. Upon reanalysis, the surrogate was diluted out. All other surrogate recoveries were within acceptable QC limits.

- Levels of 1,3,5-Trinitrobenzene (TNB) and 2,4,6-Trinitrotoluene (TNT) and 1,3-Dinitrobenzene (DNB) were detected in sample 1464B-05; sample ORNL-QS-1 showed levels of TNB and DNB as well. Other non-TCLP target analytes were detected in the samples but not reported.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results
40 CFR 261, June 29,1990

Client:	WTG	Client Sample No.:	1464C-05
Lab Sample ID:	1464E03	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	October 21, 1991
Dilution Factor:	1	Date Extracted:	October 25, 1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.009	7.5	
95487	2-Methylphenol	BQL	0.009	200	
108394	3-Methylphenol	BQL	0.009	200	
106445	4-Methylphenol	BQL	0.009	200	
NA	Total-Methylphenol	BQL	0.009	200	
67721	Hexachloroethane	BQL	0.009	3.0	
98953	Nitrobenzene	0.701	0.047	2.0	
87683	Hexachlorobutadiene	BQL	0.009	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.009	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.047	400	
121142	2,4-Dinitrotoluene	0.015	0.009	0.13	
118741	Hexachlorobenzene	BQL	0.009	0.13	
87865	Pentachlorophenol	BQL	0.047	100	
110861	Pyridine	BQL	0.009	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: 1464E03 Client Sample No.: 1464C-05

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	61	35-114	
2-Fluorobiphenyl	66	43-116	
Terphenyl-d14	74	33-141	
Phenol-d6	23	10- 94	
2-Fluorophenol	28	21-100	
2,4,6-Tribromophenol	68	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR METALS ANALYSIS
SW-846 Method 6010

Client: Waste Technology Group

Project/Case: M. K. Ferguson

LSDG: 1464E

Sample(s): 1464E01, 1464E02, 1464E03

- **Analysis** - Metals analysis was performed for three TCLP extracts for TCLP metals. Samples were prepared and analyzed according to SW-846. The following methods and instruments were used for analysis:

Analysis	Instrument	Method
ICP	TJA ICAP 61E	6010
CVAA	TJA CVAA S-12	7470

- **QA/QC** - All appropriate QC data was within acceptable control limits with the following exception:

  - The extracted spike and spike duplicate exceeded the acceptable control limits by nearly 300%. Because the digested spike sample was within acceptable control limits, an extraction spike error is suspected. As a corrective action, a new extraction spike solution has been prepared.

- **General Discussion** - None to report.

- **Analytical Difficulties** - None to report.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: october 21, 1991

LSDG: 1464E

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

TCLP - Metals

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration	1464E01 1464B-05 (mg/L)
Arsenic, mg/L As	5.0	<0.013
Barium, mg/L Ba	100.0	1.39
Cadmium, mg/L Cd	1.0	<0.002
Chromium, mg/L Cr	5.0	0.012
Lead, mg/L Pb	5.0	0.035
Mercury, mg/L Hg	0.2	<0.0002
Selenium, mg/L Se	1.0	<0.019
Silver, mg/L Ag	5.0	<0.004

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: october 21, 1991

LSDG: 1464E

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

TCLP - Metals

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration	1464E02 1464B-06 (mg/L)
Arsenic, mg/L As	5.0	<0.013
Barium, mg/L Ba	100.0	3.8
Cadmium, mg/L Cd	1.0	0.004
Chromium, mg/L Cr	5.0	0.012
Lead, mg/L Pb	5.0	<0.018
Mercury, mg/L Hg	0.2	<0.0002
Selenium, mg/L Se	1.0	<0.019
Silver, mg/L Ag	5.0	<0.004

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: october 21, 1991

LSDG: 1464E

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

TCLP - Metals

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration	1464E03 1464C-05 (mg/L)
Arsenic, mg/L As	5.0	<0.013
Barium, mg/L Ba	100.0	2.22
Cadmium, mg/L Cd	1.0	<0.002
Chromium, mg/L Cr	5.0	0.066
Lead, mg/L Pb	5.0	<0.018
Mercury, mg/L Hg	0.2	<0.0002
Selenium, mg/L Se	1.0	<0.019
Silver, mg/L Ag	5.0	<0.004

EcoTek LSI
EcoTek Laboratory Services Incorporated

RAFF
28 day
TCLP

October 11, 1991

Mr. Raphael Soto
Waste Technology Group
100 Crescent Centre Parkway
Suite 200
Tucker, GA 30084

Dear Mr. Soto:

Enclosed along with this letter are the results for the sample(s) received September 23, 1991.

Please contact Craig Johnson at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464D in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Donald L. Dihel

Donald L. Dihel
Quality Assurance Manager

Mike Buchanan
Laboratory Manager

Enclosures.
DLD/JMB/cjm

EcoTek LSI
EcoTek Laboratory Services Incorporated

ANALYTICAL RESULTS

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: September 23, 1991

LSDG: 1464D

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	1464D01 ORNL RP# 1-2
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Arsenic, mg/L As	5.0	0.027
Barium, mg/L Ba	100.0	0.911
Cadmium, mg/L Cd	1.0	0.003
Chromium, mg/L Cr	5.0	0.126
Lead, mg/L Pb	5.0	<0.018
Mercury, mg/L Hg	0.2	<0.0002
Selenium, mg/L Se	1.0	0.026
Silver, mg/L Ag	5.0	<0.004

* = If the o-, m-, p-Cresol isomers cannot be differentiated, the Total Cresol is used.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: September 23, 1991

LSDG: 1464D

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	1464D02 ORNL RP# 2-2
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Arsenic, mg/L As	5.0	0.036
Barium, mg/L Ba	100.0	0.583
Cadmium, mg/L Cd	1.0	<0.002
Chromium, mg/L Cr	5.0	0.006
Lead, mg/L Pb	5.0	<0.018
Mercury, mg/L Hg	0.2	<0.0002
Selenium, mg/L Se	1.0	0.043
Silver, mg/L Ag	5.0	<0.004

* = If the o-, m-, p-Cresol isomers cannot be differentiated, the Total Cresol is used.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: September 23, 1991

LSDG: 1464D

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	1464D03 ORNL RP# 3-2
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Arsenic, mg/L As	5.0	0.218
Barium, mg/L Ba	100.0	1.44
Cadmium, mg/L Cd	1.0	0.003
Chromium, mg/L Cr	5.0	0.03
Lead, mg/L Pb	5.0	<0.018
Mercury, mg/L Hg	0.2	<0.0002
Selenium, mg/L Se	1.0	0.061
Silver, mg/L Ag	5.0	0.011

* = If the o-, m-, p-Cresol isomers cannot be differentiated, the Total Cresol is used.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: September 23, 1991

LSDG: 1464D

Client Reference No.: M. K. Ferguson

HAZARDOUS WASTE CHARACTERISTICS

(40 CFR 261, June 29, 1990)

Lab Sample ID Client Sample ID ---------- TCLP Toxicity	Maximum Concentration Level	1464D04 ORNL RP# 4-2
o-Cresol, mg/L	200.0	< 0.020
m-Cresol, mg/L	200.0	< 0.020
p-Cresol, mg/L	200.0	< 0.020
Total Cresol*, mg/L	200.0	NA
1,4-Dichlorobenzene, mg/L	7.5	< 0.020
2,4-Dinitrotoluene, mg/L	0.13	< 0.020
Hexachlorobenzene, mg/L	0.13	< 0.020
Hexachlorobutadiene, mg/L	0.5	< 0.020
Hexachloroethane, mg/L	3.0	< 0.020
Nitrobenzene, mg/L	2.0	< 0.020
Pentachlorophenol, mg/L	100.0	< 0.100
Pyridine, mg/L	5.0	< 0.020
2,4,5-Trichlorophenol, mg/L	400.0	< 0.100
2,4,6-Trichlorophenol, mg/L	2.0	< 0.020
Arsenic, mg/L As	5.0	0.017
Barium, mg/L Ba	100.0	10.9
Cadmium, mg/L Cd	1.0	<0.002
Chromium, mg/L Cr	5.0	0.013
Lead, mg/L Pb	5.0	<0.018
Mercury, mg/L Hg	0.2	<0.0002
Selenium, mg/L Se	1.0	0.034
Silver, mg/L Ag	5.0	0.012

* = If the o-, m-, p-Cresol isomers cannot be differentiated, the Total Cresol is used.

EcoTek LSI
EcoTek Laboratory Services Incorporated

NARRATIVES

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR SEMI-VOLATILE ANALYSIS FOR TCLP COMPOUNDS USING EPA SW-846 METHOD 8270 PROTOCOLS

CLIENT: W.T.G.

LSDG: 1464D

SAMPLE(S): ORNL RP #1-2, #2-2, #3-2, #4-2

* All semi-volatile organics were analyzed by GC/MS on the instrument listed below.

  Hewlett-Packard MSD Inst. ID. 7001

* Chromatography was performed on a 30m J & W fused silica DB-5 capillary column.

* Extraction was performed on an appropriate volume of the leachate solution to yield a detection level that is significantly below EPA's maximum allowable concentration limits for TCLP compounds unless stated otherwise.

* Final extract concentration was performed by the nitrogen blowdown technique to a final volume of 1.0 or 2.0 ml to achieve the necessary PQL unless stated otherwise.

* The reports of the semi-volatile TCLP compounds identified and quantified in the samples are contained in the following sections of the data package.

* Detection limits or practical quantitation limits (PQL's) are expressed in the final quantitation report as the minimum value that can be detected with confidence and are documented as < a stated value. Detection limits are factored for initial sample volume and final extract volume along with any necessary dilution.

* One method blank and one leachate blank were extracted and analyzed with the sample batch and was found to be free of the TCLP compounds.

* The following exceptions and/or considerations should be noted for the sample group contained within.

  - Matrix spike duplicate (MSD) recovery for Hexachloroethane was below the lower limit established in SW-846 Method 8270; however, it was within the internally established limits of 14-82 % recovery.

  - The Nitrobenzene-d5 surrogate recovery was high for samples ORNL RP #2-2 and #3-2 due to an interferring (non-target) peak which coeluted with the surrogate. All other recoveries were within acceptable QC limits.

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR METALS ANALYSIS

Client: Waste Technology Group

Project/Case: M K Ferguson

LSDG: 1464D

Sample(s): 1464D01,1464D02,1464D03,1464D04

- **Analysis** - Metals analysis was performed four TCLP leachate samples for TCLP metals. Samples were prepared and analyzed according to SW-846 Method 6010 and Method 7470. The following methods and instruments were used for analysis:

Analysis	Instrument	Method
ICP	TJA ICAP 61E	6010
GFAA for Mercury	TJA SH - 12 CVAA	7470

- **QA/QC** - All appropriate QC data was within acceptable control limits with the following exceptions:

  - The extraction spike sample recoveries for Mercury failed low at 33.6% and 31.6%. The digestion spike sample recovery for Mercury was 85.6%. The duplicate spike recovery failed high at 149.0%. The LCSMS recovery for Mercury failed at 126.0% while the LCSMSD was within acceptable limits. The failed spike recoveries for Mercury in the digested spikes and LCSMS's is believed to be caused by a slight contamination. However, because all of the sample concentrations for Mercury were below the instrument detection limit, a possible contamination was not investigated.

  - The LCS recovery for Silver failed low at 72.2%. The failed LCS recovery is most likely due to precipitation of Silver Chloride with the addition of Hydrochloric acid. Because the spikes, and the LCSMSD recoveries were within acceptable limits, the problem appears to be isolated to the LCSMS, and does not affect the samples.

- **General Discussion** - Mercury analysis was preformed on a Thermo Jarrel Ash SH-12 using Smith Hieftje background correction. All other elements were analyzed for using a Thermo Jarrel Ash ICAP 61E.

- **Analytical Difficulties** - None to report.

EcoTek LSI
EcoTek Laboratory Services Incorporated

SEMI-VOLATILE QC

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464D

SEMIVOLATILE SURROGATE PERCENT RECOVERY

Lab Sample ID Client Sample ID ----------		1464D01 ORNL RP#1-2	1464D02 ORNL RP#2-2	1464D03 ORNL RP#3-2	1464D04 ORNL RP#4-2	1464D01MS ORNL RP#1-2	1464D01MSD ORNL RP#1-2	Q1192401T TCLP Blank
Surrogate	QC Limits							
Nitrobenzene-d5	35-114	104	144	143	88	99	85	78
2-Fluorobiphenyl	43-116	57	73	65	78	63	52	71
Terphenyl-d14	33-141	61	80	74	86	66	54	73
Phenol-d6	10- 94	51	43	39	45	52	38	59
2-Fluorophenol	21-100	60	63	54	65	63	48	75
2,4,6-Tribromophenol	10-123	73	107	90	105	76	62	89

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency.
Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

METALS
QC

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: September 23, 1991

LSDG: 1464D

Date of Analysis: October 9, 1991

Method: SW-846 Method 6010

Duplicate Analytical Results

Lab Sample ID	Client Sample ID	Analyte	Date of Analysis	Sample Result (mg/l)	Duplicate Result (mg/l)	%RPD
146401	ORNL RP #1-2	Arsenic	10/9/91	0.027	0.017	NA*
146401	ORNL RP #1-2	Barium	10/9/91	0.911	0.899	1.3
146401	ORNL RP #1-2	Cadmium	10/9/91	0.003	<0.002	NA*
146401	ORNL RP #1-2	Chromium	10/9/91	0.126	0.122	2.6
146401	ORNL RP #1-2	Lead	10/9/91	<0.018	<0.018	NA*
146402	ORNL RP #4-2	Mercury	10/7/91	<0.0002	<0.0002	NA*
146401	ORNL RP #1-2	Selenium	10/9/91	0.026	0.023	10.9
146401	ORNL RP #1-2	Silver	10/9/91	<0.004	<0.004	NA*

* = % RPD not applicable when less than 10 times IDL.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: September 23, 1991

LSDG: 1464D

Date of Analysis: October 9, 1991

Method: SW-846 Method 6010

LCS/LCSD ANALYTICAL RESULTS

Spike Compound	Spike Amount (mg/l)	Spiked Result (mg/l) (LCS)	% Spike Recovery (LCS)	Duplicate Spike Result (mg/l) (LCSD)	% Spike Recovery (LCSD)	%RPD
Arsenic	1	0.891	89.1	0.938	93.8	5.1
Barium	1	0.914	91.4	0.951	95.1	4
Cadmium	1	0.882	88.2	0.925	92.5	4.7
Chromium	1	0.905	90.5	0.951	95.1	4
Lead	1	0.904	90.4	0.943	94.3	4.2
Selenium	1	0.866	86.6	0.914	91.4	5.4
Silver	1	0.901	90.1	0.722	72.2	22.1
Mercury	0.001	0.0013	126	0.0011	113	10.9

LCS = Laboratory Control Standard (water matrix spike)
LCSD = Laboratory Control Standard Duplicate (water matrix spike duplicate)
% Recovery Acceptable Limit - 80 - 120
% RPD Acceptable Limit - <20

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: September 23, 1991

LSDG: 1464D

Date of Analysis: October 9, 1991

Method: SW-846 Method 6010

Method Blank Analytical Results

Method Blank - Analyte	Concentration (mg/l)	Detection Limit (mg/l)
Arsenic	<0.013	0.013
Barium	<0.001	0.001
Cadmium	<0.002	0.002
Chromium	0.004	0.003
Lead	<0.018	0.018
Mercury	<0.0002	0.0002
Selenium	<0.018	0.018
Silver	0.008	0.004

EcoTek LSI
Ecotek Laboratory Services Incorporated

Client: Waste Technology Group

Sample Receipt Date: September 23, 1991

LSDG: 1464D

Date of Analysis: October 9, 1991

Method: SW-846 Method 6010

MATRIX SPIKE / MATRIX SPIKE DUPLICATE ANALYTICAL RESULTS

Lab Sample ID:1464D01 (Mercury = 1464D04)
Client Sample ID: ORNL RP #1-2 (Mercury = ORNL RP #4-2)

Spike Compound	Spike Amount (mg/l)	Unspiked Sample Result (mg/l)	Spiked Sample Result (mg/l) (MS)	% Spike Recovery (MS)	Duplicate Spike Sample Result (mg/l) (MSD)	% Spike Recovery (MSD)	%RPD
Arsenic	1	0.027	0.907	87.9	0.865	83.8	4.8
Barium	1	0.911	1.74	82.4	1.65	73.9	5
Cadmium	1	0.003	0.863	86	0.821	81.7	5.1
Chromium	1	0.126	0.948	82.2	0.901	77.5	5.1
Lead	1	<0.018	0.874	87.4	0.822	82.2	6
Selenium	1	0.026	0.962	93.6	0.902	87.6	6.4
Silver	1	<0.004	0.84	84.1	0.794	79.4	5.7
Mercury	0.001	<0.0002	0.0015	149	0.0009	85.6	54

% Recovery Acceptable Limit: 75 - 125

EcoTek LSI
EcoTek Laboratory Services Incorporated

5342 International Park Drive, S.E.
Atlanta, Georgia 30354
(404) 244-0827
Fax # (404) 243-5355

November 19, 1991

Mr. Raphael Soto
Waste Technology Group
100 Crescent Centre Parkway
Suite 200
Tucker, GA 30084

Dear Mr. Soto:

Enclosed along with this letter are the results for the sample(s) received November 4, 1991.

