

APPENDIX B

**KIBER ENVIRONMENTAL SERVICES, INC. -
NEWTOWN CREEK TREATABILITY STUDY**

**NEWTOWN CREEK TREATABILITY STUDY
FINAL REPORT**

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**NEWTOWN CREEK TREATABILITY STUDY
FINAL REPORT**

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NEWTOWN CREEK TREATABILITY STUDY DRAFT FINAL REPORT

1.0 INTRODUCTION

1.1 TERMS OF REFERENCE

Kiber Environmental Services, Inc. (Kiber) prepared this final report as a presentation of the results for the treatability study conducted for Marcor of Pennsylvania (Marcor). The treatability testing was performed to determine the effectiveness of chemical fixation treatment of contaminated dredged estuarine sediments from the New York / New Jersey Harbor.

1.2 SCOPE OF WORK

Kiber prepared the scope of work for the treatability study based on the information in the Request For Proposal (RFP) number 725024 entitled *Decontaminating Dredged Estuarine Sediments*. In accordance with recommendations from Mr. Jeff Newton of Advanced Chemical Treatment (ACT), the objective of the proposed treatment will be beneficial reuse of the dredged sediment. The scope of work was developed in accordance with this objective.

The scope of work for the treatability study included sample receipt and homogenization, untreated sediment characterization, preliminary chemical fixation and optimization treatment, glovebox volatilization testing, and comprehensive candidate mixture evaluations. Kiber performed chemical and geotechnical evaluations on the treated materials to determine the effectiveness of fixation treatment. Additionally, bulk aliquots of the final treated material were sent to Brookhaven National Laboratory (BNL) for verification testing.

1.3 REPORT ORGANIZATION

This final report presents the sample tracking information, the test methods and protocols, and the test results for analyses and testing conducted throughout the treatability study. Section 2.0 presents information regarding the untreated materials evaluated throughout this study. This section includes information pertaining to untreated material receipt, handling and characterization. The results and testing protocols for all analyses performed on the untreated materials are also presented. All information and results associated with the chemical fixation treatment of the untreated sediment are presented in Section 3.0. Section 4.0 presents the methods and results of final candidate mixture evaluations, including glovebox volatilization studies and final treated material characterizations. Section 5.0 presents a summary of Kiber's Quality Assurance (QA) and Quality Control (QC) procedures for the treatability study. Conclusions of the treatability study are summarized in Section 6.0. Following the main text are tables and photographs from the treatability testing. Appendices are presented at the end of the document and include complete analytical data packages and physical properties data reports.

2.0 TESTING MATERIALS

2.1 OVERVIEW

The testing materials used in a treatability study will directly affect the usefulness of the data generated. As such, it is crucial that representative samples of the site materials are used for the treatability study. This section presents information on the sampling, receipt, handling and characterization of the untreated materials used during the treatability study.

2.2 MATERIAL SAMPLING, RECEIPT AND HANDLING

Brookhaven National Laboratory (BNL) was responsible for sampling of the untreated sediments from the site. On 12 October 1995, two five-gallon buckets of site sediments were received by Kiber. The buckets were labeled NC-951011-21 and NC-951011-22 and were delivered under proper chain of custody (COC) via Federal Express overnight delivery. A copy of the COC has been included as Appendix A. The sample buckets were received inside a Styrofoam liner contained in a cardboard box, with ice packed around the bucket inside the Styrofoam liner. The site sediments inside the buckets were packed in plastic liners.

Upon receipt, each bucket was opened and the headspace in the bucket was monitored for volatile organic compounds using a photoionization detector (PID). The results of this monitoring indicated that the bucket labeled NC-951011-21 had a PID reading of 4 parts per million (ppm), and bucket NC-951011-22 had a PID reading of 2 ppm. After checking the headspace of each bucket for volatile organic emissions, each bucket was closed and placed into refrigerated storage maintained at a temperature of 4 degrees Celsius (°C).

As instructed by Marcor, both buckets were the same material. Prior to initiating the treatability testing, Kiber homogenized the site sediments in the two buckets together to better ensure a homogeneous material. Note that the untreated materials were chilled to 4 °C prior to initiating homogenization to minimize the volatilization of organic compounds. To clarify the homogenization procedure, the site sediments were homogenized by adding small aliquots from each bucket to a large mixing tub. The materials were then manually blended together. Additional aliquots were added and blended until the entire contents of the two buckets were empty. The homogenized material was then placed back into the original containers and returned to refrigerated storage. The untreated Newtown Creek sediment was a black, oily sludge with a noticeable organic odor.

Any large and agglomerated particles were broken into smaller, more manageable sizes during homogenization. For bench-scale testing, Kiber typically removes all particles and debris larger than 0.5 inches in diameter. This process is performed in order to 1) simulate potential full-scale particle size reduction, and 2) ensure that the material is practical for laboratory analysis. Kiber's experience indicates that contaminants are generally concentrated on the fine-grained particles; therefore, laboratory testing on material of less than 0.5 inches in diameter typically presents a worst-case scenario. Oversized materials were not present in the any of the untreated materials. As such, all testing was conducted using the homogenized material without removal of any debris or oversized particles. Photographs following the text illustrate the site sediment during and after homogenization.

Note that the sample of site sediment received for treatability testing from BNL appeared to contain higher levels of organic contaminants than anticipated. However, Marcor and Kiber decided to proceed with treatment of the as-received site material, because the as-received sediments would represent worst case conditions.

2.3 UNTREATED WASTE CHARACTERIZATION

Untreated waste characterization is an essential component of the treatability study. The establishment of the baseline level of contamination is important for comparing and determining the effectiveness of the treatment processes. The characterization analyses allowed Kiber and Marcor to determine the concentrations of compounds in the materials received from BNL and to confirm that the materials were similar to those expected at the site. The following chemical characterization tests were conducted on aliquots of the untreated sediment in accordance with the referenced test method:

Total Volatiles	EPA Method 8260
Total Polycyclic Aromatic Hydrocarbons (PAHs)	EPA Methods 3550/8270A
Total Pesticides	EPA Method 3550/8080
Total Polychlorinated Biphenyls (PCBs)	EPA Method 3550/8080
Total Herbicides	EPA Method 8150
Total Dioxins / Furans	EPA Method M8280
Total TAL Metals	EPA Method 3051/6010A/ 7471
Total Organic Carbon	EPA Method 9060
Material pH	EPA Method 9045

The results of the untreated chemical characterization analyses are presented in Tables 1 through 7. Complete analytical and physical properties data reports are presented in Appendix B. Unless otherwise noted, all chemical and geotechnical analyses on the untreated sediment or the treated materials were performed by Kiber's analytical laboratory. Total dioxins / furans analyses were performed by Triangle Laboratories, Inc. of Durham, North Carolina. Total herbicides and total organic carbon analyses were performed by Analytical Services, Inc., of Norcross, Georgia.

The results of the total volatile analyses are presented in Table 1. A review of the results indicates that only two volatile organic compounds were detected in the site sediment, including acetone at a concentration of 1,900 micrograms per kilogram ($\mu\text{g}/\text{kg}$) and methylene chloride at 6,600 $\mu\text{g}/\text{kg}$. Note that acetone and methylene chloride are common

laboratory contaminants and their presence in the site sediments should be considered with caution.

The results of total polycyclic aromatic hydrocarbon (PAH) analyses are presented in Table 2. The data in this table indicates that the site sediment contained high concentrations of many PAH compounds. The site sediment contained fluoranthene at a concentration of 20,000 $\mu\text{g}/\text{kg}$, pyrene at a concentration of 19,000 $\mu\text{g}/\text{kg}$, and phenanthrene at a concentration of 13,000 $\mu\text{g}/\text{kg}$. The site sediment also contained several other PAH compounds, including acenaphthene, anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, chrysene, fluorene, ideno(1,2,3-cd)pyrene, 2-methylnaphthalene, and naphthalene, at concentrations ranging from 2,000 to 8,500 $\mu\text{g}/\text{kg}$.