Please contact Craig Johnson at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464F in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Donald L. Dihel
Quality Assurance Manager

Mike Buchanan
Laboratory Manager

Enclosures.
DLD/JMB/cjm

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR SEMI-VOLATILE ANALYSIS FOR TCLP COMPOUNDS USING EPA SW-846 METHOD 8270 PROTOCOLS

CLIENT: WTG

LSDG: 1464F

SAMPLE(S): ORNL-QS-2

* All semi-volatile organics were analyzed by GC/MS on one or more of the instruments listed below.

Hewlett-Packard MSD	Inst. ID. 7001
Hewlett-Packard MSD	Inst. ID. 7004

* Chromatography was performed on a 30m J & W fused silica DB-5 capillary column.

* Extraction was performed on an appropriate volume of the leachate solution to yield a detection level that is significantly below EPA's maximum allowable concentration limits for TCLP compounds unless stated otherwise.

* Final extract concentration was performed by the nitrogen blowdown technique to a final volume of 1.0 ml unless stated otherwise.

* The reports of the semi-volatile TCLP compounds identified and quantified in the samples are contained in the following sections of the data package.

* Detection limits or practical quantitation limits (PQL's) are expressed in the final quantitation report as the minimum value that can be detected with confidence and are documented as < a stated value. Detection limits are factored for initial sample volume and final extract volume along with any necessary dilution.

* A leachate blank was extracted and analyzed with the sample batch and was found to be free of the TCLP compounds.

* The following exceptions and/or considerations should be noted for the sample group contained within.

  - Sample ORNL-QS-2 was reanalyzed using a 10x dilution in order to get the Nitrobenzene concentration within the calibration range. For this reason, the PQL for nitrobenzene has been elevated by a factor of ten. For reporting purposes, both analyses were used in order to achieve the lowest detection limit for all other TCLP analytes.

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR SEMI-VOLATILE ANALYSIS FOR TCLP COMPOUNDS USING EPA SW-846 METHOD 8270 PROTOCOLS

CLIENT: WTG **LSDG:** 1464F

- All surrogate recoveries were within acceptable QC limits.
- All matrix spike recoveries were within acceptable QC limits.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results

40 CFR 261, June 29,1990

Client:	ATG	Client Sample No.:	ORNL-QS-2
Lab Sample ID:	1464F01	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	November 4, 1991
Dilution Factor:	1	Date Extracted:	November 8, 1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.010	7.5	
95487	2-Methylphenol	BQL	0.010	200	
108394	3-Methylphenol	BQL	0.010	200	
106445	4-Methylphenol	BQL	0.010	200	
NA	Total-Methylphenol	BQL	0.010	200	
67721	Hexachloroethane	BQL	0.010	3.0	
98953	Nitrobenzene	0.813	0.100	2.0	
87683	Hexachlorobutadiene	BQL	0.010	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.010	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.049	400	
121142	2,4-Dinitrotoluene	0.017	0.010	0.13	
118741	Hexachlorobenzene	BQL	0.010	0.13	
87865	Pentachlorophenol	BQL	0.049	100	
110861	Pyridine	BQL	0.010	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: Q11B0501 Client Sample No.: Leachate Blank

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	75	35-114	
2-Fluorobiphenyl	78	43-116	
Terphenyl-d14	75	33-141	
Phenol-d6	35	10- 94	
2-Fluorophenol	47	21-100	
2,4,6-Tribromophenol	68	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

TCLP QC DATA

Client: ATG
Lab Sample ID: 1464F01
Method: 8270

Client Sample ID: ORNL-QS-2
Client Reference No.: M.K.Ferguson

Compound	Matrix Spike % Recovery	% Recovery QC Lmits *
Total Cresol*, mg/L	10.8	NA
1,4-Dichlorobenzene, mg/L	92.6	37-106
2,4-Dinitrotoluene, mg/L	108.1	48-127
Hexachlorobenzene, mg/L	66.3	8-142
Hexachlorobutadiene, mg/L	77.4	38-102
Hexachloroethane, mg/L	81.8	55-100
Nitrobenzene, mg/L	156.5	54-158
Pentachlorophenol, mg/L	116.4	38-152
Pyridine, mg/L	45.4	NA
2,4,5-Trichlorophenol, mg/L	94.4	NA
2,4,6-Trichlorophenol, mg/L	97.3	52-129

* Based upon SW-846, Method 8270, Table 6
D = Detected
NA= Not available

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR METALS ANALYSIS
Method SW-846

Client: Waste Technology Group

Project/Case: M. K. Ferguson

LSDG: 1464F

Sample(s): 1464F01

- **Analysis** - Metals analysis was performed for one TCLP extract for TCLP metals. Samples were prepared and analyzed according to SW-846. The following methods and instruments were used for analysis:

Analysis	Instrument	Method
ICP	TJA ICAP 61E	6010
CVAA	TJA CVAA S-12	7470

- **QA/QC** - All appropriate QC data was within acceptable control limits.

General Discussion - None to report.

- **Analytical Difficulties** - None to report.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: ATG

Sample Receipt Date: November 4, 1991

LSDG: 1464F

Method: SW 846

Client Reference No.: M.K. Ferguson

ANALYTICAL RESULTS

Analytical Results

Lab Sample ID Client Sample ID ---------- Metals (mg/L)	1464F01 ORNL-QS-2	Detection Limit (mg/L)
Arsenic	<0.013	0.013
Barium	0.669	0.001
Cadmium	<0.002	0.002
Chromium	0.0822	0.002
Lead	<0.018	0.018
Mercury	<0.0004	0.0002
Selenium	<0.019	0.019
Silver	<0.004	0.004

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: ATG

Sample Receipt Date: November 4, 1991

LSDG: 1464F

Method: SW 846

Client Reference No.: M.K. Ferguson

ANALYTICAL RESULTS

Duplicate Results

Lab Sample ID Client Sample ID ---------- Metals (mg/L)	1464F01 ORNL-QS-2	1464F01D Duplicate	Relative Percent Difference (RPD)	Detection Limit (mg/L)
Arsenic	<0.013	<0.013	N/A	0.013
Barium	0.669	0.677	1.20%	0.001
Cadmium	<0.002	<0.002	N/A	0.002
Chromium	0.0822	0.0836	1.60%	0.002
Lead	<0.018	<0.018	N/A	0.018
Mercury	<0.0004	<0.0004	N/A	0.0002
Selenium	<0.019	<0.019	N/A	0.019
Silver	<0.004	<0.004	N/A	0.004

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: ATG

LSDG: 1464F

Client Reference No.: M.K. Ferguson

Sample Receipt Date: November 4, 1991

Method: SW 846

ANALYTICAL RESULTS

Matrix Spike/Matrix Spike Duplicate

Lab Sample ID Client Sample ID ---------- Metals (mg/L)	Spike Conc (mg/L)	1464F01 ORNL-QS-2	1464F01S Spike	Spike Recovery	1464F01SD Spike Dup.	Spike Recovery	Relative Percent
Arsenic	1.0	<0.013	0.947	94.7%	0.938	93.8%	1.0%
Barium	1.0	0.669	1.59	92.1%	1.58	91.1%	0.6%
Cadmium	1.0	<0.002	0.892	89.2%	0.901	90.1%	1.0%
Chromium	1.0	0.0822	0.921	83.9%	0.935	85.3%	1.5%
Lead	1.0	<0.018	0.856	85.6%	0.876	87.6%	2.3%
Mercury	0.002	<0.0004	0.0022	110.0%	0.00216	108.0%	1.8%
Selenium	1.0	<0.019	0.955	95.5%	0.959	95.9%	0.4%
Silver	1.0	<0.004	0.841	84.1%	0.845	84.5%	0.5%

Brian/Walter

EcoTek LSI
EcoTek Laboratory Services Incorporated

3542 International Pkwy Drive S.E.
Atlanta, Georgia 30354
(404) 244-0827
Fax (404) 243-5355

OP Tests
~~[illegible]~~
TCLP

November 25, 1991

Mr. Raphael Soto
Waste Technology Group
100 Crescent Centre Parkway
Suite 200
Tucker, GA 30084

Dear Mr. Soto:

Enclosed along with this letter are the results for the sample(s) received November 13, 1991.

Please contact Skip Cloninger at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464G in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Donald L. Dihel

Donald L. Dihel
Quality Assurance Manager

Tara L. Pope for
Mike Buchanan
Laboratory Manager

Enclosures.
DLD/JMB/cjm

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR SEMI-VOLATILE ANALYSIS FOR TCLP COMPOUNDS USING EPA SW-846 METHOD 8270 PROTOCOLS

CLIENT: WTG

LSDG: 1464G

CASE: M.K. Ferguson

* All semi-volatile organics were analyzed by GC/MS on one or more of the instruments listed below.

Hewlett-Packard MSD	Inst. ID. 7001
Hewlett-Packard MSD	Inst. ID. 7004

* Chromatography was performed on a 30m J & W fused silica DB-5 capillary column.

* Extraction was performed on an appropriate volume of the leachate solution to yield a detection level that is significantly below EPA's maximum allowable concentration limits for TCLP compounds unless stated otherwise.

* Final extract concentration was performed by the nitrogen blowdown technique to a final volume of 1.0 ml unless stated otherwise.

* The reports of the semi-volatile TCLP compounds identified and quantified in the samples are contained in the following sections of the data package.

* Detection limits or practical quantitation limits (PQL's) are expressed in the final quantitation report as the minimum value that can be detected with confidence. PQLs are factored for initial sample volume and final extract volume along with any necessary dilution.

* A leachate blank was extracted and analyzed with the sample batch and was found to be free of the TCLP compounds.

* The following exceptions and/or considerations should be noted for the sample group contained within.

  - All surrogate recoveries were within acceptable QC limits.

  - All matrix spike recoveries were within acceptable QC limits.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results
40 CFR 261, June 29,1990

Client:	WTG	Client Sample No.:	OP-II-4-1
Lab Sample ID:	1464G01	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	November 13,1991
Dilution Factor:	1	Date Extracted:	November 18,1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.010	7.5	
95487	2-Methylphenol	BQL	0.010	200	
108394	3-Methylphenol	BQL	0.010	200	
106445	4-Methylphenol	BQL	0.010	200	
NA	Total-Methylphenol	BQL	0.010	200	
67721	Hexachloroethane	BQL	0.010	3.0	
98953	Nitrobenzene	BQL	0.010	2.0	
87683	Hexachlorobutadiene	BQL	0.010	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.010	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.048	400	
121142	2,4-Dinitrotoluene	BQL	0.010	0.13	
118741	Hexachlorobenzene	BQL	0.010	0.13	
87865	Pentachlorophenol	BQL	0.048	100	
110861	Pyridine	BQL	0.010	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: 1464G01 Client Sample No.: OP-II-4-1

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	84	35-114	
2-Fluorobiphenyl	88	43-116	
Terphenyl-d14	76	33-141	
Phenol-d6	40	10- 94	
2-Fluorophenol	28	21-100	
2,4,6-Tribromophenol	57	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results

40 CFR 261, June 29,1990

Client:	WTG	Client Sample No.:	OP-II-6-1
Lab Sample ID:	1464G02	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	November 13,1991
Dilution Factor:	1	Date Extracted:	November 18,1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.009	7.5	
95487	2-Methylphenol	BQL	0.009	200	
108394	3-Methylphenol	BQL	0.009	200	
106445	4-Methylphenol	BQL	0.009	200	
NA	Total-Methylphenol	BQL	0.009	200	
67721	Hexachloroethane	BQL	0.009	3.0	
98953	Nitrobenzene	BQL	0.009	2.0	
87683	Hexachlorobutadiene	BQL	0.009	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.009	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.047	400	
121142	2,4-Dinitrotoluene	BQL	0.009	0.13	
118741	Hexachlorobenzene	BQL	0.009	0.13	
87865	Pentachlorophenol	BQL	0.047	100	
110861	Pyridine	BQL	0.009	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: 1464G02 Client Sample No.: OP-II-6-1

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	77	35-114	
2-Fluorobiphenyl	80	43-116	
Terphenyl-d14	45	33-141	
Phenol-d6	38	10- 94	
2-Fluorophenol	51	21-100	
2,4,6-Tribromophenol	90	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results

40 CFR 261, June 29,1990

Client:	WTG	Client Sample No.:	OP-III-5-1
Lab Sample ID:	1464G03	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	November 13,1991
Dilution Factor:	1	Date Extracted:	November 20,1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.011	7.5	
95487	2-Methylphenol	BQL	0.011	200	
108394	3-Methylphenol	BQL	0.011	200	
106445	4-Methylphenol	BQL	0.011	200	
NA	Total-Methylphenol	BQL	0.011	200	
67721	Hexachloroethane	BQL	0.011	3.0	
98953	Nitrobenzene	BQL	0.011	2.0	
87683	Hexachlorobutadiene	BQL	0.011	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.011	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.054	400	
121142	2,4-Dinitrotoluene	BQL	0.011	0.13	
118741	Hexachlorobenzene	BQL	0.011	0.13	
87865	Pentachlorophenol	BQL	0.054	100	
110861	Pyridine	BQL	0.011	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: 1464G03 Client Sample No.: OP-III-5-1

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	81	35-114	
2-Fluorobiphenyl	83	43-116	
Terphenyl-d14	86	33-141	
Phenol-d6	44	10- 94	
2-Fluorophenol	34	21-100	
2,4,6-Tribromophenol	46	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results

40 CFR 261, June 29,1990

Client:	WTG	Client Sample No.:	OP-III-6-1
Lab Sample ID:	1464G04	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	November 13,1991
Dilution Factor:	1	Date Extracted:	November 18,1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.010	7.5	
95487	2-Methylphenol	BQL	0.010	200	
108394	3-Methylphenol	BQL	0.010	200	
106445	4-Methylphenol	BQL	0.010	200	
NA	Total-Methylphenol	BQL	0.010	200	
67721	Hexachloroethane	BQL	0.010	3.0	
98953	Nitrobenzene	BQL	0.010	2.0	
87683	Hexachlorobutadiene	BQL	0.010	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.010	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.048	400	
121142	2,4-Dinitrotoluene	BQL	0.010	0.13	
118741	Hexachlorobenzene	BQL	0.010	0.13	
87865	Pentachlorophenol	BQL	0.048	100	
110861	Pyridine	BQL	0.010	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: 1464G04 Client Sample No.: OP-III-6-1

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	84	35-114	
2-Fluorobiphenyl	86	43-116	
Terphenyl-d14	55	33-141	
Phenol-d6	39	10- 94	
2-Fluorophenol	22	21-100	
2,4,6-Tribromophenol	17	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results
40 CFR 261, June 29,1990

Client:	WTG	Client Sample No.:	OP-I-3-2
Lab Sample ID:	1464G05	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	November 13,1991
Dilution Factor:	1	Date Extracted:	November 18,1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.010	7.5	
95487	2-Methylphenol	BQL	0.010	200	
108394	3-Methylphenol	BQL	0.010	200	
106445	4-Methylphenol	BQL	0.010	200	
NA	Total-Methylphenol	BQL	0.010	200	
67721	Hexachloroethane	BQL	0.010	3.0	
98953	Nitrobenzene	BQL	0.010	2.0	
87683	Hexachlorobutadiene	BQL	0.010	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.010	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.049	400	
121142	2,4-Dinitrotoluene	BQL	0.010	0.13	
118741	Hexachlorobenzene	BQL	0.010	0.13	
87865	Pentachlorophenol	BQL	0.049	100	
110861	Pyridine	BQL	0.010	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: 1464G05 Client Sample No.: OP-I-3-2

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	85	35-114	
2-Fluorobiphenyl	87	43-116	
Terphenyl-d14	78	33-141	
Phenol-d6	44	10- 94	
2-Fluorophenol	51	21-100	
2,4,6-Tribromophenol	93	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results

40 CFR 261, June 29,1990

Client:	WTG	Client Sample No.:	OP-II-1-2
Lab Sample ID:	1464G06	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	November 13,1991
Dilution Factor:	1	Date Extracted:	November 18,1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.010	7.5	
95487	2-Methylphenol	BQL	0.010	200	
108394	3-Methylphenol	BQL	0.010	200	
106445	4-Methylphenol	BQL	0.010	200	
NA	Total-Methylphenol	BQL	0.010	200	
67721	Hexachloroethane	BQL	0.010	3.0	
98953	Nitrobenzene	BQL	0.010	2.0	
87683	Hexachlorobutadiene	BQL	0.010	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.010	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.051	400	
121142	2,4-Dinitrotoluene	BQL	0.010	0.13	
118741	Hexachlorobenzene	BQL	0.010	0.13	
87865	Pentachlorophenol	BQL	0.051	100	
110861	Pyridine	BQL	0.010	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: 1464G06 Client Sample No.: OP-II-1-2

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	89	35-114	
2-Fluorobiphenyl	89	43-116	
Terphenyl-d14	83	33-141	
Phenol-d6	51	10- 94	
2-Fluorophenol	66	21-100	
2,4,6-Tribromophenol	86	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results

40 CFR 261, June 29,1990

Client:	WTG	Client Sample No.:	OP-II-2-2
Lab Sample ID:	1464G07	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	November 13,1991
Dilution Factor:	1	Date Extracted:	November 18,1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.010	7.5	
95487	2-Methylphenol	BQL	0.010	200	
108394	3-Methylphenol	BQL	0.010	200	
106445	4-Methylphenol	BQL	0.010	200	
NA	Total-Methylphenol	BQL	0.010	200	
67721	Hexachloroethane	BQL	0.010	3.0	
98953	Nitrobenzene	BQL	0.010	2.0	
87683	Hexachlorobutadiene	BQL	0.010	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.010	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.050	400	
121142	2,4-Dinitrotoluene	BQL	0.010	0.13	
118741	Hexachlorobenzene	BQL	0.010	0.13	
87865	Pentachlorophenol	BQL	0.050	100	
110861	Pyridine	BQL	0.010	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: 1464G07 Client Sample No.: OP-II-2-2

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	69	35-114	
2-Fluorobiphenyl	76	43-116	
Terphenyl-d14	71	33-141	
Phenol-d6	38	10- 94	
2-Fluorophenol	44	21-100	
2,4,6-Tribromophenol	59	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results

40 CFR 261, June 29,1990

Client:	WTG	Client Sample No.:	OP-II-3-2
Lab Sample ID:	1464G08	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	November 13,1991
Dilution Factor:	1	Date Extracted:	November 18,1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.009	7.5	
95487	2-Methylphenol	BQL	0.009	200	
108394	3-Methylphenol	BQL	0.009	200	
106445	4-Methylphenol	BQL	0.009	200	
NA	Total-Methylphenol	BQL	0.009	200	
67721	Hexachloroethane	BQL	0.009	3.0	
98953	Nitrobenzene	BQL	0.009	2.0	
87683	Hexachlorobutadiene	BQL	0.009	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.009	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.046	400	
121142	2,4-Dinitrotoluene	BQL	0.009	0.13	
118741	Hexachlorobenzene	BQL	0.009	0.13	
87865	Pentachlorophenol	BQL	0.046	100	
110861	Pyridine	BQL	0.009	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: 1464G08 Client Sample No.: OP-II-3-2

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	81	35-114	
2-Fluorobiphenyl	90	43-116	
Terphenyl-d14	65	33-141	
Phenol-d6	31	10- 94	
2-Fluorophenol	28	21-100	
2,4,6-Tribromophenol	35	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results

40 CFR 261, June 29,1990

Client:	WTG	Client Sample No.:	Method Blank
Lab Sample ID:	Q11B1801	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	N / A
Dilution Factor:	1	Date Extracted:	November 18,1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.010	7.5	
95487	2-Methylphenol	BQL	0.010	200	
108394	3-Methylphenol	BQL	0.010	200	
106445	4-Methylphenol	BQL	0.010	200	
NA	Total-Methylphenol	BQL	0.010	200	
67721	Hexachloroethane	BQL	0.010	3.0	
98953	Nitrobenzene	BQL	0.010	2.0	
87683	Hexachlorobutadiene	BQL	0.010	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.010	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.050	400	
121142	2,4-Dinitrotoluene	BQL	0.010	0.13	
118741	Hexachlorobenzene	BQL	0.010	0.13	
87865	Pentachlorophenol	BQL	0.050	100	
110861	Pyridine	BQL	0.010	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: Q11B1801 Client Sample No.: Method Blank

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	67	35-114	
2-Fluorobiphenyl	76	43-116	
Terphenyl-d14	49	33-141	
Phenol-d6	33	10- 94	
2-Fluorophenol	47	21-100	
2,4,6-Tribromophenol	74	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results

40 CFR 261, June 29,1990

Client:	WTG	Client Sample No.:	Leachate Blank
Lab Sample ID:	Q11B1401T	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	N / A
Dilution Factor:	1	Date Extracted:	November 18,1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.010	7.5	
95487	2-Methylphenol	BQL	0.010	200	
108394	3-Methylphenol	BQL	0.010	200	
106445	4-Methylphenol	BQL	0.010	200	
NA	Total-Methylphenol	BQL	0.010	200	
67721	Hexachloroethane	BQL	0.010	3.0	
98953	Nitrobenzene	BQL	0.010	2.0	
87683	Hexachlorobutadiene	BQL	0.010	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.010	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.050	400	
121142	2,4-Dinitrotoluene	BQL	0.010	0.13	
118741	Hexachlorobenzene	BQL	0.010	0.13	
87865	Pentachlorophenol	BQL	0.050	100	
110861	Pyridine	BQL	0.010	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: Q11B1401T Client Sample No.: Leachate Blank

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	77	35-114	
2-Fluorobiphenyl	84	43-116	
Terphenyl-d14	64	33-141	
Phenol-d6	44	10- 94	
2-Fluorophenol	63	21-100	
2,4,6-Tribromophenol	84	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile TCLP Analytical Results

40 CFR 261, June 29,1990

Client:	WTG	Client Sample No.:	Method Blank
Lab Sample ID:	Q11B2005	Client Reference No.:	M.K.Ferguson
Matrix:	Water	Date Received:	N / A
Dilution Factor:	1	Date Extracted:	November 20,1991

CAS Number	Compound Name	Result mg/l	PQL mg/l	MCL mg/l	Note
106467	1,4-Dichlorobenzene	BQL	0.010	7.5	
95487	2-Methylphenol	BQL	0.010	200	
108394	3-Methylphenol	BQL	0.010	200	
106445	4-Methylphenol	BQL	0.010	200	
NA	Total-Methylphenol	BQL	0.010	200	
67721	Hexachloroethane	BQL	0.010	3.0	
98953	Nitrobenzene	BQL	0.010	2.0	
87683	Hexachlorobutadiene	BQL	0.010	0.5	
88062	2,4,6-Trichlorophenol	BQL	0.010	2.0	
95954	2,4,5-Trichlorophenol	BQL	0.050	400	
121142	2,4-Dinitrotoluene	BQL	0.010	0.13	
118741	Hexachlorobenzene	BQL	0.010	0.13	
87865	Pentachlorophenol	BQL	0.050	100	
110861	Pyridine	BQL	0.010	5.0	

MCL = Maximum Concentration Limit
PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* = Indicates an estimated value when the mass spectral data indicate the presence of a compound that meets the identification criteria in which the result is less than the practical quantitation limit but greater than zero.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Semivolatile Surrogate Recovery Data

Lab Sample ID: Q11B2005 Client Sample No.: Method Blank

Surrogate Compound	% Recovery	QC Limits	Notes
Nitrobenzene-d5	86	35-114	
2-Fluorobiphenyl	90	43-116	
Terphenyl-d14	87	33-141	
Phenol-d6	54	10- 94	
2-Fluorophenol	68	21-100	
2,4,6-Tribromophenol	87	10-123	

D = Surrogate diluted out
*** = Surrogate recovery outside QC Limits

Surrogates are compounds added to the sample prior to extraction to monitor the extraction efficiency. Lower surrogate recoveries may indicate possible matrix effect on the extraction procedure.

EcoTek LSI
EcoTek Laboratory Services Incorporated

TCLP QC DATA

Client: WTG
Lab Sample ID: 1464G08
Method: 8270

Client Sample ID: OP-II-3-2
Client Reference No.: M.K.Ferguson

Compound	Matrix Spike % Recovery	% Recovery QC Lmits *
Total Cresol, mg/L	48	NA
1,4-Dichlorobenzene, mg/L	85	37-106
2,4-Dinitrotoluene, mg/L	82	48-127
Hexachlorobenzene, mg/L	97	8-142
Hexachlorobutadiene, mg/L	72	38-102
Hexachloroethane, mg/L	75	55-100
Nitrobenzene, mg/L	96	54-158
Pentachlorophenol, mg/L	91	38-152
Pyridine, mg/L	43	NA
2,4,5-Trichlorophenol, mg/L	77	NA
2,4,6-Trichlorophenol, mg/L	65	52-129

* Based upon SW-846, Method 8270, Table 6
D = Detected
NA= Not available

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR METALS ANALYSIS
Method SW-846

Client: WTG

Project/Case: M. K. Ferguson

LSDG: 1464G

Sample(s): 1464G01-08

- **Analysis** - Metals analysis was performed for eight TCLP leachates for TCLP metals. Samples were prepared and analyzed according to SW-846. The following methods and instruments were used for analysis:

Analysis	Instrument	Method
CVAA for Mercury	TJA S - 12 CVAA	7470
ICP	TJA ICAP 61E	6010

- **QA/QC** - All appropriate QC data was within acceptable control limits.

- **General Discussion** - None.

- **Analytical Difficulties** - Negative Silver results for samples 1464G01 through 1464G05 indicate the possibility of interference. Dilutions were analyzed for these samples for silver only, to reduce the effect of the interference.

EcoTek LSI
Ecotek Laboratory Services Incorporated

Client: WTG

LSDG: 1464G

Client Reference No.: M.K. Ferguson

Sample Receipt Date: November 13, 1991

Method: SW 846

ANALYTICAL RESULTS

Analytical Results

Lab Sample ID Client Sample ID ---------- Metals (mg/L)	2 1464G01 OP-II-4-1	1 1464G02 OP-II-6-1	2 1464G03 OP-III-5-1	2 1464G04 OP-III-6-1	2 1464G05 OP-I-3-2	2 1464G06 OP-II-1-2	2 1464G07 OP-II-2-2	2 1464G08 OP-II-3-2	Detection Limit (mg/L)
Arsenic	2.93	0.346	2.96	3.05	0.639	1.25	1.80	3.73	0.012
Barium	1.49	1.33	1.25	1.12	1.33	1.18	1.19	0.817	0.001
Cadmium	1.14	0.004	2.87	2.82	0.0333	0.0879	0.267	1.63	0.001
Chromium	0.012	0.0270	0.0169	0.0196	0.0239	0.0259	0.0205	0.010	0.002
Lead	<0.012	<0.012	0.0207	0.0154	<0.012	<0.012	<0.012	<0.012	0.012
Mercury	'<0.0002	'<0.0002	'<0.0002	'<0.0002	'<0.0002	'<0.0002	'<0.0002	'<0.0002	0.0002
Selenium	0.0907	0.0998	0.158	0.168	0.0788	0.0482	0.0720	0.105	0.03
Silver	<0.025	<0.100	<0.025	<0.025	<0.025	<0.005	<0.005	<0.005	0.005

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464G

Method: SW-846

Sample Receipt Date: November 13, 1991

Date of Analysis: November 22, 1991

MATRIX SPIKE ANALYTICAL RESULTS

Lab Sample ID: 1464G01
Client Sample ID: OP-II-4-1

Spike Compound	Spike Amount (mg/L)	Unspiked Sample Result (mg/L)	Spiked Sample Result (mg/L)	% Spike Recovery
Arsenic	1.00	2.93	3.84	91.1
Barium	1.00	1.49	2.38	88.8
Cadmium	1.00	1.14	2.00	86.8
Chromium	1.00	0.012	0.832	82
Lead	1.00	<0.012	0.822	82.2
Mercury	0.001	<0.0002	0.0010	103.8
Selenium	1.00	0.091	0.973	88.2
Silver	1.00	<0.025	0.861	86.2

EcoTek LSI
Ecotek Laboratory Services Incorporated

Client: WTG

LSDG: 1464G

Method: SW 846

Sample Receipt Date: November 13, 1991

Date of Analysis: November 22, 1991

LCS/LCSD ANALYTICAL RESULTS

Spike Compound	Spike Amount (mg/L)	LCSMS1 Result (mg/L) (LCS)	LCSMS1 % Spike Recovery (LCS)	LCSMS2 Result (mg/L) (LCS)	LCSMS2 % Spike Recovery (LCS)
Arsenic	1.00	0.983	98.3%	0.966	96.6%
Barium	1.00	0.988	98.8%	0.966	96.6%
Cadmium	1.00	0.986	98.6%	0.973	97.3%
Chromium	1.00	0.960	96.0%	0.944	94.4%
Lead	1.00	0.965	96.5%	0.954	95.4%
Mercury	0.001	0.0010	102.6%	0.0010	104.6%
Selenium	1.00	0.954	95.4%	0.942	94.2%
Silver	1.00	0.958	95.8%	0.944	94.4%

LCS = Laboratory Control Standard (water matrix spike). % Recovery = 80% - 120%

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: November 13, 1991

LSDG: 1464G

Date of Analysis: November 22, 1991

Method: SW-846 Method 6010/7470

Duplicate Analytical Results

Lab Sample ID: 1464G-01
Client Sample ID: OP-II-4-1

Analyte	Date of Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	%RPD
Arsenic	11/13/91	2.93	3.01	2.6
Barium	11/13/91	1.49	1.52	1.6
Cadmium	11/13/91	1.14	1.16	1.9
Chromium	11/13/91	0.012	0.012	2.6
Lead	11/13/91	<0.012	<0.012	NR*
Mercury	11/13/91	<0.0002	<0.0002	NR*
Selenium	11/13/91	0.0907	0.0931	2.7
Silver	11/13/91	<0.025	<0.025	NR*

NR* = %RPD not reportable due to the sample concentration being less than the instrument detection limit.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: November 13, 1991

LSDG: 1464G

Method: SW-846

Preparation Blank Analytical Results

Method Blank - Analyte	Concentration (mg/L)	Detection Limit (mg/L)
Arsenic	<0.012	0.012
Barium	<0.001	0.001
Cadmium	<0.001	0.001
Chromium	<0.002	0.002
Lead	<0.012	0.012
Mercury	<0.0002	0.0002
Selenium	<0.030	0.03
Silver	<0.005	0.005

EcoTek LSI
Ecotek Laboratory Services Incorporated

Client: WTG

LSDG: 1464G

Method: SW-846

Sample Receipt Date: November 13, 1991

Date of Analysis: November 22, 1991

MATRIX SPIKE ANALYTICAL RESULTS

Lab Sample ID: 1464G08
Client Sample ID: OP-II-4-1

Spike Compound	Spike Amount (mg/L)	Sample Result	MS Sample Result (mg/L)	MS Sample Recovery	MSD Sample Result (mg/L)	MSD Sample Recovery	%RPD Recovery
Arsenic	1.00	3.73	4.69	96.0%	4.73	100.0%	0.8%
Barium	1.00	0.82	1.53	71.3%	1.55	73.3%	1.3%
Cadmium	1.00	1.63	2.53	90.0%	2.55	92.0%	0.8%
Chromium	1.00	0.01	0.82800	81.8%	0.837	82.7%	1.1%
Lead	1.00	<0.012	0.802	80.2%	0.811	81.1%	1.1%
Mercury	0.001	<0.0002	0.00104	94.5%	0.00110	100.0%	5.6%
Selenium	1.00	0.11	1.08	97.5%	1.050	94.5%	2.8%
Silver	1.00	<0.005	0.678	67.8%	0.685	68.5%	1.0%

January 21, 1992

Mr. Rafael Soto
WTG
100 Crescent Centre Pkwy.
Tucker, GA 30084

Dear Mr. Soto:

Enclosed along with this letter are the hard copy results for the sample(s) received December 19, 1991. This information was faxed to you today.

Please contact Skip Cloninger at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464I in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Donald L. Dihel
Quality Assurance Manager

Mike Buchanan
Laboratory Manager

Enclosures.
DLD/JMB/crb

CASE NARRATIVE FOR GENERAL CHEMISTRY

Client: WTG

Project/Case: MK-Ferguson

LSDG: 1464I

Sample(s): M0, M1, M2, M3, M4, M5, M6, M7, S0, S1, S2, S3, S4, S5, S6, S7

* Alkalinity, Method 310.1

  An unaltered sample is titrated to an electrometrically determined endpoint of pH 4.5 with a low normality acid solution.

* Chloride, Method 325.2

  Thiocyanate ion (SCN) is liberated from mercuric thiocyanate by the chloride ion to form mercuric chloride and in the presence of the ferric ion, form highly colored ferric thiocyanate which is proportional to the original chloride concentration.

* Fluoride, Method 340.2

  The fluoride is determined potentiometrically using a fluoride electrode in conjunction with a standard reference electrode and a selective ion meter.

* Nitrate/Nitrite, Method 353.1

  Nitrate is reduced to nitrite with hydrazine sulfate and the nitrite (that originally present plus reduced nitrate) is determined colorimetrically by the formation of a pink color.

* Phosphorus, All Forms, Method 365.3

  Organic phosphorus is converted to orthophosphate by a persulfate digestion, mixed with reagents to form a blue color complex, and the converted plus the original orthophosphate in the sample are measured spectrophotometrically.

* Sulfate, Method 375.4

  Sulfate ion is converted to a barium sulfate suspension. The resulting turbidity is determined by a spectrophotometer and compared to a calibration curve prepared from standard sulfate solutions.

ECO

* All QA/QC requirements were acceptable with the following notations:

1) Total Phosphorous - Samples M0 (1464I01), S0 (1464I02), M1 (1464I03), S1 (1464I04), M2 (1464I05), S2 (1464I06), M3 (1464I07), and S3 (1464I08) were analyzed one day past the holdtime. The sample matrix spike failed, however, all other QA/QC requirements were acceptable.

2) Nitrate/Nitrite - All samples except M0 (1464I01) and S0 (1464I02) required various dilutions and the detection limit was raised accordingly.