Table 3 presents the results of the total pesticide and polychlorinated biphenyls (PCBs) analyses performed on the Newtown Creek sediment. The results presented in this table indicate that only one chlorinated pesticide compound, 4-4'-DDD, was detected in the site sediment at a concentration of 140 $\mu\text{g}/\text{kg}$. The PCBs analyses indicated that two PCB compounds were detected in the site sediment. Aroclor-1242 was detected at a concentration of 2,500 $\mu\text{g}/\text{kg}$ and Aroclor-1260 was detected at 1,600 $\mu\text{g}/\text{kg}$.

The results total herbicide analyses are presented in Table 4. There were no detectable concentrations of herbicides in the untreated site sediment.

Table 5 presents the results of total dioxins and furans analyses. A review of the results in this table indicates that several dioxin and furan compounds were detected in the site sediment. The analytical data received from Triangle Laboratories reported the concentrations of specific analytes as well as total analytes. The Newtown Creek waste contained the following total dioxin compounds: total tetrachlorodibenzo-p-dioxin (TCDD) at a concentration of 0.35 $\mu\text{g}/\text{kg}$; total pentachlorodibenzo-p-dioxin (PeCDD) at 0.94 $\mu\text{g}/\text{kg}$; total hexachlorodibenzo-p-dioxin (HxCDD) at 0.75 $\mu\text{g}/\text{kg}$; and total heptachlorodibenzo-p-dioxin (HpCDD) at 3.53 $\mu\text{g}/\text{kg}$. Additionally, the site sediment contained the specific analyte 1,2,3,4,6,7,8,9-octachlorodibenzo-p-dioxin at a concentration of 19 $\mu\text{g}/\text{kg}$.

The results of furan analyses in Table 5 indicate that the site sediments had the following total analytes: total tetrachlorodibenzofuran (TCDF) at a concentration of 2.73 $\mu\text{g}/\text{kg}$; total pentachlorodibenzofuran (PeCDF) at 4.56 $\mu\text{g}/\text{kg}$; total hexachlorodibenzofuran at 9.36 $\mu\text{g}/\text{kg}$; and total heptachlorodibenzofuran at 6.01 $\mu\text{g}/\text{kg}$. Additionally, the site sediment contained the specific analyte 1,2,3,4,6,7,8,9-octachlorodibenzofuran at a concentration of 4.19 $\mu\text{g}/\text{kg}$.

Total Target Analyte List (TAL) metals analyses on the untreated materials are summarized in Table 6. A review of the data in this table indicates that the site sediments contained several metals at concentrations greater than 1,000 milligrams per kilogram (mg/kg), including aluminum at 17,000 mg/kg, calcium at 9,800 mg/kg, copper at 1,000 mg/kg, iron at 31,000 mg/kg, magnesium at 9,000 mg/kg, potassium at 5,100 mg/kg, sodium at 14,000 mg/kg, and zinc at 1,600 mg/kg. Several of the metals regulated by the Resource Conservation and Recovery Act (RCRA) were detected in the site sediment at concentrations less than 1,000 mg/kg, including barium at 210 mg/kg, chromium at 340 mg/kg, lead at 560 mg/kg, mercury at 3.1 mg/kg, and selenium at 25 mg/kg. Other metals detected in the site sediment included cobalt, manganese, nickel, and vanadium.

Table 7 presents the results of the remaining chemical analyses including total organic carbon (TOC) and material pH. Review of the results in this table indicate that the site sediment exhibited a TOC concentration of 5,700 mg/kg. Material pH analyses of the site sediment was performed in triplicate, with results ranging from 7.10 to 7.42.

Kiber also performed geotechnical testing of the site sediment. Physical properties characterization provides basic information on the handling properties of the untreated sediment. These properties are used to prepare cost estimates and design specifications with regard to full-scale treatment, material excavation, transport and storage. The information generated is critical to making sound engineering decisions. The following analyses were performed in accordance with the referenced methods:

Moisture Content	ASTM D 2216
Bulk Unit Weight / Specific Gravity	ASTM D 5057

The results of the moisture content, bulk unit weight, and bulk specific gravity analyses performed on the site sediments are included in Table 7. The results indicate that the average as-received moisture content of the site sediment was 194%, calculated on a dry weight basis. The bulk unit weight of the untreated sediment was 71 pounds per cubic foot (lbs/ft³), and the bulk specific gravity was 1.1.

3.0 CHEMICAL FIXATION TREATMENT

3.1 OVERVIEW

The initial phase of the Newtown Creek treatability study was designed to determine the relative effectiveness of chemical fixation treatment of the contaminated site sediment. At the request of Marcor, Kiber only evaluated proprietary reagents developed by Advanced Chemical Treatment, Inc. (ACT) of Ithaca, New York. Typically, proprietary reagents attempt to treat the contaminants through fixation, a process which chemically alters the form of the contaminant, thereby destroying the contaminant or transforming it to a form less susceptible to leaching. The proprietary reagents and reagent concentrations for treatment evaluations were specified by Mr. Jeff Newton of ACT based on 1) his experience treating similar waste materials, and 2) the results of the untreated characterization analyses. Note that all treatment outlined by Mr. Jeff Newton was authorized by Ms. Karen Hartley of Marcor prior to verification of the treatment process.

3.2 BLENDING TECHNIQUES AND SAMPLE FORMATION

Kiber developed a total of 5 mixtures, specified by Mr. Jeff Newton, to treat the sediment during the chemical fixation treatment phase of the study. The proprietary reagents evaluated included SWT-27T, SWT-27, SWT-25, and SWT-23. The blending process implemented for the treatability study was a cost-effective process intended to mimic full-scale processes as much as possible on the laboratory scale. This laboratory procedure was modified as necessary to simulate the potential full-scale application of the treatment process.

Table 8 summarizes the mixtures developed for the chemical fixation treatment phase of the treatability study. This table includes Kiber's sample number, the untreated material type, the reagent type, the reagent addition rate and the water addition rate.

Each mixture was developed by placing an aliquot of the untreated site sediment into a blending chamber. A slurry of reagent and water was added to the untreated material and blended at a rate of approximately 40 to 60 rotations per minute (rpm) until visually homogeneous, a period of approximately 3 minutes. The reagent / water slurry was formed by adding the specified percentage of water to the percentage of reagent prior to blending with the untreated sediment. Potable tap water was used for all the mixtures since distilled or deionized water is not practical for use in full-scale remediation. Photographs following the text illustrates Kiber's bench-scale stabilization testing equipment and show examples of treated materials.

The percent reagent and water are based on the initial weight of the untreated aliquot. To clarify, in a mixture with 20 percent reagent and 25 percent water, 40 grams of reagent were slurried with 50 grams of water and added to 200 grams of untreated sediment. All reagent and water addition rates were specified by ACT.

During mixture preparation, volatile organic emissions were monitored using a PID meter. The volatile organic emissions monitoring was performed with a HNu Model 101 photoionization detector (PID). The instrument was secured over the treatment chamber and organic emission readings were recorded approximately every 15 seconds for the duration of the treatment. The temperature increase in the materials due to addition and hydration of the reagents was determined using a digital temperature probe. PID and temperature monitoring was performed before and during the blending process and continued for several minutes after the completion of the mixture development. The results of this monitoring, including the initial and maximum values obtained, are presented in Table 8. The results in this table indicate that the mixtures exhibited low levels of volatile organic emissions, with readings at 0.2 ppm for all mixtures. Maximum temperatures for the mixtures ranged from 26.0 °C for mixture 1397-005, developed with 12.5% SWT-23, to 30 °C for mixture 1397-002, developed with 20% SWT-27.

After mixture development, the treated materials were compacted into cylindrical sample molds and were allowed to cure for 7 days in an oven maintained at a temperature of 47 °C.