Client: WTG

Sample Receipt Date: December 19, 199

LSDG: 1464I

Method: EPA 310.1

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	Alkalinity as CaCO3 (mg/l)
1464I01	M0	2.4
1464I02	S0	13.1
1464I03	M1	28.3
1464I04	S1	11.0
1464I05	M2	49.1
1464I06	S2	14.6
1464I07	M3	83.0
1464I08	S3	24.5
1464I09	M4	74.7
1464I10	S4	25.7
1464I11	M5	63.7
1464I12	S5	25.3
1464I13	M6	67.4
1464I14	S6	25.1
1464I15	M7	60.8
1464I16	S7	23.4
Detection Limit		1.0

Client: WTG

Sample Receipt Date: December 19, 199

LSDG: 1464I

Method: EPA 325.2

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	Chloride (mg/l)
1464I01	M0	<2.0
1464I02	S0	<2.0
1464I03	M1	<2.0
1464I04	S1	<2.0
1464I05	M2	<2.0
1464I06	S2	<2.0
1464I07	M3	<2.0
1464I08	S3	<2.0
1464I09	M4	<2.0
1464I10	S4	<2.0
1464I11	M5	<2.0
1464I12	S5	<2.0
1464I13	M6	<2.0
1464I14	S6	<2.0
1464I15	M7	<2.0
1464I16	S7	<2.0
Detection Limit		2.0

Ecotek LSI
Environmental Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: December 19, 199

LSDG: 1464I

Method: EPA 340.2

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	Fluoride (mg/l)
1464I01	M0	0.10
1464I02	S0	0.57
1464I03	M1	0.20
1464I04	S1	0.16
1464I05	M2	0.31
1464I06	S2	0.24
1464I07	M3	0.62
1464I08	S3	0.43
1464I09	M4	0.89
1464I10	S4	0.70
1464I11	M5	0.80
1464I12	S5	0.63
1464I13	M6	0.72
1464I14	S6	0.65
1464I15	M7	0.63
1464I16	S7	0.64
Detection Limit		0.10

Ecolab LSI

Client: WTG

Sample Receipt Date: December 19, 199

LSDG: 1464I

Method: EPA 365.3

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	Total Phosphorus (mg/l)
1464I01	M0	<0.1
1464I02	S0	<0.1
1464I03	M1	<0.1
1464I04	S1	<0.1
1464I05	M2	<0.1
1464I06	S2	<0.1
1464I07	M3	<0.1
1464I08	S3	<0.1
1464I09	M4	<0.1
1464I10	S4	<0.1
1464I11	M5	<0.1
1464I12	S5	<0.1
1464I13	M6	<0.1
1464I14	S6	<0.1
1464I15	M7	<0.1
1464I16	S7	<0.1
Detection Limit		0.1

Ecotek LSI
Ecotek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: December 19, 1991

LSDG: 1464I

Method: EPA 353.1

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	Nitrate/Nitrite (mg/l)	Detection Limit (mg/l)
1464I01	M0	1.38	0.05
1464I02	S0	0.86	0.05
1464I03	M1	44.5	1.25
1464I04	S1	96.1	5.0
1464I05	M2	48.1	1.25
1464I06	S2	83.4	2.5
1464I07	M3	72.9	2.5
1464I08	S3	117	5.0
1464I09	M4	58.9	2.5
1464I10	S4	78.1	2.5
1464I11	M5	37.1	1.25
1464I12	S5	43.8	1.25
1464I13	M6	29.3	1.0
1464I14	S6	27.6	1.0
1464I15	M7	21.3	0.5
1464I16	S7	17.3	0.5

Client: WTG

Sample Receipt Date: December 19, 199

LSDG: 1464I

Method: EPA 375.4

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	Sulfate (mg/l)
1464I01	M0	<1.0
1464I02	S0	3.2
1464I03	M1	<1.0
1464I04	S1	<1.0
1464I05	M2	<1.0
1464I06	S2	<1.0
1464I07	M3	<1.0
1464I08	S3	2.8
1464I09	M4	<1.0
1464I10	S4	<1.0
1464I11	M5	<1.0
1464I12	S5	<1.0
1464I13	M6	<1.0
1464I14	S6	<1.0
1464I15	M7	<1.0
1464I16	S7	2.5
Detection Limit		1.0

Ecolab LSI
Environmental Services Incorporated

CASE NARRATIVE FOR METALS ANALYSIS
Method SW-846

Client: WTG

Project/Case: MK-Ferguson

LSDG: 1464I

Sample(s): M0, M1, M2, M3, M4, M5, M6, M7, S0, S1, S2, S3, S4, S5, S6, S7

- **Analysis** - Metals analysis was performed for sixteen water samples for the following metals;

Calcium Iron Magnesium Nickel Potassium Sodium

Samples were prepared and analyzed according to SW-846. The following methods and instruments were used for analysis:

Analysis	Instrument	Method
ICP	TJA ICAP 61E	6010

- **QA/QC** - All appropriate QC data was within acceptable control limits with the following exceptions:

  - Matrix spike recovery for Calcium in sample S7 was outside the 25% control limits at 196.1% recovery.

  - Traces of Calcium, Iron and Sodium were observed in the preparation blank.

- **General Discussion** - Matrix spike recovery for Calcium may have failed the control limits due to elevated levels of Calcium in the sample (approximately thirty times the spike concentration). Serial dilution analysis for this analyte does not show any evidence of interference.

- **Analytical Difficulties** - None to report.

Ecotek LSI

Client: WTG

Sample Receipt Date: December 19, 1991

LSDG: 1464I

Method: SW-846 6010

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID ---------- Metals (mg/L)	1464I01 M0	1464I02 S0	1464I03 M1	1464I04 S1	Detection Limit (mg/L)
Calcium	2.18	38.4	35.8	90.2	0.009
Iron	0.300	8.62	0.0572	0.131	0.004
Magnesium	0.185	5.28	0.0370	0.103	0.030
Nickel	0.125	3.08	0.0212	0.0814	0.004
Potassium	0.931	1.59	21.1	6.67	0.259
Sodium	0.921	3.74	22.3	35.3	0.012

Client: WTG

Sample Receipt Date: December 19, 1991

LSDG: 1464I

Method: SW-846 6010

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID ---------- Metals (mg/L)	1464I13 M6	1464I14 S6	1464I15 M7	1464I16 S7	Detection Limit (mg/L)
Calcium	53.3	40.5	43.0	27.9	0.009
Iron	0.0281	0.0590	0.0400	0.176	0.004
Magnesium	<0.030	0.0461	<0.030	0.116	0.030
Nickel	0.008	0.0480	0.0131	0.0931	0.004
Potassium	8.21	2.69	5.20	1.69	0.259
Sodium	9.51	9.13	6.14	5.30	0.012

Client: WTG

Sample Receipt Date: December 19, 1991

LSDG: 1464I

Method: SW-846 6010

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID ---------- Metals (mg/L)	1464I09 M4	1464I10 S4	1464I11 M5	1464I12 S5	Detection Limit (mg/L)
Calcium	81.8	89.2	61.8	56.9	0.009
Iron	0.0366	0.0276	0.0226	0.351	0.004
Magnesium	0.0363	0.0483	0.0355	<0.030	0.030
Nickel	0.010	0.0586	0.007	0.0493	0.004
Potassium	21.3	6.40	12.0	3.97	0.259
Sodium	24.1	26.6	14.0	15.0	0.012

Ecotek LSI
Earth Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: December 19, 1991

LSDG: 1464I

Method: SW-846 6010

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID Client Sample ID ---------- Metals (mg/L)	1464I05 M2	I1464I06 S2	1464I07 M3	1464I08 S3	Detection Limit (mg/L)
Calcium	45.5	84.4	76.9	119	0.009
Iron	0.0335	0.0270	0.0330	0.0400	0.004
Magnesium	0.0310	<0.030	<0.030	0.0581	0.030
Nickel	0.007	0.0442	0.008	0.0680	0.004
Potassium	20.9	6.03	28.9	8.27	0.259
Sodium	23.2	30.8	32.2	41.0	0.012

ECOTEK LSI

CASE NARRATIVE FOR
TOTAL URANIUM by LASER PHOSPHORIMETRY

Client: WTG

Project/Case: MK-Ferguson

LSDG: 1464I

Sample(s): M0, M1, M2, M3, M4, M5, M6, M7, S0, S1, S2, S3, S4, S5, S6, S7

* The uranium in the sample aliquot is converted to a chloride complex in a hydrochloric acid solution and is loaded onto an anion exchange resin. The uranium chloride complex is attracted to the resin while most other actinide chloride anions are collected in the effluent. The uranium is removed from the resin with dilute HCL.

* The uranium in the prepared sample is analyzed with a kinetic phosphorescence analyzer. The KPA-11 uses a pulsed laser to phosphoresce the uranium in the sample. The phosphorescence is received by the detector and, over a series of time gates, a decay curve is generated. A linear regression is performed on the data and the uranium concentration is determined.

* The following exceptions and/or considerations should be noted for the sample group contained within.

  None.

EcoTek LSI
Eco-Tek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: December 19, 1991

LSDG: 1464I

Client Reference No.: M. K. Ferguson

ANALYTICAL RESULTS

Lab Sample ID	Client Sample ID	Total Uranium pCi/G
1464I01	M0	< 3.4
1464I02	S0	20
1464I03	M1	< 3.4
1464I04	S1	< 3.4
1464I05	M2	< 3.4
1464I06	S2	< 3.4
1464I07	M3	< 3.4
1464I08	S3	< 3.4
1464I09	M4	< 3.4
1464I10	S4	< 3.4
1464I11	M5	< 3.4
1464I12	S5	< 3.4
1464I13	M6	< 3.4
1464I14	S6	< 3.4
1464I15	M7	< 3.4
1464I16	S7	8.5

EcoTek LSI
Ecotek Laboratory Services Incorporated

Chain-Of-Custody Record

12 1

SDG No.

Project Manager: R. SOTO

Comments: TAT: 14 DAYS

Project Name/Location: WTG/MKF

Samplers: CRAIG JOHNSON, NORM JACOB (Print) — Craig Johnson, x Norman P Jacob (Signature)

Sample ID	Collection Date	Collection Time	Comp or Grab	Sample Type	Sample Location	No Cont	Analyses Requested: PER ATTACHED	Remarks
M4	12/19/91	3:30 PM		LEACHATE		1		
S4	12/19/91	↓				1		
M5	12/20/91					1		
S5	12/20/91					1		
M6	12/21/91					1		
S6	12/21/91					1		
M7	12/22/91					1		
S7	12/22/91	↓				1		

Relinquished By	Date	Received By	Relinquished By	Date	Received By
Print: NORM JACOB	1/2/92	Print: CRAIG JOHNSON	Print		Print
Signature: x Norman P Jacob	Time: 11:52	Signature: Craig Johnson	Signature	Time	Signature
Relinquished By	Date	Received By	Relinquished By	Date	Received By
Print		Print	Print		Print
Signature	Time	Signature	Signature	Time	Signature

Page ___ of ___

LOC Rev 0 (7/90)

WTG
Waste Technologies Group, Inc.

WTG92.080

February 28, 1992

Ms. Marj Wesley
MK-Ferguson Company
Weldon Spring Site Remedial Action Project
7295 Hwy 94 South
St. Charles, MO 63304

Dear Marj:

Please find enclosed the laboratory report on ANS 16.1 test performed on quarry soils spiked to 131 ppm Nitrobenzene and treated according to the ORNL formula.

I have also included the calculation sheets for the respective leach indeces for TNT, DNT, and Nitrobenzene.

Should you have any questions, please contact me.

Sincerely,

Pat Stewart for

Rafael Soto
Director of Business Development

RS/pbs

Encl.

EcoTek LSI
EcoTek Laboratory Services Incorporated

3342 International Park Drive, S.E.
Atlanta, Georgia 30316
(404) 244-0827
Fax # (404) 243-5355

RECEIVED

February 24, 1992

Mr. Rafael Soto
WTG
100 Crescent Centre Pkwy.
Tucker, GA 30084

Dear Mr. Soto:

Enclosed along with this letter are the hard copy results for the sample(s) received February 10, 1991. This information was faxed to you today.

Please contact Tara Pipes at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464J in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Donald L. Dihel

Donald L. Dihel
Quality Assurance Manager

Tara L. Pipes

Tara L. Pipes
Assistant Laboratory Manager

Enclosures.
DLD/TLP/crb

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR NITROAROMATICS ANALYSIS BY GC/ECD

Client: W.T.G.

LSDG: 1464J

Project: Weldon Springs/MKF

* The batch was analyzed using a Hewlett-Packard 5890 gas chromatograph equipped with an electron capture detector.

* Chromatography was performed on a DB-210 column using a temperature program suitable for resolving the target analytes. The instrument was calibrated using a minimum of three concentrations.

* Initial sample volume was 25 ml for aqueous matrices unless noted otherwise.

* Final extract volume was 5.0 ml unless noted otherwise.

* The reports of the target compounds identified and quantified in the samples are contained in the following sections of the data package. Also included are the appropriate calibration and quality control data where applicable. Targets are confirmed by at least one other technique when the concentration level permits.

* Practical Quantitation Limits (PQL) are based upon factored for initial sample volume, final extract volume, and any necessary dilutions.

* A blank was extracted with the sample batch and found to be free of the target analytes.

* The following exceptions and/or considerations should be noted for the sample group contained within.

  - None

EcoTek LSI
EcoTek Laboratory Services Incorporated

Nitroaromatics Analytical Results

EcoTek LSI SOP OL-2510-A

Client:	WTG	Client Sample No.:	N-0
Lab Sample ID:	1464J01	Client Reference No.:	Weldon Springs/MKF
Matrix:	Water	Date Received:	February 10, 1992
Dilution Factor:	1	Date Extracted:	February 12, 1992

CAS Number	Compound Name	Result µg/l	PQL µg/l	Note
98-95-3	Nitrobenzene	BQL	6.0	
606-20-2	2,6-Dinitrotoluene	BQL	6.0	
99-65-0	1,3-Dinitrobenzene	BQL	6.0	
121-4-2	2,4-Dinitrotoluene	BQL	6.0	
118-96-7	TNT	3.4	6.0	*
99-35-4	TNB	BQL	6.0	

PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* =Detected but below BQL

EcoTek LSI
EcoTek Laboratory Services Incorporated

Nitroaromatics Analytical Results

EcoTek LSI SOP OL-2510-A

Client:	WTG	Client Sample No.:	N-1
Lab Sample ID:	1464J02	Client Reference No.:	Weldon Springs/MKF
Matrix:	Water	Date Received:	February 10, 1992
Dilution Factor:	1	Date Extracted:	February 12, 1992

CAS Number	Compound Name	Result µg/l	PQL µg/l	Note
98-95-3	Nitrobenzene	20.8	6.0	
606-20-2	2,6-Dinitrotoluene	BQL	6.0	
99-65-0	1,3-Dinitrobenzene	BQL	6.0	
121-4-2	2,4-Dinitrotoluene	BQL	6.0	
118-96-7	TNT	BQL	6.0	
99-35-4	TNB	BQL	6.0	

PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* =Detected but below BQL

EcoTek LSI
EcoTek Laboratory Services Incorporated

Nitroaromatics Analytical Results

EcoTek LSI SOP OL-2510-A

Client:	WTG	Client Sample No.:	N-2
Lab Sample ID:	1464J03	Client Reference No.:	Weldon Springs/MKF
Matrix:	Water	Date Received:	February 10, 1992
Dilution Factor:	1	Date Extracted:	February 12, 1992

CAS Number	Compound Name	Result µg/l	PQL µg/l	Note
98-95-3	Nitrobenzene	24.4	6.0	
606-20-2	2,6-Dinitrotoluene	BQL	6.0	
99-65-0	1,3-Dinitrobenzene	BQL	6.0	
121-4-2	2,4-Dinitrotoluene	BQL	6.0	
118-96-7	TNT	BQL	6.0	
99-35-4	TNB	BQL	6.0	

PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* =Detected but below BQL

EcoTek LSI
EcoTek Laboratory Services Incorporated

Nitroaromatics Analytical Results

EcoTek LSI SOP OL-2510-A

Client:	WTG	Client Sample No.:	N-3
Lab Sample ID:	1464J04	Client Reference No.:	Weldon Springs/MKF
Matrix:	Water	Date Received:	February 10, 1992
Dilution Factor:	1	Date Extracted:	February 12, 1992

CAS Number	Compound Name	Result µg/l	PQL µg/l	Note
98-95-3	Nitrobenzene	68.9	6.0	
606-20-2	2,6-Dinitrotoluene	0.9	6.0	*
99-65-0	1,3-Dinitrobenzene	BQL	6.0	
121-4-2	2,4-Dinitrotoluene	BQL	6.0	
118-96-7	TNT	BQL	6.0	
99-35-4	TNB	BQL	6.0	

PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* =Detected but below BQL

EcoTek LSI
EcoTek Laboratory Services Incorporated

Nitroaromatics Analytical Results

EcoTek LSI SOP OL-2510-A

Client:	WTG	Client Sample No.:	N-4
Lab Sample ID:	1464J05	Client Reference No.:	Weldon Springs/MKF
Matrix:	Water	Date Received:	February 10, 1992
Dilution Factor:	1	Date Extracted:	February 12, 1992

CAS Number	Compound Name	Result µg/l	PQL µg/l	Note
98-95-3	Nitrobenzene	59.2	6.0	
606-20-2	2,6-Dinitrotoluene	0.6	6.0	*
99-65-0	1,3-Dinitrobenzene	BQL	6.0	
121-4-2	2,4-Dinitrotoluene	BQL	6.0	
118-96-7	TNT	1.4	6.0	*
99-35-4	TNB	BQL	6.0	

PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* =Detected but below BQL

EcoTek LSI
EcoTek Laboratory Services Incorporated

Nitroaromatics Analytical Results

EcoTek LSI SOP OL-2510-A

Client:	WTG	Client Sample No.:	N-5
Lab Sample ID:	1464J06	Client Reference No.:	Weldon Springs/MKF
Matrix:	Water	Date Received:	February 10, 1992
Dilution Factor:	1	Date Extracted:	February 12, 1992

CAS Number	Compound Name	Result µg/l	PQL µg/l	Note
98-95-3	Nitrobenzene	53.1	6.0	
606-20-2	2,6-Dinitrotoluene	0.5	6.0	*
99-65-0	1,3-Dinitrobenzene	BQL	6.0	
121-4-2	2,4-Dinitrotoluene	BQL	6.0	
118-96-7	TNT	3.0	6.0	*
99-35-4	TNB	BQL	6.0	

PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* =Detected but below BQL

EcoTek LSI
EcoTek Laboratory Services Incorporated

Nitroaromatics Analytical Results

EcoTek LSI SOP OL-2510-A

Client:	WTG	Client Sample No.:	N-6
Lab Sample ID:	1464J07	Client Reference No.:	Weldon Springs/MKF
Matrix:	Water	Date Received:	February 10, 1992
Dilution Factor:	1	Date Extracted:	February 12, 1992

CAS Number	Compound Name	Result µg/l	PQL µg/l	Note
98-95-3	Nitrobenzene	52.1	6.0	
606-20-2	2,6-Dinitrotoluene	0.6	6.0	*
99-65-0	1,3-Dinitrobenzene	BQL	6.0	
121-4-2	2,4-Dinitrotoluene	BQL	6.0	
118-96-7	TNT	8.1	6.0	
99-35-4	TNB	BQL	6.0	

PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* =Detected but below BQL

EcoTek LSI
EcoTek Laboratory Services Incorporated

Nitroaromatics Analytical Results

EcoTek LSI SOP OL-2510-A

Client:	WTG	Client Sample No.:	N-7
Lab Sample ID:	1464J08	Client Reference No.:	Weldon Springs/MKF
Matrix:	Water	Date Received:	February 10, 1992
Dilution Factor:	1	Date Extracted:	February 12, 1992

CAS Number	Compound Name	Result µg/l	PQL µg/l	Note
98-95-3	Nitrobenzene	67.5	6.0	
606-20-2	2,6-Dinitrotoluene	0.6	6.0	*
99-65-0	1,3-Dinitrobenzene	BQL	6.0	
121-4-2	2,4-Dinitrotoluene	BQL	6.0	
118-96-7	TNT	11.6	6.0	
99-35-4	TNB	1.3	6.0	*

PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* =Detected but below BQL

EcoTek LSI
EcoTek Laboratory Services Incorporated

Nitroaromatics Analytical Results

EcoTek LSI SOP OL-2510-A

Client:	WTG	Client Sample No.:	Method Blank
Lab Sample ID:	NA021201	Client Reference No.:	Weldon Springs/MKF
Matrix:	Water	Date Received:	February 10, 1992
Dilution Factor:	1	Date Extracted:	February 12, 1992

CAS Number	Compound Name	Result µg/l	PQL µg/l	Note
98-95-3	Nitrobenzene	BQL	6.0	
606-20-2	2,6-Dinitrotoluene	BQL	6.0	
99-65-0	1,3-Dinitrobenzene	BQL	6.0	
121-4-2	2,4-Dinitrotoluene	BQL	6.0	
118-96-7	TNT	BQL	6.0	
99-35-4	TNB	BQL	6.0	

PQL = Practical Quantitation Limit
BQL = Below Quantitation Limit
* =Detected but below BQL

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464J

Method: SW-846 8240

Client Reference No.: Weldon Springs/MKF

Sample Receipt Date: February 10, 1992

Date of Extraction: February 12, 1992

Date of Analysis: February 13, 1992

MS/MSD ANALYTICAL RESULTS
NITROAROMATICS

Lab Sample ID: 1464J01
Client Sample ID: N-0

Spike Compound	% Recovery QC Limits *	Spike Amount (µg/l)	Unspiked Sample Result (µg/l)	Spiked Sample Result (µg/l) (MS)	% Spike Recovery (MS)	Duplicate Spike Sample Result (µg/l) (MSD)	% Spike Recovery (MSD)	%RPD
Nitrobenzene	50-150	4	0	7	164	6	153	7
2,6-Dinitrotoluene	50-150	4	0	4	97	4	99	2
1,3-Dinitrobenzene	50-150	4	0	4	94	4	108	14
2,4-Dinitrotoluene	50-150	4	0	4	110	4	110	0
TNT	50-150	4	3	7	99	7	93	6
TNB	50-150	4	0	4	100	4	95	5

* Advisory Only ; Recovery Limits in Development

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR GENERAL CHEMISTRY

Client: WTG

LSDG: 1464J

* Alkalinity, Method 310.1

  An unaltered sample is titrated to an electrometrically determined endpoint of pH 4.5 with a low normality acid solution.

* Chloride, Method 325.2

  Thiocyanate ion (SCN) is liberated from mercuric thiocyanate by the chloride ion to form mercuric chloride. Ferric ion is added to form highly colored ferric thiocyanate in concentration proportional to the original chloride concentration.

* Fluoride, Method 340.2

  The fluoride is determined potentiometrically using a fluoride electrode in conjunction with a standard reference electrode and a selective ion meter.

* Nitrate/Nitrite, Method 353.1

  Nitrate is reduced to nitrite with hydrazide sulfate and the nitrite (that originally present plus reduced nitrate) is determined colorimetrically by the formation of a pink color.

* Phosphorus, All Forms, Method 365.3

  Organic phosphorus is converted to orthophosphate by a persulfate digestion, mixed with reagents to form a blue color complex, and the converted plus the original orthophosphate in are sample is measured spectrophotometrically.

* Sulfate, Method 375.4

  Sulfate ion is converted to a barium sulfate suspension and the resulting turbidity is determined by a spectrophotometer as compared to a calibration curve prepared from sulfate standards.

* All QA/QC requirements were acceptable for these analyses.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

LSDG: 1464J

Client Reference No.: Weldon Springs/MKF

Sample Receipt Date: February10, 1992

Method: EPA Method 310.1

ANALYTICAL RESULTS

ALKALINITY

Lab Sample ID	Client Sample ID	Total Alkalinity (mg/l)	Detection Limit (mg/l)
1464J01	N-0	6.8	5.0
1464J02	N-1	40.6	5.0
1464J03	N-2	39.0	5.0
1464J04	N-3	94.3	5.0
1464J05	N-4	80.0	5.0
1464J06	N-5	55.1	5.0
1464J07	N-6	40.6	5.0
1464J08	N-7	29.2	5.0

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: February10, 1992

LSDG: 1464J

Method: EPA Method 325.2

Client Reference No.: Weldon Springs/MKF

ANALYTICAL RESULTS

CHLORIDE

Lab Sample ID	Client Sample ID	Chloride (mg/l)	Detection Limit (mg/l)
1464J01	N-0	<2.0	2.0
1464J02	N-1	<2.0	2.0
1464J03	N-2	<2.0	2.0
1464J04	N-3	<2.0	2.0
1464J05	N-4	<2.0	2.0
1464J06	N-5	<2.0	2.0
1464J07	N-6	<2.0	2.0
1464J08	N-7	<2.0	2.0

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: February10, 1992

LSDG: 1464J

Method: EPA Method 340.2

Client Reference No.: Weldon Springs/MKF

ANALYTICAL RESULTS
FLUORIDE

Lab Sample ID	Client Sample ID	Fluoride (mg/l)	Detection Limit (mg/l)
1464J01	N-0	<0.1	0.1
1464J02	N-1	<0.1	0.1
1464J03	N-2	<0.1	0.1
1464J04	N-3	<0.1	0.1
1464J05	N-4	<0.1	0.1
1464J06	N-5	<0.1	0.1
1464J07	N-6	<0.1	0.1
1464J08	N-7	<0.1	0.1

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: February10, 1992

LSDG: 1464J

Method: EPA Method 353.1

Client Reference No.: Weldon Springs/MKF

ANALYTICAL RESULTS

NITRITE/NITRATE

Lab Sample ID	Client Sample ID	Nitrite/Nitrate (mg/l)	Detection Limit (mg/l)
1464J01	N-0	0.08	0.05
1464J02	N-1	0.44	0.05
1464J03	N-2	0.47	0.05
1464J04	N-3	1.46	0.05
1464J05	N-4	1.09	0.05
1464J06	N-5	0.89	0.05
1464J07	N-6	0.91	0.05
1464J08	N-7	0.91	0.05

EcoTek LSI

Client: WTG

Sample Receipt Date: February10, 1992

LSDG: 1464J

Method: EPA Method 365.3

Client Reference No.: Weldon Springs/MKF

ANALYTICAL RESULTS

TOTAL PHOSPHATE

Lab Sample ID	Client Sample ID	Phosphate (mg/l)	Detection Limit (mg/l)
1464J01	N-0	<0.10	0.10
1464J02	N-1	<0.10	0.10
1464J03	N-2	<0.10	0.10
1464J04	N-3	<0.10	0.10
1464J05	N-4	<0.10	0.10
1464J06	N-5	<0.10	0.10
1464J07	N-6	<0.10	0.10
1464J08	N-7	<0.10	0.10

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: February10, 1992

LSDG: 1464J

Method: EPA Method 375.4

Client Reference No.: Weldon Springs/MKF

ANALYTICAL RESULTS

SULFATE

Lab Sample ID	Client Sample ID	Sulfate (mg/l)	Detection Limit (mg/l)
1464J01	N-0	<1.0	1.0
1464J02	N-1	<1.0	1.0
1464J03	N-2	<1.0	1.0
1464J04	N-3	<1.0	1.0
1464J05	N-4	<1.0	1.0
1464J06	N-5	<1.0	1.0
1464J07	N-6	<1.0	1.0
1464J08	N-7	<1.0	1.0

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR METALS ANALYSIS
Method SW-846

Client: WTG

Project/Case: MKF/ Weldon Springs

LSDG: 1464J

Sample(s): N0, N1, N2, N3, N4, N5, N6, N7

- **Analysis** - Metals analysis was performed on eight water samples for Calcium, Iron, Magnesium, Nickel, Potassium, and Sodium. Samples were prepared and analyzed according to SW-846. The following method and instrument were used for analysis:

Analysis	Instrument	Method
ICP	TJA ICAP 61E	6010

- **QA/QC** - All appropriate QC data was within acceptable control limits with the following exceptions:

  - The preparation blank shows traces of Calcium, Iron and Sodium.

  - Calcium in the Sample Matrix Spike and Matrix Spike Duplicate failed the 20% Relative Percent Difference (RPD).

- **General Discussion** - Traces of analytes observed in the preparation blank were not at levels considered to be significant to the analysis. Failure of the RPD for Calcium in the Sample Matrix Spike and Matrix Spike Duplicate may have been due to the high levels of that analyte observed in the sample matrix relative to the spiking concentration (approximately thirty six times the spike concentration).

- **Analytical Difficulties** - None to report.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: February 10, 1992

LSDG: 1464J

Method: SW-846

Client Reference No.: Weldon Springs/MKF

ANALYTICAL RESULTS

TCLP Metals

Lab Sample ID Client Sample ID Metals (mg/L)	1464J01 N-0	1464J02 N-1	Detection Limit (mg/L)
Nickel	ND	ND	0.004
Calcium	2.10	19.1	0.009
Iron	0.0925	0.0292	0.004
Magnesium	0.0334	ND	0.030
Sodium	0.169	0.902	0.012
Potassium	0.792	6.96	0.259

ND= Not Detected

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: February 10, 1992

LSDG: 1464J

Method: SW-846

Client Reference No.: Weldon Springs/MKF

ANALYTICAL RESULTS

TCLP Metals

Lab Sample ID Client Sample ID Metals (mg/L)	1464J03 N-2	1464J04 N-3	Detection Limit (mg/L)
Nickel	ND	ND	0.004
Calcium	18.5	36.8	0.009
Iron	0.0213	0.0947	0.004
Magnesium	ND	ND	0.030
Sodium	0.910	2.11	0.012
Potassium	7.02	17.7	0.259

ND= Not Detected

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: February 10, 1992

LSDG: 1464J

Method: SW-846

Client Reference No.: Weldon Springs/MKF

ANALYTICAL RESULTS

TCLP Metals

Lab Sample ID Client Sample ID Metals (mg/L)	1464J05 N-4	1464J06 N-5	Detection Limit (mg/L)
Nickel	ND	ND	0.004
Calcium	29.1	22.8	0.009
Iron	0.0498	0.0411	0.004
Magnesium	ND	ND	0.030
Sodium	1.45	1.08	0.012
Potassium	13.2	10.4	0.259

ND= Not Detected

EcoTek LSI
EcoTek Laboratory Services Incorporated

Client: WTG

Sample Receipt Date: February 10, 1992

LSDG: 1464J

Method: SW-846

Client Reference No.: Weldon Springs/MKF

ANALYTICAL RESULTS

TCLP Metals

Lab Sample ID Client Sample ID Metals (mg/L)	1464J07 N-6	1464J08 N-7	Detection Limit (mg/L)
Nickel	ND	ND	0.004
Calcium	10.5	28.2	0.009
Iron	0.0129	0.0550	0.004
Magnesium	ND	ND	0.030
Sodium	1.05	0.992	0.012
Potassium	10.3	10.1	0.259

ND= Not Detected

Ecotek LSI
Ecotek Laboratory Services Incorporated

Chain-Of-Custody Record

SDG No. 1464 J

Project Manager: Raphael Soto / WTF

Project Name/Location: M.K. Ferguson

Samplers: (Print) (Signature)

Comments:
Nitro, spec = Nitrobenzene, 2,4 Dinitrotoluene, TNT
Anions = Alkalinity, Cl^-, F^-, SO_4, Tot. phos.
Cations = Nitrate/Nitrite
metals = Ca, Fe, Mg, Ni, K, Na
14 day TAT

Sample ID	Collection Date	Collection Time	Comp or Grab	Sample Type	Sample Location	No Cont	Nitro Spec	Anions	Cations	Metals Spec								Remarks
N-1						1	✓	✓	✓	✓								
N-2						1	✓	✓	✓	✓								
N-3						1	✓	✓	✓	✓								
N-4						1	✓	✓	✓	✓								
N-5						1	✓	✓	✓	✓								
N-6						1	✓	✓	✓	✓								
N-7						1	✓	✓	✓	✓								
N-8						1	✓	✓	✓	✓								

Relinquished By	Date	Received By	Relinquished By	Date	Received By
Print RAFAEL SOTO	2-10-92	Print JOHN KOESTLER	Print		Print
Signature	Time 12:05	Signature John Koestler	Signature	Time	Signature
Relinquished By	Date	Received By	Relinquished By	Date	Received By
Print		Print	Print		Print
Signature	Time	Signature	Signature	Time	Signature

Page ___ of ___

MK-FERGUSON, WELDON SPRING
ANS 16.1 DATA & CALCULATIONS
BY:R. SOTO; 2-24-92

SAMPLE ID: QUARRY SOILS (CONTAMINANT: TNT)

D=[(An/Ao)/dtn]^2*(V/S)^2*T * π V=131 cm^3; S=154.8 cm^2; Ao=1.685 E+5 micro g

INTERVAL	tn (sec)	dtn	T	Sample conc. (ppb)	An (micro g)	Ao (micro g)	An/Ao	[(An/Ao)/dtn]^2	(V/S)^2	D	LIXn
1	7200	7200	1800	6	0.0093	168500	5.519288e-08	5.876261e-23	0.7161	2.379716e-19	19
2	25200	18000	14800	6	0.0093	168500	5.519288e-08	4.796948e-24	0.7161	1.597270e-19	19
3	86400	61200	51200	6	0.0093	168500	5.519288e-08	4.080737e-25	0.7161	4.700674e-20	19
4	173000	86400	126000	6	0.0093	168500	5.519288e-08	1.017827e-25	0.7161	2.885333e-20	20
5	259000	86400	214000	6	0.0093	168500	5.519288e-08	4.541157e-26	0.7161	2.186411e-20	20
6	346000	86400	301000	8.1	0.0126	168500	7.451039e-08	4.637473e-26	0.7161	3.140505e-20	20
7	432000	86400	388000	11.6	0.0180	168500	1.067062e-07	6.101155e-26	0.7161	5.325929e-20	19

TOTAL TNT RELEASED..... 0.077035
FRACTION RELEASED.....4.571810e-07

AVERAGE LIX= 19

MK-FERGUSON, WELDON SPRING
ANS 16.1 DATA & CALCULATIONS
BY:R. SOTO; 2-24-92

SAMPLE ID: QUARRY SOILS (CONTAMINANT: NITROBENZENE)