The treated materials were cured in an oven to simulate potential full-scale conditions. It is ACT's experience that full-scale stockpiled materials will generate high heats of hydration due to the chemical fixation reaction. Although temperature increases were observed during the laboratory evaluations, experience indicates that higher temperatures will be achieved during full-scale treatment due to significantly larger material quantities. Heat generated during laboratory testing dissipates relatively quickly due to small sample volumes. Oven curing attempts to simulate the higher and more sustained temperature increases anticipated during full-scale treatment.

3.3 TREATMENT EVALUATIONS

The initial chemical fixation phase of the treatability study was designed to evaluate several proprietary reagents developed by ACT for treatment of the Newtown Creek site sediment. In order to determine the relative effectiveness of the different treatment reagents, Kiber evaluated the treated materials for a variety of testing parameters, including penetrometer strength, volumetric expansion, and chemical analyses.

During curing, penetrometer analyses were conducted on each of the treated materials at cure times of 1, 2, 3 and 7 days. This is a screening test to estimate the setting and strength properties of the treated materials. Testing was conducted using a Humboldt Pocket Penetrometer. The results of the penetrometer strength analyses and volumetric expansion testing are presented in Table 9. The results in this table indicates that four of the treated materials, including mixtures 1297-001 through 1397-004, achieved penetrometer strengths greater than 4.5 tons per square foot (tons/ft²) after 7 days of curing. Mixture 1397-005, developed with 12.5% SWT-23, exhibited a penetrometer strength of 0.5 tons/ft² after 7 days of curing.

The volumetric expansion due to addition of the treatment reagents was determined after 7 days of curing. This testing was performed by compacting a pre-weighed aliquot of untreated sediment into a cylindrical sample mold. The volume of the untreated sediment was

measured and recorded. The untreated sediment was then removed from the mold, and treated in accordance with the previously outlined protocols. Upon completion of the treatment process, the material was again compacted into the same type of sample mold and allowed to cure for a period of 7 days. After completion of the 7-day cure, the volume of the treated material was measured and recorded. The percent volumetric expansion or shrinkage was determined based on the following equation: $[(\text{Final Volume} - \text{Initial Volume}) / \text{Initial Volume}] * 100$.

The results of volumetric expansion analyses are also presented in Table 9. The results in this table indicate that the volumetric expansion of the treated materials due to the addition of the treatment reagents ranged from -1 to +27%. Mixture 1397-003, developed with 20% SWT-25, and mixture 1397-004, developed with 25% SWT-23, exhibited the highest volumetric expansions, with results ranging from 22 to 27%, respectively. The other three mixtures had volumetric expansions that were much lower, ranging from -1 to +3%. A negative result for volumetric expansion indicates a reduction in volume of the treated material.

Upon completion of the 7 day curing period, Kiber sampled aliquots of each treated mixture for the following analyses in accordance with the referenced methods:

Total Polycyclic Aromatic Hydrocarbons (PAHs)	EPA Method 3550/8270A
Total Polychlorinated Biphenyls / Pesticides	EPA Method 3550/8080
Total Herbicides	EPA Method 8150
Total TAL Metals	EPA Methods 3051/6010A/ 7471
Material pH	EPA Method 9045

The results of these analyses are presented in Tables 10 through 14. Complete analytical data sheets are presented in Appendix C.

The results of total PAHs analyses performed on the treated materials are presented in Table 10. A review of the results in this table indicate that the chemical fixation treatment process successfully reduced the concentration of total PAHs in the site sediment. Specifically, the

concentration of every PAH compound detected in the untreated sediment was reduced in all treated materials. For example, fluoranthene was detected in the untreated sediment at a concentration of 20,000 $\mu\text{g}/\text{kg}$, while its concentration in the treated materials ranged from 6,300 to 8,500 $\mu\text{g}/\text{kg}$. Pyrene was detected at a concentration of 19,000 $\mu\text{g}/\text{kg}$ in the untreated site sediment and at concentrations ranging from 6,600 to 8,700 $\mu\text{g}/\text{kg}$ in the treated materials. In general, mixture 1397-003, developed with a 20% addition of SWT-25, achieved the greatest reduction of total PAH concentrations.

There were some PAHs detected in the treated materials, such as acenaphthylene, benzo(k)fluoranthene and dibenzofuran, that were not detected in the untreated site sediment. Kiber believes that these compounds were present in the untreated site sediment, however, because of their relatively low concentrations and the dilutions necessary to analyze the site sediment, these compounds were not detected at the detection limits reported. All treated material were able to be analyzed for total PAHs with lower detection limits, and therefore these compounds were detected.

The results of the pesticides / PCBs analyses performed on the treated materials are presented in Table 11. A review of the pesticides results in this table indicates that the treated materials exhibited low concentrations of total pesticides. The pesticide compound 4,4'-DDD, which was the only pesticide detected in the site sediment, was not detected in the treated material. Aldrin was detected at concentrations ranging from 76 to 91 $\mu\text{g}/\text{kg}$ for three mixtures, and 4,4'-DDE was detected at a concentration of 110 $\mu\text{g}/\text{kg}$ in mixture 1397-005.

The results of total PCBs analyses on the treated materials are also presented in Table 11. The results in this table indicate that the total PCB concentrations were reduced for all treated materials. Aroclor-1248 was detected in the site sediment at a concentration of 2,500 $\mu\text{g}/\text{kg}$ and at concentration ranging from 860 to 1,000 $\mu\text{g}/\text{kg}$ in the treated materials. Aroclor-1260 was detected in the site sediment at a concentration of 1,600 $\mu\text{g}/\text{kg}$ and in the treated materials at concentrations ranging from 220 to 690 $\mu\text{g}/\text{kg}$. Mixture 1397-003, developed with 20% SWT-25, exhibited the lowest concentrations for both PCBs. This treated material

had a total Aroclor-1242 concentration of 860 $\mu\text{g}/\text{kg}$ and a total Aroclor-1260 concentration of 220 $\mu\text{g}/\text{kg}$.

Table 12 summarizes the results of the total herbicides analyses performed on the treated materials. The results of these analyses indicate that, like the results of the untreated analyses, there were no detectable concentrations of herbicides in the treated materials.

The results of the total TAL metals analyses are presented in Table 13. A review of the data indicates varying results. The concentrations of some metals, such as chromium, copper, lead, mercury, nickel, selenium, and zinc, were lower in the treated materials than in the untreated sediment. For example, lead was present in the untreated sediment at a concentration of 560 mg/kg and in the treated materials at concentrations ranging from 310 to 470 mg/kg . The results of the metals analyses also indicates that some metals, such as aluminum, calcium, magnesium, and manganese, were present in the treated materials at greater concentrations than in the untreated sediment. However, these metals are commonly found in chemical fixation treatment reagents. Kiber believes that the concentrations of these metals in the site materials increased due to the addition of the treatment reagents. Unlike the results of the organic analyses, there was no clear trend in the total metals results which indicated that one mixture exhibited lower total metals concentrations compared to the other mixtures.

Table 15 contains the results of material pH analyses performed on the treated materials. The data in this table indicates that pH values of the treated materials ranged from 9.98 to 11.27. The pH values of all treated materials were higher than the pH values of the untreated material, which exhibited an average pH of 7.41. The pH values for all treated material were less than 12.

4.0 CANDIDATE MIXTURE EVALUATIONS

4.1 OVERVIEW

In order to further evaluate chemical fixation treatment of the site sediment, Kiber developed a candidate treatment mixture selected by Marcor. This final mixture was then evaluated for a series of treatment evaluations, including glovebox evaluations and chemical and geotechnical evaluations. Glovebox volatilization studies were performed to estimate the potential for volatile emissions occurring during application of the chemical fixation treatment process.

Final candidate mixture evaluations were performed on one mixture design selected by Marcor. This mixture was selected based on the results of chemical fixation for each of the untreated material types. The mixture selected for final evaluations was 1397-003, which was developed with a 20% addition of SWT-25. This mixture was judged to be the most successful mixture at reducing contaminant concentrations in the site sediment. In order to improve the treatment characteristics, Marcor requested that SWT-25 be evaluated at the higher addition rate of 25%. Therefore, the candidate mixture design selected by Marcor for candidate evaluations was the following:

<u>Reagent Type</u>	<u>Addition Rate</u>
SWT-25	25%

This mixture design was evaluated for all further treatability testing, including glovebox volatilization studies, and chemical and geotechnical analyses.

4.2 GLOVEBOX VOLATILIZATION STUDIES

4.2.1 Glovebox Procedure

As part of the final treatment evaluations, Kiber performed glovebox testing on the candidate mixture. Glovebox testing was performed to evaluate the potential for volatile emissions to occur during the chemical fixation treatment process. The glovebox testing was performed in duplicate to evaluate potential variation in the results. All final mixture evaluations performed by Kiber were conducted on samples of the treated materials generated during glovebox testing.

All of the necessary equipment required for treatment was placed into the glovebox, including mixing equipment, digital thermometer, and pre-weighed aliquots of the untreated material, reagents and water. Note that the aliquots of untreated material, reagents and water were sealed in airtight containers inside the glovebox until the actual mixing process began. Once all equipment and materials were inside, the glovebox was sealed from the environment. A PID was attached to a monitoring port on the side of the sealed glovebox. This monitoring unit and the digital thermometer were used for real-time evaluation of the conditions inside the glovebox chamber. Monitoring of temperature and PID was performed throughout performance of each glovebox test. Photographs illustrate the glovebox equipment and procedure.

One end of the glovebox chamber was then connected to a breathing-quality air supply. The air supply was used to purge the chamber prior to initiation of the testing procedure. Air was continuously flushed from the sealed glovebox until contaminant levels inside the glovebox, as measured by PID, were reduced to levels below the laboratory background. Each glovebox was purged for a period of approximately 12 minutes prior to initiation of the treatment procedures.

After purging the chamber, the other end of the glovebox was connected to a series of air sampling cartridges and an air pump. The sampling port had three carbon cartridges in series connected to an air pump running at 3 liters per minute (Lpm). The carbon cartridges utilized

during the volatilization study were 8 mm in diameter and 110 mm in length. Each cartridge contained 600 mg of coconut based charcoal. These carbon cartridges were used for the analysis of total volatile organics.

In order to reduce the likelihood of laboratory contamination entering the glovebox and becoming trapped on the carbon cartridges, the inflow to the glovebox was kept slightly higher than the outflow. As such, a slight positive pressure was maintained within the glovebox based on an inflow rate of 4 Lpm and an outflow rate of 3 Lpm. The air supply was used to flush any volatile organic compounds (VOCs) from the chamber and onto the sampling cartridges.

Once the carbon cartridges were attached to the pumps, mixing began according to previously outlined protocols. The mixing procedure was performed in one single batch within each glovebox. Treatment was performed by placing a pre-weighed 1,000 gram aliquot of untreated material into a blending chamber. The material was then blended at a rate of approximately 40 to 60 revolutions per minute (rpm) for approximately 3 minutes.

At the completion of the treatment process, the treated materials were placed into glass sample jars for curing. The lids were not placed on the jars, and the treated materials remained open to the glovebox for the duration of the testing procedure. Glovebox monitoring continued at regular intervals for PID and temperature for a period of 120 minutes after termination of mixing. Upon completion of the glovebox testing procedure, the carbon cartridges were analyzed for total volatiles in accordance with EPA Method 8260.

As requested by Marcor, Kiber performed the glovebox volatilization testing in duplicate. The duplicate glovebox test was designed to provide Marcor with confirmation data regarding potential volatilization during full-scale treatment. The duplicate was performed under identical conditions as the glovebox test previously described.

Table 15 presents information pertaining to glovebox testing conditions. This table includes mixture development information, the amount of sediment treated, inflow and outflow rates,

total volume of air pumped through each sampling port, and the results of PID and temperature monitoring. This table includes both the final candidate mixture, 1397-006, and the duplicate mixture.

After completion of glovebox testing, the treated materials in the glass containers were allowed to cure in an oven maintained at a temperature of 47 °C for a period of 30 days. Upon completion of the 30 day cure, the treated materials were subjected to a series of analytical and geotechnical evaluations. The results of these evaluations will be discussed in a later section of this report.

Kiber performed an additional glovebox volatilization test to generate three carbon cartridges for analyses by BNL. Glovebox testing was performed under identical conditions as described previously, with three carbon cartridges used to sample the glovebox. The cartridges were sent to BNL on 14 December 1995 via Federal Express overnight delivery. The cartridge samples were sent under COC; a copy of the COC is presented in Appendix D.

4.2.2 Glovebox Testing Results

The results of PID and temperature monitoring are included in Table 15. PID and temperature monitoring was performed continuously throughout each glovebox test. However, due to the low PID readings recorded, only the maximum values obtained for each glovebox test are reported. Both the final mixture and the duplicate produced a maximum PID of 0.6 ppm throughout the glovebox testing. The results of temperature monitoring indicate that the two duplicate mixtures achieved a maximum temperature of 25.0 and 25.6 °C after mixture development. These values represent an increase in temperature of 6.1 and 6.7 °C relative to the untreated temperature of 18.9 °C.

The results of total volatile analyses performed on the carbon cartridges are presented in Table 16. Complete analytical data reports are presented in Appendix E. Table 16 includes the results of analyses performed on each of the three cartridges sampled in series during each glovebox evaluation. Note that the volatile results in these tables are reported as the total weight of each compound, in micrograms (μg), detected in each cartridge. Each carbon

cartridge was labeled "A," "B" or "C" to specify the order in which it was placed in series from the glovebox. For clarification, "A" was closest to the glovebox while "C" was furthest. Each cartridge was analyzed individually to estimate breakthrough of volatilized organic compounds.

A review of the results in Table 16 indicates that methylene chloride and trichloroethene were the primary contaminants detected in the carbon cartridges. These two compounds were the only volatiles detected in every cartridge for both glovebox tests. Trichloroethene was detected at a total amounts of 0.53, 1.5, and 1.9 μg in the "A," "B," and "C" cartridges, respectively, for mixture 1397-006. For the duplicate test, trichloroethene was detected at total amounts of 0.46, 2.8, and 0.33 μg . Methylene chloride was detected at total amounts of 3.9, 7.7, and 9.5 μg in the three cartridges for mixture 1397-006 and at total amounts of 20, 11, and 5.4 μg for the duplicate. Note that methylene chloride is a common laboratory contaminant, and as such, these numbers should be used with caution.

Other compounds detected in at least one of the cartridges for the mixtures include bromodichloromethane, chloroethane, 2-hexanone, 4-methyl-2-pentanone, 1,1,1-trichloroethene, and vinyl acetate.

4.3 FINAL MIXTURE EVALUATIONS

4.3.1 Overview

The primary objective of the final mixture evaluations was to determine the chemical and geotechnical characteristics of the candidate mixture. These evaluations include both total and TCLP analyses, as well as bulk density, moisture content, strength, and permeability testing performed on the final treated materials.

Final mixture evaluations were performed on aliquots of the treated material developed during glovebox testing. Sufficient material was developed for the final mixture to perform all analyses outlined herein. Immediately after glovebox testing, the treated materials were

placed in the glass sample containers and allowed to cure for a total of 30 days in an oven maintained at a temperature of 47 °C.

Penetrometer analyses were conducted on the treated materials at cure times of 1, 2, 3, 7, 14, and 30 days. The volumetric expansion due to addition of the treatment reagents was also determined after 30 days of curing.