D=[(An/Ao)/dtn]^2*(V/S)^2*T V=131 cm^3; S=154.8 cm^2; Ao=8335 micro g

INTERVAL	tn (sec)	dtn	T	Sample conc. (ppb)	An (micro g)	Ao (micro g)	An/Ao	[(An/Ao)/dtn]^2	(V/S)^2	D	LIXn
1	7200	7200	1800	20.8	0.0322	8335	3.868026e-06	2.886117e-19	0.7161	1.168794e-15	15
2	25200	18000	14800	24.4	0.0378	8335	4.537493e-06	3.242132e-20	0.7161	1.079553e-15	15
3	86400	61200	51200	68.9	0.1068	8335	1.281284e-05	2.199192e-20	0.7161	2.533289e-15	15
4	173000	86400	126000	59.2	0.0918	8335	1.100900e-05	4.049519e-21	0.7161	1.147957e-15	15
5	259000	86400	214000	53.1	0.0823	8335	9.874625e-06	1.453589e-21	0.7161	6.998533e-16	15
6	346000	86400	301000	52.1	0.0808	8335	9.688662e-06	7.841072e-22	0.7161	5.309988e-16	15
7	432000	86400	388000	67.5	0.1046	8335	1.255249e-05	8.442912e-22	0.7161	7.370137e-16	15

TOTAL NITROBENZENE RELEASED..... 0.5363
FRACTION RELEASED..... 0.01%

AVERAGE LIX= 15

MK-FERGUSON, WELDON SPRING
ANS 16.1 DATA & CALCULATIONS
BY:R. SOTO; 2-24-92

SAMPLE ID: QUARRY SOILS (CONTAMINANT: 2,4-DNT)

D=[(An/Ao)/dtn]^2*(V/S)^2*T·π V=131 cm^3; S=154.8 cm^2; Ao=2831 micro g

INTERVAL	tn (sec)	dtn	T	Sample conc. (ppb)	An (micro g)	Ao (micro g)	An/Ao	[(An/Ao)/dtn]^2	(V/S)^2	D	LIXn
1	7200	7200	1800	6	0.0093	2831	3.285058e-06	2.081714e-19	0.7161	8.430343e-16	15
2	25200	18000	14800	6	0.0093	2831	3.285058e-06	1.699359e-20	0.7161	5.658461e-16	15
3	86400	61200	51200	6	0.0093	2831	3.285058e-06	1.445635e-21	0.7161	1.665253e-16	16
4	173000	86400	126000	6	0.0093	2831	3.285058e-06	3.605736e-22	0.7161	1.022153e-16	16
5	259000	86400	214000	6	0.0093	2831	3.285058e-06	1.608743e-22	0.7161	7.745545e-17	16
6	346000	86400	301000	8.1	0.0126	2831	4.434829e-06	1.642864e-22	0.7161	1.112550e-16	16
7	432000	86400	388000	11.6	0.0180	2831	6.351113e-06	2.161385e-22	0.7161	1.886755e-16	16

TOTAL 2,4-DNT RELEASED.. 0.077035
FRACTION RELEASED.....2.721123e-05

AVERAGE LIX= 16

EcoTek

P.O. Box [illegible]
219 Banner Hill Road
Erwin, Tennessee 37650
(615) 743-[illegible]

September 10, 1991

Ms. Marjorie L. Wesely
Geotechnical Engineer
MK-Ferguson Company
Weldon Spring Site Remedial Action Project
7295 Hwy 94 South
St. Charles, MO 63304

Re: P.O.#3589-0002-6366

Dear Ms. Wesely,

As per your request, the following is a brief description of the method used to prepare the quarry soil sample for baseline TCLP analyses and solidification testing.

A total of 0.1591 grams of nitrobenzene, 0.0129 grams of 2,4 DNT, 20 grams of TNT, and 0.200 grams of TNB were mixed with 785 ml of demineralized water. A total of 1157 grams of quarry soil was mixed with the water. This mixture was utilized for the baseline TCLP sample and for all solidification mixtures. The following table summarizes the nitroaromatics present on a quarry soil and solidification mixture basis.

I hope this provides the necessary information. Please feel free to contact me at (404)244-0827 anytime should you require additional information.

Sincerely,

Bryan T. Carlson
Senior Project Chemist

c: Thomas Parkes
Raphael Soto

Nitroaromatic Concentration (ppm)

Constituent	Quarry Soil Basis	Solidification Mix Basis
Nitrobenzene	137.5	81.8
1,3 DNB	<1.2	<0.71
2,6 DNT	10.2	6.1
2,4 DNT	30.6	18.2
1,3,5 TNB	261	155
2,4,6 TNT	20058	11932

HERCULES INCORPORATED
HERCULES AEROSPACE COMPANY
ALLEGANY BALLISTICS LABORATORY
ROCKET CENTER, WEST VIRGINIA

TEST REPORT

EXPLOSIVITY TESTING OF STABILIZED TNT CONTAMINATED SOIL SAMPLES

FEBRUARY, 1992

PREPARED FOR

MK-FERGUSON COMPANY
WELDON SPRING SITE
7295 HIGHWAY 94 SOUTH
ST. CHARLES, MO 63303

AO-8414-520-03-001

HERC NO. 92-06

WARRANTY

"Hercules warrants that it has performed the testing required by the statement of work in a safe and competent manner and in accordance with the standards employed by HERCULES in performing the same or similar testing for itself. ANY OTHER PROVISIONS OF THIS AGREEMENT TO THE CONTRARY NOT WITHSTANDING, THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED, WHETHER ARISING BY LAW, CUSTOM OR CONDUCT INCLUDING WITHOUT LIMITATION, THOSE OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, THAT ACCIDENTS OR HAZARDS OF ANY KIND WHATSOEVER WILL BE ELIMINATED, THAT ANY PARTICULAR STANDARD OR CRITERION OF HAZARD OR ACCIDENT ELIMINATION OF ANY KIND WHATSOEVER WILL BE ACHIEVED OR THAT ANY PARTICULAR OR ANTICIPATED RESULTS OF ANY KIND WHATSOEVER WILL BE ACHIEVED BY OWNER'S USE OR APPLICATION OF ANY OF THE INFORMATION, ADVICE, RECOMMENDATIONS OR SERVICES PROVIDED IN WHOLE OR IN PART BY HERCULES. ALL SAID INFORMATION, ADVICE, RECOMMENDATIONS OR SERVICES ARE FOR THE SOLE USE OF OWNER AND ARE USED AT OWNER'S RISK. THE RIGHTS AND REMEDIES PROVIDED HEREIN ARE EXCLUSIVE AND IN LIEU OF ANY OTHER RIGHTS OR REMEDIES WHETHER ARISING BY LAW, CUSTOM OR CONDUCT."

CAUTION

CONCLUSIONS PRESENTED IN THIS HAZARD ANALYSIS REPORT ARE BASED UPON THE HARDWARE (OR DESIGN), MATERIAL OF CONSTRUCTION, OPERATING CONDITIONS, PROCESS MATERIALS AND PROCEDURES AS THEY EXISTED AT THE TIME OF THE ANALYSIS (OR AS THEY WERE PRESENTED TO HERCULES FOR ANALYSIS). IF CHANGES IN ANY OF THESE PARAMETERS OCCUR IN THE FUTURE, THE CONCLUSIONS OF THE CURRENT HAZARD ANALYSIS MAY BE INVALIDATED.

TEST RESULTS
EXPLOSIVITY TESTING OF STABILIZED TNT CONTAMINATED SOIL SAMPLES

TEST OBJECTIVE

The objective of the test described herein was to synthesize a sample of stabilized quarry residue sample containing 2% TNT and other nitroaromatic compounds of the types and proportions listed in Attachment 1, and perform sensitivity, reactivity, and DSC testing on the sample to determine if it had explosive properties.

TEST DESCRIPTION

Soil samples from the Weldon Spring Quarry Site were provided by EcoTek along with a list of spiking agents and their proportions to duplicate earlier tests performed by EcoTek. These instructions were provided in a memo from Brian Carlson of EcoTek to Marge Wesley of MK-Ferguson dated 9/10/91, Attachment 1. Mr. Carlson traveled to ABL and monitored the sample preparation on 1/9/92 and witnessed some of the slurry testing.

The test stabilization mixture was prepared and cast into 2" cubes. The following tests were performed on the slurry mixture on the same day as prepared and on the material after allowing to cure about 2 weeks:

- # 8 Cap Test
- Impact Sensitivity
- Friction Sensitivity
- Differential Scanning Calorimeter

TEST RESULTS

The samples were prepared on 1/9/92 and one set of tests were performed the same day. A second set of 2" cubes was allowed to cure about two weeks and the same tests were repeated. One portion of the cast material was broken up to get the samples required for sensitivity testing. This cured material broke up easily, being rather crumbly in nature as opposed to being hard or brittle. The test results are shown in Table I.

Other observations noted were:

1. A small amount of reddish water was observed seeping out of the slurry samples.

2. A radioactivity check performed on the samples prior to beginning work showed the level of disintegrations/minute to be about 20 counts above background level.

TABLE I
SOIL REACTIVITY TESTS FOR MK-ROBINSON

Test Description	Slurry Sample	Cured Sample
Friction Sensitivity	501 Lbs. Force @ 8 Ft/Sec	499 Lbs. Force @ 8 Ft/Sec
Impact Sensitivity	Greater than 120 cm	17 cm
Differential Scanning Calorimeter	One exotherm beginning at 252 degrees C noted on one of six trials with 3 samples. No other exotherms under test limit of 300 degrees C.	No exotherms under 300 degrees C.
#3 Cap Test	No reaction	No reaction

CONCLUSIONS

It is concluded from the test results that the stabilized mixture does not exhibit explosive properties in either the uncured or cured state. There was some energetic reaction noted on the sensitivity tests but this was not inconsistent with a sample containing non-homogeneous particles of TNT. Because the material would not sustain a reaction in the #8 cap test, and because there were no reproducible exotherms on DSC, it is concluded that the material can be handled safely without the risk of detonation or explosion.

The material did exhibit some reddish liquid seeping out of the samples. Without analysis, it is assumed that this is some form of the "red water" associated with TNT manufacture. Although not present in enough concentration to be an explosion hazard, it could present environmental concerns if it were allowed to enter the ground water system.

DISCUSSION

A short description of the tests performed is given below:

Friction Sensitivity. A sample of material is placed on an anvil and a stationary wheel is placed on top of the sample. Pressure is applied to the wheel and a pendulum is used to propel the anvil at a known velocity. Pressure and velocity can be measured.

Impact Sensitivity. A sample of material is placed on an anvil and a hammer is placed on top of the sample. A known weight is then dropped a known distance on to the hammer. The impact energy is varied by changing the drop height.

In both the friction and impact tests, positive reactions are detected by observation of sounds and flash as well as by the use of an infra-red analyzer to detect products of combustion. Ten trials are run at a particular energy level and the Threshold Initiation Level (TIL) is considered the minimum energy level at which no reaction occurs.

Differential Scanning Calorimetry (DSC). This is a measure of the thermal stability of the material. A sample is placed in a cell and the temperature is incrementally increased. The temperature is recorded and any endotherms or exotherms resulting from sample reactions are noted.

#8 Cap Test. In this test a 2" cube of the material to be tested is placed on top of a lead witness column and a #8 blasting cap is placed on top of the sample. The cap is initiated and the reactivity of the material is measured by deformation of the lead column. Five samples are run per test and a positive reaction on any is considered a positive test.

A positive impact sensitivity TIL of 17 centimeters was recorded for the cured sample but the results pattern was consistent with a non-homogeneous mixture of explosive and soil. The machine limit of 120 centimeters was reached with the slurry sample without recording a positive reaction. The

friction sensitivity tests resulted in TIL's of 501 pounds force at 8 ft/sec for the slurry sample and 489 pounds force at 8 ft/sec for the cured sample. Again, it is not unexpected that a non-homogeneous mixture of TNT and soil would give a positive reaction.

In the DSC testing, two trials were run on three samples each of both the slurry and cured material. One trial in the slurry test exhibited a slight exotherm at 190 C^{o} and a significant exotherm at 252 C^{o}. In the absence of any other positive results, this was attributed to a localized inclusion of one of the nitroaromatic spiking compounds.

No reactivity was recorded on any of the ten samples subjected to the #8 cap test. In this test, the bulk material rather than a sample is tested and non-homogeneity is less a concern.

ECOTEK

ATTACHMENT 1, Page 1 of 2

219 Banner Hill Road
Erwin, Tennessee 37650
(615) 743-6188

September 10, 1991

Ms. Marjorie L. Wesely
Geotechnical Engineer
MK-Ferguson Company
Weldon Spring Site Remedial Action Project
7295 Hwy 94 South
St. Charles, MO 63304

Re: P.O.#3589-0002-6366

Dear Ms. Wesely,

As per your request, the following is a brief description of the method used to prepare the quarry soil sample for baseline TCLP analyses and solidification testing.

A total of 0.1591 grams of nitrobenzene, 0.0129 grams of 2,4 DNT, 20 grams of TNT, and 0.200 grams of TNB were mixed with 785 ml of demineralized water. A total of 1157 grams of quarry soil was mixed with the water. This mixture was utilized for the baseline TCLP sample and for all solidification mixtures. The following table summarizes the nitroaromatics present on a quarry soil and solidification mixture basis.

I hope this provides the necessary information. Please feel free to contact me at (404)244-0827 anytime should you require additional information.

Sincerely,

Bryan Y. Carlson
Senior Project Chemist

(404) 244-0827

c: Thomas Parkes
Raphael Solo

Post-it™ brand fax transmittal memo 7671	# of pages ▸ 2
To Bill Workman	From Marj. Wesely
Co. Hercules	Co. MK-Ferguson
Dept.	Phone #
Fax # 304 726-5562	Fax # 314-447-0803

BILL,
THIS IS THE RECIPE WE USED IN SPIKING SAMPLES WHICH HAVE NITROAROMATIC CONTAMINATION.
OUR QUARRY

MARJ WESELY

Nitroaromatic Concentration (ppm)

Constituent	Quarry Soil Basis	Solidification Mix Basis
Nitrobenzene	137.5	81.8
1,3 DNB	<1.2	<0.71
2,6 DNT	10.2	6.1
2,4 DNT	30.6	18.2
1,3,5 TNB	261	155
2,4,6 TNT	20058	11932

CHEN-NORTHERN, INC.