After a cure time of 30 days, the final treated material was subjected to extensive treated characterization analyses. At the end of the 30-day cure, aliquots of the treated material was sampled and analyzed by Kiber for the following parameters in accordance with the referenced methods:

Total Volatiles	EPA Method 8260
TCLP Volatiles	EPA Methods 1311/8260
Total Polycyclic Aromatic Hydrocarbons	EPA Methods 3550/8270A
TCLP Semivolatiles	EPA Methods 1311/3510/ 8270A
Total Polychlorinated Biphenyls / Pesticides	EPA Method 3550/8080
TCLP Pesticides	EPA Methods 1311/3510/ 8080
Total Herbicides	EPA Method 8150
TCLP Herbicides	EPA Methods 1311/8150
Total Dioxins / Furans	EPA Method 8290
Total TAL Metals	EPA Methods 3051/6010A/ 7471
TCLP RCRA Metals	EPA Methods 1311/3015/ 6010A/7470
Reactive Cyanide	EPA Method 7.3.3
Reactive Sulfide	EPA Method 7.3.4
Ignitability	EPA Method 1020A
Material pH	EPA Method 9045
Bulk Density	ASTM D 2937
Moisture Content	ASTM D 2216
Unconfined Compressive Strength	ASTM D 2166
Permeability	ASTM D 5084

All analyses were performed by Kiber's analytical laboratory, unless otherwise noted. As discussed previously, total dioxins / furans analyses were performed by Triangle

Laboratories, and total herbicides analyses were performed by Analytical Services, Inc. Additionally, total organic carbon and reactivity analyses on the treated material were performed by Analytical Environmental Services, Inc., of Atlanta, Georgia.

4.3.2 Test Results

The results of the final mixture evaluations performed on mixture 1397-006, the final candidate mixture, are presented in Tables 17 through 29. Complete analytical data and physical properties data reports for all analyses are presented in Appendix E.

The results of penetrometer analyses performed on the mixture are presented in Table 17. Penetrometer analyses are screening tests designed to estimate the strength and setting properties of the treated material. A review of the data in Table 17 indicates that the mixture achieved a penetrometer strength of greater than 4.5 tons per square foot (tons/ft²) after 14 days of curing. The final treated material had a volumetric expansion of 3% due to the treatment process.

The results of the total volatiles analysis performed on the treated material are summarized in Table 18. The results in this table indicate that the treated material contained acetone, methylene chloride, and toluene at concentrations greater than 100 µg/kg. Additional volatile compounds detected in the treated material at concentrations less than 100 µg/kg included 2-butanone, ethylbenzene, 2-hexanone, 4-methyl-2-pentanone, and xylene. The total concentration of acetone and methylene chloride in the treated material was greatly reduced compared to the untreated sediment. Acetone was reduced from 1,900 µg/kg to 110 µg/kg, and methylene chloride was reduced from 6,600 µg/kg to 190 µg/kg.

The results of TCLP volatiles analyses are presented in Table 19. None of the volatile compounds detected exceeded applicable TCLP regulatory limits. The results in this table indicate that the treated material leached several volatile compounds, including acetone at a concentration of 18 µg/L, 2-butanone at 46 µg/L, and methylene chloride at 13 µg/L. Additional volatile compounds detected at concentrations less than 10 µg/L included chloroform, 2-hexanone, 4-methyl-2-pentanone, toluene, and xylene.

Table 20 presents the results of total PAH analyses performed on the treated material. A review of the results in this table reveal that the treatment process reduced the total concentrations of all PAHs detected in the untreated sediment. These results correspond with the results of total PAH analyses performed on the treated materials during the preliminary fixation phase of the treatability study. In fact, the total PAH concentrations for the final mixture are generally lower than the total PAH concentrations for the preliminary mixture, 1397-003, which was also developed with SWT-25. For example, fluoranthene was detected at a concentration of 20,000 $\mu\text{g}/\text{kg}$ in the untreated sediment, 6,300 $\mu\text{g}/\text{kg}$ in 1397-003, and 3,800 $\mu\text{g}/\text{kg}$ in 1397-006. Pyrene was detected at a concentration of 19,000 $\mu\text{g}/\text{kg}$ in the untreated sediment, 6,600 $\mu\text{g}/\text{kg}$ in mixture 1397-003, and 3,400 $\mu\text{g}/\text{kg}$ in mixture 1397-006. The preliminary mixture, 1397-003, was developed with 20% addition of SWT-25 and was analyzed after a 7 day cure. The final mixture 1397-006 was developed with 25% was developed with 25% SWT-25 and analyzed after a 30 day cure. Kiber cannot determine if the improved results in the final mixture were due to the increased reagent addition rate, the longer cure time, or a combination of these factors.

The results of TCLP semivolatiles analyses performed on the final treated material are presented in Table 21. The treated material did not exceed TCLP regulatory limits for any semivolatile compound. The results in this table indicate that several semivolatile compounds leached from the treated material, including benzoic acid at 120 $\mu\text{g}/\text{L}$, benzyl alcohol at 17 $\mu\text{g}/\text{L}$, 3,4-methylphenol at 10 $\mu\text{g}/\text{L}$, n-nitroso-di-n-propylamine at 18 $\mu\text{g}/\text{L}$, and phenol at 39 $\mu\text{g}/\text{L}$. Additional semivolatile compounds detected at concentrations less than 10 $\mu\text{g}/\text{L}$ include acenaphthene, bis(2-ethylhexyl)phthalate, 2-methylnaphthalene, and naphthalene.

The results of the total pesticides and PCBs analyses are summarized in Table 22. The data in this table indicates that there were no pesticides detected in the final treated material. The results of PCBs analyses indicates that Aroclor-1242 was detected at a concentration of 2,000 $\mu\text{g}/\text{kg}$, Aroclor-1254 was detected at a concentration of 1,800 $\mu\text{g}/\text{kg}$, and Aroclor-1260 was detected at a concentration of 930 $\mu\text{g}/\text{kg}$.

Table 23 presents the results of TCLP pesticides performed on mixture 1397-006. The results indicate that there were no detectable concentrations of pesticides in the TCLP leachate for the final treated material. The treated material did not exceed TCLP regulatory limits for any pesticide. TCLP PCBs were not analyzed because they are not included in TCLP regulations.

Tables 24 and 25 summarize the results of total and TCLP herbicides analyses performed on the final mixture. The results in these two tables indicate that there were no detectable concentrations of total or TCLP herbicides. Note that only 2,4-D and 2,4,5-TP (Silvex) were analyzed in the TCLP leachate because these two compounds are the only herbicides regulated by TCLP.

The results of total dioxins and furans analyses performed on mixture 1397-006 are presented in Table 26. The results in this table indicate that, in general, total concentrations of most dioxins and all furans in the site sediment were reduced by the treatment process. Total dioxin analytes detected in the treated material included total hexachlorodibenzo-p-dioxin (HxCDD) at a concentration of 3.07 $\mu\text{g}/\text{kg}$ and total heptachlorodibenzo-p-dioxin (HpCDD) at a concentration of 8.05 $\mu\text{g}/\text{kg}$. Total furan analytes detected in the treated materials included total tetrachlorodibenzofuran (TCDF) at a concentration of 0.445 $\mu\text{g}/\text{kg}$; total pentachlorodibenzofuran (PeCDF) at 0.92 $\mu\text{g}/\text{kg}$; total hexachlorodibenzofuran at 1.31 $\mu\text{g}/\text{kg}$; and total heptachlorodibenzofuran at 2.25 $\mu\text{g}/\text{kg}$.

The results of total TAL metals analyses performed on the treated material are summarized in Table 27. The results in this table reveal similar results as the preliminary treated materials. Some metals, such as chromium, copper, lead, mercury, nickel, selenium, and zinc, had lower concentrations in the treated material than in the untreated sediment. However, some metals, such as calcium, magnesium, and manganese, were present in the treated material at greater concentrations than in the untreated sediment.

Table 28 presents the results of TCLP metals analyses. Note that for the TCLP metals analyses, only those metals specified as RCRA (Resource Conservation Recovery Act) metals

were analyzed for the treated material because these are the only metals regulated by TCLP. The results in Table 28 indicate that barium, chromium, mercury, and silver were present in the leachate from the final mixture. All metals detected were present at concentrations less than 1.0 mg/L, and all metals were present at concentrations less than applicable TCLP regulatory limits.

The results of additional analyses performed on the treated material, including total organic carbon (TOC), material pH, reactive cyanide, total sulfide, and physical property evaluations, are presented in Table 29. The results in this table indicate that the treated material had a total organic carbon concentration of 8,800 mg/kg, a material pH of 10.53, a reactive cyanide concentration of 2.5 mg/kg, and a total sulfide concentration of 5.9 mg/kg. Note that total sulfide was initially performed instead of reactive cyanide. As the concentration of total sulfide was lower than the TCLP limit of 500 mg/kg, the sample was not analyzed for reactive sulfide. The treated material did not exceed TCLP limits for reactive cyanide or reactive sulfide.

Table 29 also contains the results of physical properties evaluations performed on the treated material after 30 days of curing. The treated material had a dry-weight moisture content of 5%, a bulk density of 49 lbs/ft³, a bulk specific gravity of 0.8, and an ignitability of greater than 140 °F. The ignitability of the treated material was greater than the TCLP limit of 140 °F.

The results of unconfined compressive strength testing (UCS) are presented in Table 30. The UCS test is a measure of the shear strength of a soil-like material under unsaturated and undrained conditions. All testing was performed on specimens measuring 3.0 inches in diameter and 6.0 inches in height. Before testing, the weight and dimensions were recorded for each test specimen. Each specimen was tested at a strain rate of 1 percent per minute. Testing was terminated at failure of the specimen as defined by ASTM D 2166. To clarify, UCS testing was terminated after achieving the maximum unconfined compressive strength or upon attaining 15 percent strain, whichever occurred first. A review of the results in Table

30 indicates that the treated material exhibited an unconfined compressive strength of 78 pounds per square inch (lbs/in²).

Table 30 also contains the results of permeability testing. Permeability testing was performed to estimate the flow rate of water through the materials under saturated conditions. The hydraulic conductivity of a stabilized waste is an important property, as it indicates the rate at which water will pass through the material. For the Newtown Creek treatability study, Kiber performed permeability testing in duplicate. All testing was performed on specimens measuring 3.0 inches in diameter and approximately 1 to 2 inches in height. Kiber conducted the permeability testing at an effective confining stress of 10 lbs/in². Testing was terminated after achieving stable readings in accordance with the termination criteria outlined in ASTM D 5084. A review of the results in Table 30 indicates that the permeability results for the duplicate samples were 4.2×10^{-5} and 4.6×10^{-5} centimeters per second (cm/sec).

4.3.3 Batch Mixture Development

In addition to the final mixture evaluations performed by Kiber, bulk aliquots of the treated materials were also prepared and sent to BNL for verification testing. Because of the material volume required by BNL, additional material was treated to generate the required quantities. This final batch mixture was performed with identical reagent and water addition rates as the final mixture developed for glovebox testing, and was therefore given the same sample number. Mixture development was performed in accordance with previously discussed mixing protocols. The mixture was developed with a large quantity of site sediment in a large Hobart laboratory blender. As requested by Marcor, bulk quantities of the final treated material were sent to BNL after 30 days of curing. Approximately 6 to 7 kilograms (kg) of the treated material was sent to BNL. The treated material was sent via Federal Express overnight deliver under proper (COC). A copy of the COC is presented in Appendix D.

5.0 QUALITY ASSURANCE / QUALITY CONTROL

Kiber maintains strict Quality Assurance (QA) and Quality Control (QC) programs as part of Kiber's standard operating procedures. The QA/QC program for the Newtown Creek treatability study had two primary objectives; 1) to validate the quality of each analysis conducted in accordance with the referenced protocols, and 2) to evaluate the effectiveness of each treatment process on the chemical treatment of the site soils. The treatability and analytical testing procedures implemented throughout the study were known, tested and approved EPA and ASTM methodologies.

The primary objectives of the treatability QA/QC program were to validate the quality of each analysis and treatment evaluation and to evaluate the effectiveness and variability of the treatment processes on the site soils. These objectives were achieved for treatability testing through 1) calibration of the associated equipment, and 2) supervision and review by qualified technical personnel. All treatability testing was supervised by personnel experienced in both laboratory evaluations and full-scale application of the treatment processes.

All equipment associated with the treatability testing is calibrated on a regular basis, as specified by the manufacturer. Daily monitoring and calibration was also performed on common laboratory equipment including pH meters, ovens, and balances.

The analytical QA/QC program was developed in accordance with EPA's Level III QA/QC standards as outlined in *Preparation Aids for the Development of Category III Quality Assurance Project Plans*. Specifically, the objectives of the QA/QC program were to ensure that the data generated was comparable, accurate, reproducible, valid, and defensible. All QA/QC testing was applied to the initial phase of the Newtown Creek treatability study on a batch-specific basis. The program included analyses of method blanks, duplicates, blank spikes, laboratory control samples, and surrogate recoveries, as appropriate.

Complete QA/QC data is reported with the full data reports presented in each of the referenced appendices. Any sample-specific observations are reported on the appropriate data reports.

6.0 CONCLUSIONS

Kiber performed the Newtown Creek treatability study to evaluate the effectiveness of chemical fixation treatment of dredged estuarine sediments sampled from the New York / New Jersey Harbor. The treatability study involved several phases, including sample receipt and homogenization, untreated sediment characterization, preliminary chemical fixation and optimization treatment, glovebox volatilization testing, and comprehensive candidate mixture evaluations. Proprietary reagents provided by Advanced Chemical Treatment (ACT, Inc.) were evaluated during the study. Based on the results of preliminary treated evaluations, detailed chemical and geotechnical analyses were outlined for treatment performed with 25% addition of SWT-25.

The results of the treatability study indicate that the site sediments can be successfully treated with a 25% addition of SWT-25. Although no specific performance criteria were identified, the final candidate mixture 1) exhibited lower concentrations of organic contaminants, 2) was nonhazardous as defined by TCLP, and 3) exhibited improved physical properties and material handling characteristics.

DISCLAIMER

When performing treatability studies, Kiber Environmental Services, Inc. is typically provided with samples from a given site. These samples usually have been collected by site personnel and are intended to be representative of the site materials. The treatability study, however, is constrained by the accuracy of the samples collected in the field. Since Kiber has no control over sample collection, the results of the study are assumed to be only estimations of the anticipated full-scale results.

Kiber Environmental Services, Inc. has applied its best technical and scientific knowledge to the performance of the work under the economic parameters of the study. The information contained in the report in no way guarantees the same results in full scale adaptation and is only meant to be used as a guideline for operational procedures.

Furthermore, the study period defined by the client limits the evaluation of technologies to a restricted time frame. Kiber can evaluate the technologies based on this time frame; however, Kiber cannot comment on long term effects.

TABLES

**KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 1
Untreated Waste Characterization
Summary of Total Volatile Organic Analyses - EPA Method 8260**

ANALYTICAL PARAMETER	RESULTS (ug/kg)	
	Concentration	PQL
I. TOTAL VOLATILES		
(1) Acetone	1,900 J	6,600
Benzene	-	3,300
Bromodichloromethane	-	3,300
Bromoform	-	3,300
Bromomethane	-	3,300
2-Butanone (Methyl ethyl ketone)	-	6,600
Carbon disulfide	-	3,300
Carbon tetrachloride	-	3,300
Chlorobenzene	-	3,300
Chloroethane	-	6,600
Chloroform	-	3,300
Chloromethane	-	6,600
Dibromochloromethane	-	3,300
1,1-Dichloroethane	-	3,300
1,2-Dichloroethane	-	3,300
1,1-Dichloroethene	-	3,300
1,2-Dichloroethene (total)	-	3,300
1,2-Dichloropropane	-	3,300
cis-1,3-Dichloropropene	-	3,300
trans-1,3-Dichloropropene	-	3,300
Ethylbenzene	-	3,300
2-Hexanone	-	3,300
(1) Methylene chloride	6,600	6,600
4-Methyl-2-pentanone (MIBK)	-	3,300
Styrene	-	3,300
1,1,2,2-Tetrachloroethane	-	3,300
Tetrachloroethene	-	3,300
Toluene	-	3,300
1,1,1-Trichloroethane	-	3,300
1,1,2-Trichloroethane	-	3,300
Trichloroethene	-	6,600
Vinyl Acetate	-	3,300
Vinyl Chloride	-	6,600
Xylene (total)	-	3,300

(1) Values often represent laboratory contamination, and as such, should be considered with caution.