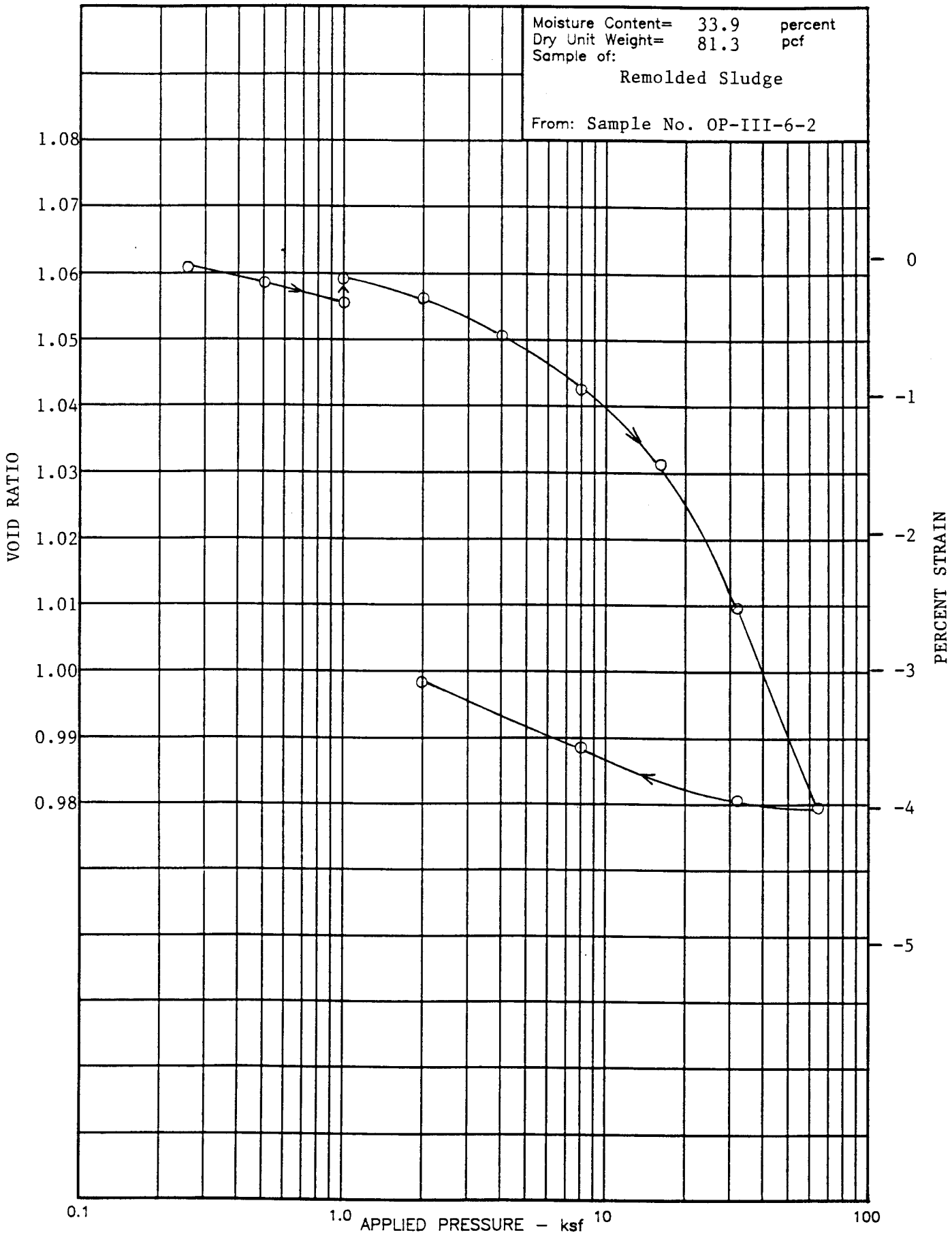
TABLE II
SUMMARY OF CONSOLIDATION TEST RESULTS

JOB NO. 1 156 92

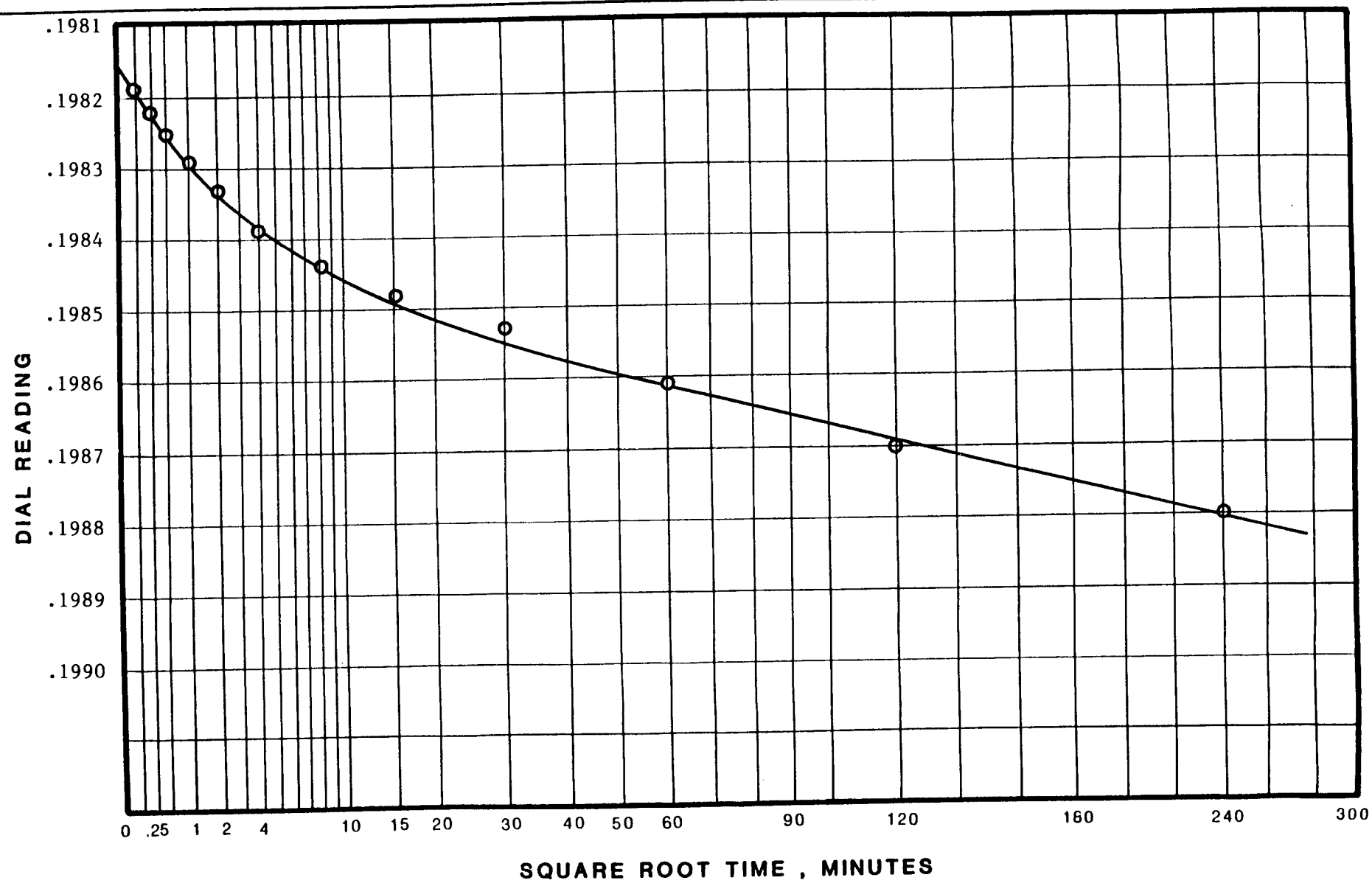
MARCH 12, 1992

	Sample No. OP-III-6-2
Initial Moisture Content, %	33.9
Initial Dry Density, pcf	81.3
Initial Void Ratio	1.073
Initial Saturation, %	85.5
Final Moisture Content, %	37.1
Final Dry Density, pcf	83.9
Final Void Ratio	1.008
Final Saturation, %	99.4
Preconsolidation Pressure, psf	N/A
Pressure at Inundation, psf	1000
Test Method	ASTM 2435-90, Method A
Coefficient of Consolidation, c_v, Calculation Method	Log of Time and Square Root of Time
Duration of Pressure Increments	24 hr (250 to 2,000 psf) 48 hr (4,000 to 64,000 psf)

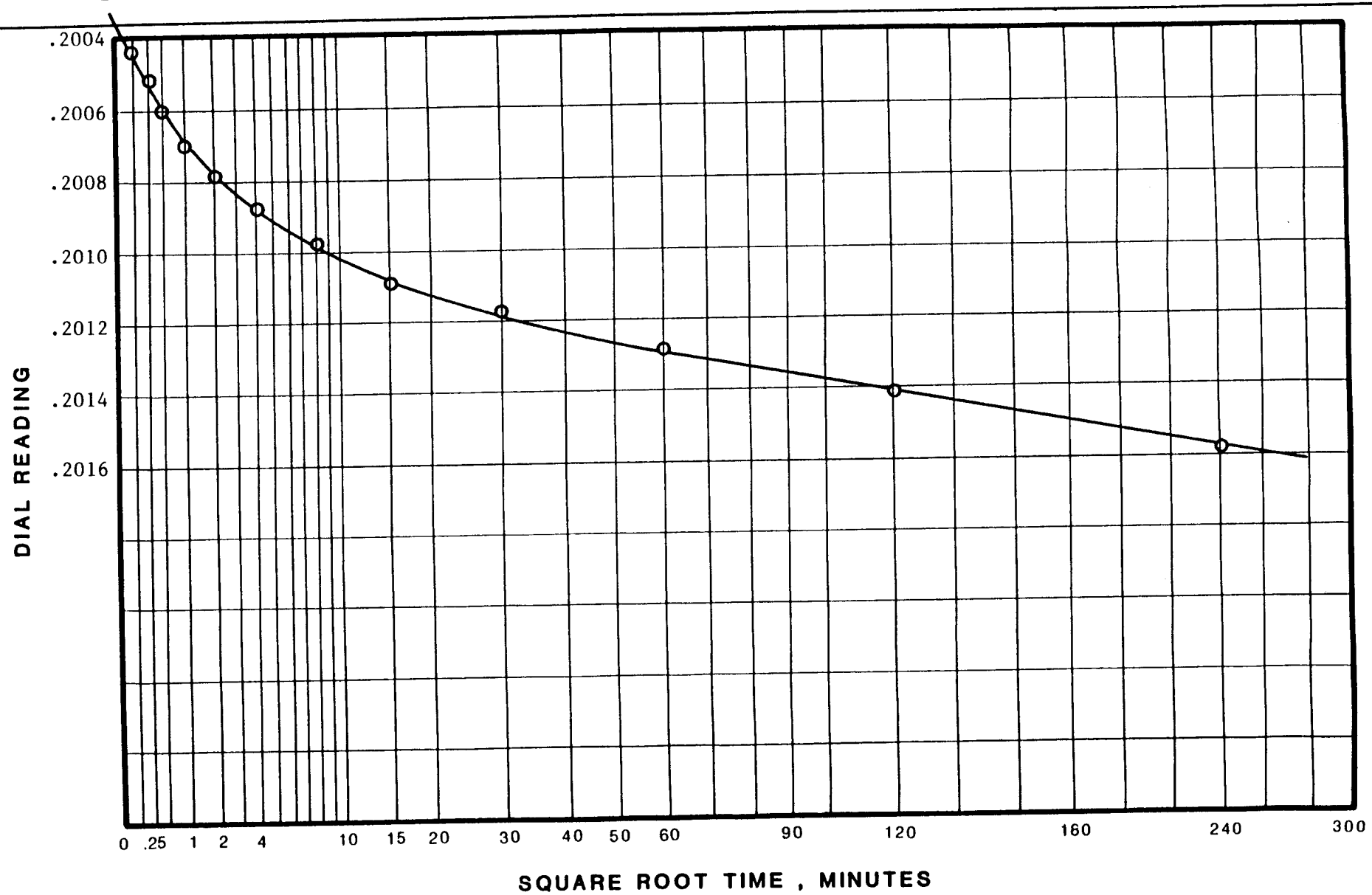
Pressure, psf	Coefficient of Consolidation, C_v, cm^2/sec	
	Log of Time Method	Square Root of Time Method
2000	1.55E-04	7.90E-03
4000	2.11E-04	2.36E-02
Average	1.83E-04	1.58E-02



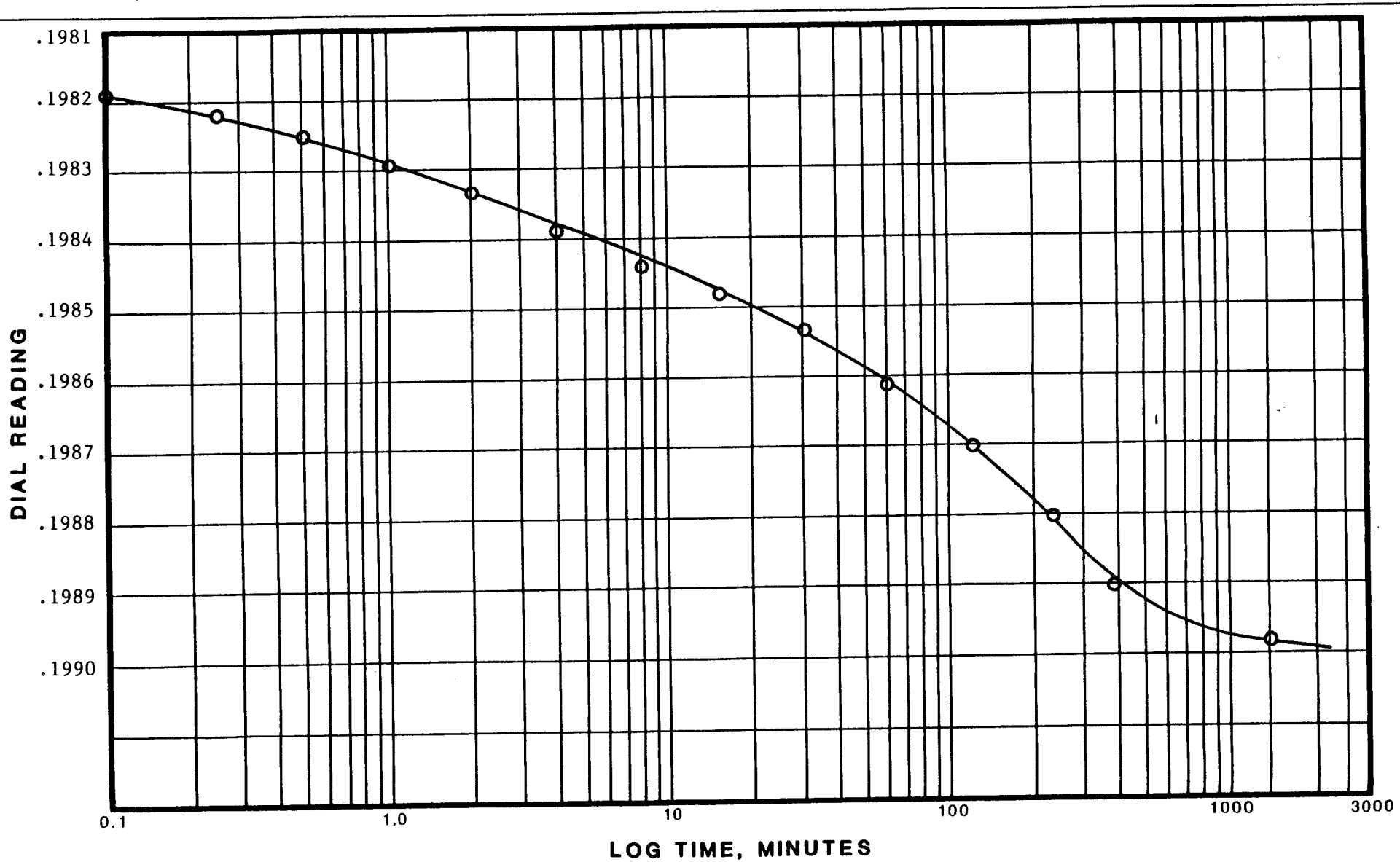
1 156 92	Chen Northern, Inc.	SWELL–CONSOLIDATION TEST RESULTS	Fig. 1



HOLE _____	DEPTH _____	SAMPLE NO. OP-III-6-2	LOAD STRESS 2000 PSF	TIME SETTLEMENT CURVE
c_v 7.90E-03	CM^2/SEC	a_v 2.74E-03	K_{avg} 2.13E-08 CM/SEC	Chen Northern, Inc.
d_{90} .19836		d_{100} .19839		Job Number 1 156 92 / Date 2-24-92 / Fig. 2
t_{90} 180 s		t_{100} 240 s		

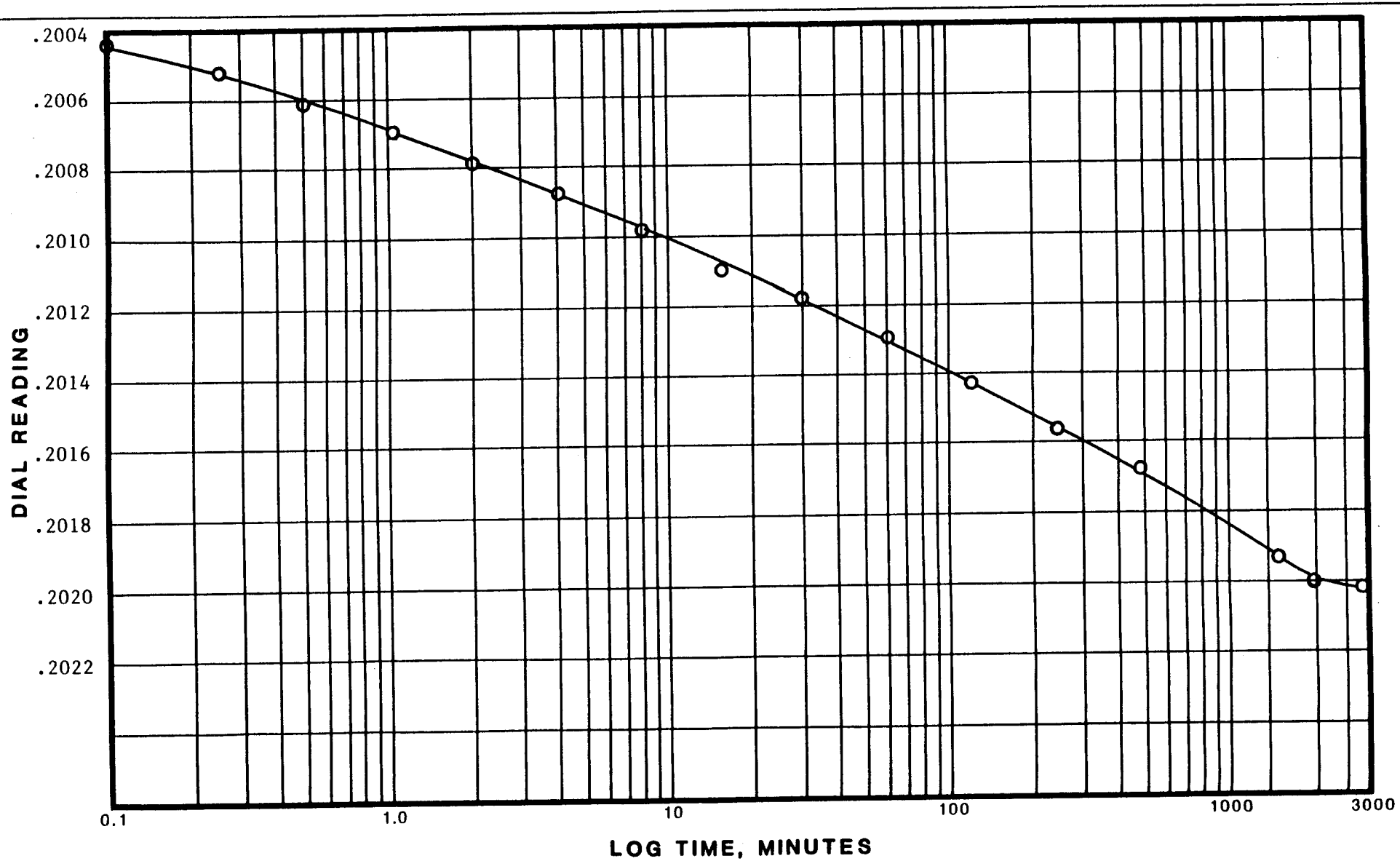


HOLE _____	DEPTH _____	SAMPLE NO. OP-III-6-2	LOAD STRESS 4000 PSF	TIME SETTLEMENT CURVE
c_v 2.36E-02	CM²/SEC	a_v 2.80E-03	K_{avg} 6.52E-08 CM/SEC	Chen Northern, Inc.
d_{90} .20068		d_{100} .20072		Job Number 1 156 92 / Date 2-25-92 / Fig. 3
t_{90} 60 s		t_{100} 79 s		



HOLE _____	DEPTH _____	SAMPLE NO. OP-III-6-2	LOAD STRESS 2000 PSF		TIME SETTLEMENT CURVE
c_v 1.55E-04 CM²/SEC		a_v 2.74E-03		k_{avg} 4.19E-10 CM/SEC	Chen Northern, Inc.
d_{50} .19855		d_{100} .19896			Job Number 1-156-92 / Date 2-24-92 / Fig. 4
t_{50} 2130 S		t_{100} 33,000 S			

L-11 4 (5-85)



HOLE _____	DEPTH _____	SAMPLE NO. OP-III-6-2	LOAD STRESS 4000 PSF		TIME SETTLEMENT CURVE
c_v 2.11E-04	CM²/SEC	a_v 2.80E-03	k_{avg} 5.82E-10 CM/SEC		Chen Northern, Inc.
d_{50} .20115		d_{100} .20200			
t_{50} 1560 S		t_{100} 115,200 S			

Job Number	Date	Fig.
1-156-92	2-25-92	5

1-11-4 (5-06)

Chen Northern, Inc.