PQL Practical Quantitation Limit

- Non Detectable concentrations

J Estimated Value (less than PQL)

**KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 2
Untreated Waste Characterization
Summary of Total Semivolatile Organic Analyses - EPA Method 8270A**

ANALYTICAL PARAMETER	RESULTS (ug/kg)	
	Concentration	PQL
I. TOTAL PAHs		
Acenaphthene	2,500 J	27,000
Acenaphthylene	-	27,000
Anthracene	7,600 J	27,000
Benzo(a)anthracene	8,500 J	27,000
Benzo(b)fluoranthene	8,100 J	27,000
Benzo(k)fluoranthene	-	27,000
Benzo(g,h,i)perylene	-	27,000
Benzo(a)pyrene	5,000 J	27,000
Chrysene	7,300 J	27,000
Dibenz(a,h)anthracene	-	27,000
Dibenzofuran	-	27,000
Fluoranthene	20,000 J	27,000
Fluorene	3,200 J	27,000
Indeno(1,2,3-cd)pyrene	2,400 J	27,000
2-Methylnaphthalene	2,000 J	27,000
Naphthalene	2,300 J	27,000
Phenanthrene	13,000 J	27,000
Pyrene	19,000 J	27,000

PAH Polycyclic Aromatic Hydrocarbons

PQL Practical Quantitation Limit

- Non Detectable Concentrations

J Estimated Value (less than PQL)

KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY

TABLE 3
Untreated Waste Characterization
Summary of Pesticide / PCB Analyses - EPA Method 8080

ANALYTICAL PARAMETER	RESULTS (ug/kg)	
	Concentration	PQL
I. TOTAL PESTICIDES		
alpha-BHC	-	200
gamma-BHC (Lindane)	-	200
Heptachlor	-	400
Endosulfan I	-	990
Dieldrin	-	200
Endrin	-	400
4,4'-DDD	140 J	400
4,4'-DDT	-	400
Methoxychlor	-	600
beta-BHC	-	200
delta-BHC	-	200
Aldrin	-	200
Heptachlor epoxide	-	400
4,4'-DDE	-	400
Endosulfan II	-	990
Endrin aldehyde	-	400
Endosulfan sulfate	-	990
Endrin ketone	-	400
alpha-Chlordane	-	1,000
gamma-Chlordane	-	1,000
Toxaphene	-	4,000
II. TOTAL PCBs		
Aroclor-1016	-	1,500
Aroclor-1221	-	3,000
Aroclor-1232	-	1,500
Aroclor-1242	2,500	1,500
Aroclor-1248	-	1,500
Aroclor-1254	-	1,500
Aroclor-1260	1,600	1,500

PQL Practical Quantitation Limit

- Non Detectable Concentrations

J Estimated Value (less than PQL)

**KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 4
Untreated Waste Characterization
Summary of Herbicide Analyses - EPA Method 8150**

ANALYTICAL PARAMETER	RESULTS (ug/kg)	
	Concentration	PQL
I. TOTAL HERBICIDES		
2, 4-D	-	165
2, 4-DB	-	610
2, 4, 5-T	-	134
2, 4, 5-TP (Silvex)	-	330
Dalapon	-	3,886
Dicamba	-	181
Dichloroprop	-	436
Dinoseb	-	47
MCPA	-	167,000
MCPD	-	129,000

PQL Practical Quantitation Limit
- Non Detectable Concentrations

**KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 5
Untreated Waste Characterization
Summary of Dioxin / Furan Analyses - EPA Method 8290**

ANALYTICAL PARAMETER	RESULTS (ug/kg)	
	Concentration	PQL
I. DIOXINS RESULTS		
SPECIFIC ANALYTES		
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.08	0.02
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.12	0.05
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	-	0.10
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	0.15	0.08
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	0.25	0.09
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.65	0.16
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	19	0.63
TOTAL ANALYTES		
Total TCDD	0.35	0.02
Total PeCDD	0.94	0.05
Total Hx CDD	0.75	0.10
Total HpCCDD	3.53	0.16
II. FURANS RESULTS		
SPECIFIC ANALYTES		
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.38	0.02
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	0.40	0.03
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.18	0.03
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	2.42	0.09
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	0.70	0.06
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	0.27	0.09
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	-	0.10
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	5.15	0.10
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	0.10	0.18
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	4.19	0.57
TOTAL ANALYTES		
Total TCDF	2.73	0.02
Total PeCDF	4.56	0.03
Total HxCDF	9.36	0.10
Total HpCDF	6.01	0.18

PQL Practical Quantitation Limit
- Non Detectable Concentrations

**KIBER ENVIRONMENTAL SERVICES, INC.
 MARCOR ENVIRONMENTAL
 NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 6
 Untreated Waste Characterization
 Summary of TAL Metals Analyses - EPA Methods 6010A / 7471**

ANALYTICAL PARAMETER	RESULTS (mg/kg)	
	Concentration	PQL
I. TOTAL TAL METALS		
Aluminum	17,000	5.4
Antimony	-	0.35
Arsenic	-	1.1
Barium	210	0.77
Beryllium	-	0.22
Cadmium	-	0.75
Calcium	9,800	28
Chromium	340	0.1
Cobalt	15	0.04
Copper	1,000	0.1
Iron	31,000	19
Lead	560	0.21
Magnesium	9,000	10
Manganese	310	16
Mercury	3.1 J	6.5
Nickel	260	0.06
Potassium	5,100	10
Selenium	25	0.13
Silver	-	0.41
Sodium	14,000	1.1
Thallium	-	1.0
Vanadium	74	0.16
Zinc	1,600	0.27

PQL Practical Quantitation Limit
 - Non Detectable Concentrations
 J Estimated Value (less than PQL)

**KIBER ENVIRONMENTAL SERVICES, INC.
 MARCOR ENVIRONMENTAL
 NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 7
 Untreated Waste Characterization
 Summary of Additional Analyses**

ANALYTICAL PARAMETER	UNIT	RESULTS ⁽¹⁾		
		A	B	C
I. CHEMICAL ANALYSES				
Total Organic Carbon	mg/L	5,700	-	-
Material pH	s.u.	7.10	7.41	7.42
II. PHYSICAL PROPERTIES				
Moisture Content, Dry Basis	%	194	194	195
Bulk Density	lb/ft ³	71	71	71
Bulk Specific Gravity	-	1.1	1.1	1.1

(1) A, B, and C represent multiple aliquots of the untreated material .

- Not analyzed or not applicable.

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NEWTOWN CREEK TREATABILITY STUDY

TABLE 8
Chemical Fixation Treatment
Mixture Development and Monitoring

KIBER SAMPLE No.	REAGENT TYPE	REAGENT ADDITION (1) (%)	WATER ADDITION (1) (%)	MIXTURE MONITORING (2)		
				PID (ppm) (3)		Temperature Increase (°C)
				Initial	Maximum	
1397-001	SWT-27T	20.0	25.0	0.0	0.2	9.2
1397-002	SWT-27	20.0	25.0	0.0	0.2	8.9
1397-003	SWT-25	20.0	24.0	0.0	0.2	5.6
1397-004	SWT-23	25.0	28.8	0.0	0.2	5.6
1397-005	SWT-23	12.5	14.4	0.0	0.2	4.4

- (1) For a mixture with 20% reagent addition and 25% water addition, 40 grams of reagent were slurried with 50 grams of water and added to 200 grams of untreated soil. Reagents were slurried with water before addition to the untreated soil.
- (2) Initial PID and temperature values were obtained prior to mixing. PID and temperature monitoring began during mixing and continued for 30 minutes after mixing.
- (3) PID: Photo Ionization Detector.