Consulting Engineers and Scientists

96 South Zuni Street
Denver Colorado 80223

303 744-7105
303 744-0210 Facsimile

December 18, 1991

Mr. Rafael Soto
Waste Technologies Group, Inc.
100 Crescent Centre Parkway, Suite 200
Atlanta, Georgia 30084

Subject: Laboratory Testing of Solidified Sludge From Weldon Spring Site

Job No. 1 156 92

Dear Mr. Soto:

As requested, we have performed compressive strength tests on four cube samples which we received on November 27, 1991, at our Denver laboratory. This testing was performed in general accordance with ASTM C579-82, "Compressive Strength of Chemical-Resistant Mortars, Grouts, and Monolithic Structures", which covers the testing of 2-inch cube specimens. The results of these tests are presented on Table I.

We have also performed Harvard miniature compaction tests on four additional samples, in accordance with ASTM STP 479, "Suggested Method of Test for Moisture-Density Relations of Soils Using Harvard Compaction Apparatus". Based on the results of these tests, we remolded specimens for testing in general accordance with ASTM D2166-85, "Unconfined Compressive Strength of Cohesive Soil". The results of these tests are presented on Table II.

If you have any questions regarding this submittal or if we can be of further assistance, please call.

Sincerely,

Chen-Northern, Inc.

Sally K. Miller, E.T.
Laboratory Manager

Rev. by: DAG
SKM/kd
Enclosures

HIH

CHEN-NORTHERN, INC.

TABLE I
SUMMARY OF LABORATORY TEST RESULTS - CUBES

JOB NO. 1 156 92

DECEMBER 16, 1991

Sample No.	Compressive Strength, psi
OP-I-3-4	335
OP-II-1-4	185
OP-II-2-4	225
OP-II-3-1	125

CHEN-NORTHERN, INC.

TABLE II
SUMMARY OF LABORATORY TEST RESULTS
REMOLDED SPECIMENS

JOB NO. 1 156 92

DECEMBER 16, 1991

Sample No.	OP-II-4-2	OP-II-6-2	OP-III-5-2	OP-III-6-2
Optimum Moisture Content, %*	35.5	32.2	33.2	32.3
Maximum Dry Density, pcf*	81.3	86.6	86.8	86.8
Remolded Moisture Content, %**	30.3	30.9	32.9	31.6
Remolded Dry Density, pcf	81.6	83.2	82.5	84.4
Percent Compaction	100.4	96.1	95.0	97.2
Unconfined Compressive Strength, psi	59.5	42.6	31.8***	35.8

* Determined from Harvard Miniature Compaction Test

** Because of the small volume of soil available, it was difficult to accurately determine the moisture content of the specimens prior to remolding. The moisture contents reported here are based on the entire specimen after testing for unconfined compressive strength, and they reflect the most accurate measure of the final moisture contents of the specimens.
Since they are, for the most part, drier than the optimum moisture contents, the densities, and therefore the compactions, are greater than requested.

*** Although it was necessary to re-use material for the Harvard compaction tests and the unconfined tests, we did not re-use any material that had been oven-dried (for purposes of determining moisture content). Each sample, therefore, decreased in useable volume as testing proceeded. In the case of Sample No. OP-III-5-2, the unconfined test was necessarily performed on a shorter specimen due to this fact.

Chen Northern, Inc.

Consulting Engineers and Scientists

96 South Zuni Street
Denver Colorado 80223

303 744-7105
303 744-0210 Facsimile

March 12, 1992

Mr. Rafael Soto
Waste Technologies Group, Inc.
100 Crescent Centre Parkway, Suite 200
Atlanta, Georgia 30084

Subject: Laboratory Testing of Submitted Samples of Solidified Sludge From Weldon Spring Site

Job No. 1 156 92, Part 2

Dear Mr. Soto:

As requested, we have performed hydraulic conductivity tests on two cube samples labeled "OP-II-1-1" and OP-III-6-3" which we received on February 5, 1992, at our Denver laboratory. This testing was performed in accordance with ASTM D 5084-90, and the results are presented on Table I. In addition, we have collected five 10 ml specimens of hydraulic conductivity test effluent from Sample No. OP-II-1-1. These specimens were preserved with nitric acid to a pH of less than 2 and sent to Mr. Skip Cloninger with EcoTek/LSI in Atlanta, Georgia. The hydraulic conductivity test had been in progress for four days when the collection of effluent was initiated.

We have also performed a consolidation test on a remolded specimen from Sample No. OP-III-6-2, which we also received on February 5, 1992. This specimen was remolded to 95% of the maximum dry density at optimum moisture content as determined by the Harvard miniature compaction test. Testing was performed in accordance with ASTM D 2435-90. The loading schedule was specified by Mr. Serban Grozescu of MK-Ferguson Company. Pressures of 250 psf to 2,000 psf were applied for 24 hours, whereas pressures from 4,000 psf to 64,000 psf were applied for 48 hours to better define the end-of-primary consolidation. These test results are presented on Tables I and II and on Figs. 1 through 5, enclosed.

The total weight of Sample No. OP-III-6-2, as received, was 876.5 g at a moisture content of 59.2% (large bag), and 167.6 g at a moisture content of 49.2% (small bag).

If you have any questions regarding this submittal or if we can be of further assistance, please call.

Sincerely,

Chen-Northern, Inc.

Sally K. Miller, E.T.
Laboratory Manager

Rev. by: DAG
SKM/kd
Enclosures

CHEN-NORTHERN, INC.

TABLE I

' OF PERMEABILITY TEST RESULTS

Job No. 1 156 92
March 12, 1992

al le , cc	B-Parameter After Saturation	Final Moisture Content, %	Final Dry Density, pcf	* Final Saturation,%	Coefficient of Permeability, cm/sec
30	0.98	77.0	53.9	97.8	2.7×10^{-7}
38	0.96	58.4	64.2	96.9	7.5×10^{-6}

ity of 2.70.

CHEN-NORTHERN, INC.

TABLE I

: OF PERMEABILITY TEST RESULTS

Job No. 1 156 92
March 12, 1992

al le , cc	B-Parameter After Saturation	Final Moisture Content, %	Final Dry Density, pcf	* Final Saturation,%	Coefficient of Permeability, cm/sec
30	0.98	77.0	53.9	97.8	2.7×10^{-7}
38	0.96	58.4	64.2	96.9	7.5×10^{-6}

ity of 2.70.

Waste Technologies Group, Inc.

WTG92.137

April 2, 1992

Ms. Marj Wesely
MK-Ferguson Company
Weldon Spring Site Remedial Action Project
7295 Hwy 94 South
St. Charles, MO 63304

Dear Marj:

Please find enclosed the report from EcoTek LSI for As and U analyses on leachates from permeability Samples obtained by Chen-Northern from sample OP-II-1-1.

Should you have any questions, please contact me.

Sincerely,

Rafael Soto
Director of Business Development

RS/pbs

Encl.

EcoTek LSI
EcoTek Laboratory Services Incorporated

3342 International Park Drive, S.E.
Atlanta, Georgia 30341
(404) 244-0827
Fax #(404) 243-5555

April 1, 1992

Mr. Raphael Soto
Waste Technology Group, Inc.
100 Crescent Centre Parkway
Suite 200
Tucker, GA 30084

Dear Mr. Soto:

Enclosed along with this letter are the hard copy results for the sample(s) received March 18, 1992. This information was faxed to you today.

Please contact Tara Pipes at (404)244-0827 if you have any questions. Also, please refer to LSDG number 1464K (2210) in future correspondence.

Sincerely,

ECOTEK LABORATORY SERVICES, INC.

Donald L. Dihel
Quality Assurance Manager

Tara L. Pipes
Assistant Laboratory Manager

Enclosures.
DLD/TLP/cjm

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR METALS ANALYSIS
Method SW-846

Client: WTG

Project/Case: (Job# 1-156-92) OP-II-1-1

LSDG: 1464K

Sample(s): 1464K01, 1464K02, 1464K03, 1464K04, 1464K05

- **Analysis** - Metals analysis was performed on five water samples. Samples were prepared and analyzed according to SW-846. The following method and instrument was used for analysis:

Analysis	Instrument	Method
GFAA	TJA GFAA SH-22	7060

- **QA/QC** - All appropriate QC data was within acceptable control limits.
- **General Discussion** - None to report.
- **Analytical Difficulties** - Due to extremely limited sample volume all samples were prepared at five-fold dilutions raising the detection limit by GFAA from 0.003 mg/L to 0.015 mg/L.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Trace Metals Analytical Results
Method SW-846

Client: WTG
Lab Sample ID: 1464K01
Matrix: Water

Client Sample No.: #1
Client Reference No.: OP-II-1-1
Date Received: March 18, 1992

Analyte	Date Analyzed	Dilution Factor	Result mg/L	Detection Limit mg/L	Note
Arsenic	3/30/92	5	<0.015	0.015	

* = The Duplicate analysis not within control limits.
N = The Matrix spike sample recovery was outside of control limits.
E = The ICP serial dilution result exceeded control limit, indicating a possilbe interference.
B = The Analyte was observed in the preparation blank as well the sample, indicating a possible/probable contamination and warns the data user to take appropriate action.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Trace Metals Analytical Results
Method SW-846

Client: WTG
Lab Sample ID: 1464K02
Matrix: Water

Client Sample No.: #2
Client Reference No.: OP-II-1-1
Date Received: March 18, 1992

Analyte	Date Analyzed	Dilution Factor	Result mg/L	Detection Limit mg/L	Note
Arsenic	3/30/92	5	<0.015	0.015	

* = The Duplicate analysis not within control limits.
N = The Matrix spike sample recovery was outside of control limits.
E = The ICP serial dilution result exceeded control limit, indicating a possilbe interference.
B = The Analyte was observed in the preparation blank as well the sample, indicating a possible/probable contamination and warns the data user to take appropriate action.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Trace Metals Analytical Results
Method SW-846

Client: WTG
Lab Sample ID: 1464K03
Matrix: Water

Client Sample No.: #3
Client Reference No.: OP-II-1-1
Date Received: March 18, 1992

Analyte	Date Analyzed	Dilution Factor	Result mg/L	Detection Limit mg/L	Note
Arsenic	3/30/92	5	<0.015	0.015	

* = The Duplicate analysis not within control limits.
N = The Matrix spike sample recovery was outside of control limits.
E = The ICP serial dilution result exceeded control limit, indicating a possilbe interference.
B = The Analyte was observed in the preparation blank as well the sample, indicating a possible/probable contamination and warns the data user to take appropriate action.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Trace Metals Analytical Results
Method SW-846

Client: WTG
Lab Sample ID: 1464K04
Matrix: Water

Client Sample No.: #4
Client Reference No.: OP-II-1-1
Date Received: March 18, 1992

Analyte	Date Analyzed	Dilution Factor	Result mg/L	Detection Limit mg/L	Note
Arsenic	3/30/92	5	<0.015	0.015	

* = The Duplicate analysis not within control limits.
N = The Matrix spike sample recovery was outside of control limits.
E = The ICP serial dilution result exceeded control limit, indicating a possilbe interference.
B = The Analyte was observed in the preparation blank as well the sample, indicating a possible/probable contamination and warns the data user to take appropriate action.

EcoTek LSI
EcoTek Laboratory Services Incorporated

Trace Metals Analytical Results
Method SW-846

Client: WTG
Lab Sample ID: 1464K05
Matrix: Water

Client Sample No.: #5
Client Reference No.: OP-II-1-1
Date Received: March 18, 1992

Analyte	Date Analyzed	Dilution Factor	Result mg/L	Detection Limit mg/L	Note
Arsenic	3/30/92	5	<0.015	0.015	

* = The Duplicate analysis not within control limits.
N = The Matrix spike sample recovery was outside of control limits.
E = The ICP serial dilution result exceeded control limit, indicating a possilbe interference.
B = The Analyte was observed in the preparation blank as well the sample, indicating a possible/probable contamination and warns the data user to take appropriate action.

EcoTek LSI
EcoTek Laboratory Services Incorporated

CASE NARRATIVE FOR
TOTAL URANIUM by LASER PHOSPHORIMETRY

Client: WTG

LSDG: 1464K

* The uranium in the sample aliquot is converted to a chloride complex in a hydrochloric acid solution and is loaded onto an anion exchange resin. The uranium chloride complex is attracted to the resin while most other actinide chloride anions are collected in the effluent. The uranium is removed from the resin with dilute HCL.

* The uranium in the prepared sample is analyzed with a kinetic phosphorescence analyzer. The KPA-11 uses a pulsed laser to phosphoresce the uranium in the sample. The phosphorescence is received by the detector and, over a series of time gates, a decay curve is generated. A linear regression is performed on the data and the uranium concentration is determined.

* The following exceptions and/or considerations should be noted for the sample group contained within.

  The samples were analyzed without any dilution, however an interference was observed, in the form of low sample intensities and nonlinear phosphorescence decay curves. To eliminate the interferences a sample dilution was performed. The dilutions resulted in acceptable data, but at the same time elevated the detection limits.

EcoTek LSI
EcoTek Laboratory Services Incorporated

TOTAL URANIUM

Client: WTG
LSDG: 1464K

Client Reference No.: OP-II-1-1
Date Received: 3/18/92

Lab Sample ID	Client Sample ID	Date Analyzed	Analyte	Matrix	Result (pCi/L)	2 Sigma Error (pCi/L)	Detection Limit (pCi/L)
1464K01	#1	3/30/92	Total Uranium	Water	ND	N/A	68
1464K02	#2	3/30/92	Total Uranium	Water	ND	N/A	34
1464K03	#3	3/30/92	Total Uranium	Water	ND	N/A	34
1464K04	#4	3/30/92	Total Uranium	Water	ND	N/A	34
1464K05	#5	3/30/92	Total Uranium	Water	ND	N/A	34

JOB NO.: 1-156-92

SITE NAME: Weldon Spring

PROJECT: Permeability Testing of Solidified Sludge - Sample # OP-II-1-1

SAMPLED BY: Cathy Lanky

Chen Northern, Inc.

CONSULTING ENGINEERS AND SCIENTISTS

ENVIRONMENTAL SERVICES DIVISION

CHAIN OF CUSTODY RECORD

CUSTODY NO.: N/A

PROJ. ENG.: S.K. Miller

CONTACT: C. Lanky / Dave Glater 303-744-7105

SAMPLE NUMBER	DATE	TIME	SAMPLE LOCATION	MATRIX	COMPOSITE OR GRAB	FIELD MEASUREMENTS	NO. OF CONTAINERS	ANALYSIS REQUIRED	REMARKS (PRESERVATION, ETC.)
1	3/5/92	9:18	Effluent from OP-II-1-1 Perm Test	Water		No alpha/gamma detected	1		Nitric Acid
2	3/6/92	10:15					1		
3	3/9/92	8:49					1		
4	3/10/92	9:37					1		
5	3/11/92	14:59					1		

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Sally K. Miller	3/12/92 12:00	
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)

Relinquished by: (Signature)	Date/Time	Received by: (Signature)
UPS	03/16/92 1000	Carolyn S. Pusey
Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Shipped/Delivered:		Date/Time
Remarks:		