**KIBER ENVIRONMENTAL SERVICES, INC.
 MARCOR ENVIRONMENTAL
 NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 9
 Chemical Fixation Treatment
 Mixture Development and Analyses**

KIBER SAMPLE No.	REAGENT TYPE	REAGENT ADDITION (1) (%)	WATER ADDITION (1) (%)	PENETROMETER ANALYSES (tons/ft ²)				VOLUMETRIC EXPANSION (2) (%)
				1 Day	2 Day	3 Day	7 Day	
1397-001	SWT-27T	20.0	25.0	< 0.5	< 0.5	< 0.5	> 4.5	2
1397-002	SWT-27	20.0	25.0	< 0.5	< 0.5	< 0.5	> 4.5	3
1397-003	SWT-25	20.0	24.0	< 0.5	1.0	2.5	> 4.5	22
1397-004	SWT-23	25.0	28.8	< 0.5	< 0.5	< 0.5	> 4.5	27
1397-005	SWT-23	12.5	14.4	< 0.5	< 0.5	0.5	0.5	-1

(1) Percent reagent addition is based on the total weight of the untreated aliquot. For a mixture with 20% reagent addition and 25% water addition, 40 grams of reagent was slurred with 50 grams of water and added to 200 grams of untreated material.

(2) Volumetric expansion was determined after 7 days of curing. A positive value denotes expansion and a negative value denotes volumetric reduction.

KIBER ENVIRONMENTAL SERVICES, INC.
 MARCOR ENVIRONMENTAL
 NEWTOWN CREEK TREATABILITY STUDY

TABLE 10
 Chemical Fixation Treatment
 Summary of Total Semivolatile Organic Analyses - EPA Method 8270
 (Treated Materials)

ANALYTICAL PARAMETER	TESTING RESULTS (ug/kg)												
	Untreated Sludge		1397-001		1397-002		1397-003		1397-004		1397-005		
	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	
I. TOTAL PAHs													
Acenaphthene	2,500 J	27,000	1,200 J	2,600	1,000 J	2,800	740 J	2,800	790 J	2,800	1,000 J	2,900	
Acenaphthylene	-	27,000	580 J	2,600	600 J	2,800	520 J	2,800	580 J	2,800	580 J	2,900	
Anthracene	7,600 J	27,000	2,400 J	2,600	3,200	2,800	2,300 J	2,800	2,500 J	2,800	2,900	2,900	
Benzo(a)anthracene	8,500 J	27,000	3,000	2,600	4,000	2,800	2,900	2,800	3,500	2,800	4,100	2,900	
Benzo(b)fluoranthene	8,100 J	27,000	2,600	2,600	2,800	2,800	3,200	2,800	2,900	2,800	4,400	2,900	
Benzo(k)fluoranthene	-	27,000	870 J	2,600	1,000 J	2,800	3,700	2,800	1,100 J	2,800	-	2,900	
Benzo(g,h,i)perylene	-	27,000	870 J	2,600	1,100 J	2,800	890 J	2,800	1,200 J	2,800	1,300 J	2,900	
Benzo(a)pyrene	5,000 J	27,000	2,000 J	2,600	2,500 J	2,800	1,900 J	2,800	2,400 J	2,800	2,900	2,900	
Chrysene	7,300 J	27,000	3,700	2,600	4,200	2,800	2,800	2,800	3,800	2,800	4,400	2,900	
Dibenz(a,h)anthracene	-	27,000	350 J	2,600	430 J	2,800	390 J	2,800	380 J	2,800	430 J	2,900	
Dibenzofuran	-	27,000	590 J	2,600	670 J	2,800	450 J	2,800	460 J	2,800	690 J	2,900	
Fluoranthene	20,000 J	27,000	6,400	2,600	7,300	2,800	6,300	2,800	7,100	2,800	8,500	2,900	
Fluorene	3,200 J	27,000	720 J	2,600	1,200 J	2,800	830 J	2,800	650 J	2,800	1,300 J	2,900	
Indeno(1,2,3-cd)pyrene	2,400 J	27,000	720 J	2,600	930 J	2,800	730 J	2,800	1,000 J	2,800	1,000 J	2,900	
2-Methylnaphthalene	2,000 J	27,000	900 J	2,600	1,000 J	2,800	830 J	2,800	750 J	2,800	1,000 J	2,900	
Naphthalene	2,300 J	27,000	1,000 J	2,600	1,100 J	2,800	900 J	2,800	910 J	2,800	1,100 J	2,900	
Phenanthrene	13,000 J	27,000	4,700	2,600	5,300	2,800	4,200	2,800	4,200	2,800	5,100	2,900	
Pyrene	19,000 J	27,000	7,100	2,600	8,700	2,800	6,600	2,800	7,500	2,800	8,700	2,900	

PAH Polycyclic Aromatic Hydrocarbons
 PQL Practical Quantitation Limit
 - Non Detectable Concentrations
 J Estimated Value (less than PQL)

KIBER ENVIRONMENTAL SERVICES, INC.
 MARCOR ENVIRONMENTAL
 NEWTOWN CREEK TREATABILITY STUDY

TABLE 11
 Chemical Fixation Treatment
 Summary of Pesticide / PCB Analyses - EPA Method 8080
 (Treated Materials)

ANALYTICAL PARAMETER	TESTING RESULTS (ug/kg)												
	Untreated Sludge		1397-001		1397-002		1397-003		1397-004		1397-005		
	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	
I. TOTAL PESTICIDES													
alpha-BHC	-	200	-	52	-	56	-	58	-	56	-	59	59
gamma-BHC (Lindane)	-	200	-	52	-	56	-	58	-	56	-	59	59
Heptachlor	-	400	-	52	-	56	-	58	-	56	-	59	59
Endosulfan I	-	990	-	52	-	56	-	58	-	56	-	59	59
Dieldrin	-	200	-	100	-	110	-	120	-	110	-	120	120
Endrin	-	400	-	100	-	110	-	120	-	110	-	120	120
4,4'-DDD	140 J	400	-	100	-	110	-	120	-	110	-	120	120
4,4'-DDT	-	400	-	100	-	110	-	120	-	110	-	120	120
Methoxychlor	-	600	-	520	-	560	-	580	-	560	-	590	590
beta-BHC	-	200	-	52	-	56	-	58	-	56	-	59	59
delta-BHC	-	200	-	52	-	56	-	58	-	56	-	59	59
Aldrin	-	200	-	52	76	56	-	58	85	56	91	59	59
Heptachlor epoxide	-	400	-	52	-	56	-	58	-	56	-	59	59
4,4'-DDE	-	400	-	100	-	110	-	120	-	110	-	120	120
Endosulfan II	-	990	-	100	-	110	-	120	-	110	-	120	120
Endrin aldehyde	-	400	-	100	-	110	-	120	-	110	-	120	120
Endosulfan sulfate	-	990	-	100	-	110	-	120	-	110	-	120	120
Endrin ketone	-	400	-	100	-	110	-	120	-	110	-	120	120
alpha-Chlordane	-	1,000	-	52	-	56	-	58	-	56	-	59	59
gamma-Chlordane	-	1,000	-	52	-	56	-	58	-	56	-	59	59
Toxaphene	-	4,000	-	2,600	-	2,800	-	2,900	-	2,800	-	2,900	2,900
II. TOTAL PCBs													
Aroclor-1016	-	1,500	-	520	-	560	-	58	-	560	-	590	590
Aroclor-1221	-	3,000	-	1,000	-	1,100	-	120	-	1,100	-	1,200	1,200
Aroclor-1232	-	1,500	-	520	-	560	-	58	-	560	-	590	590
Aroclor-1242	2,500	1,500	920	520	1,000	560	860	580	910	560	920	590	590
Aroclor-1248	-	1,500	-	520	-	560	-	58	-	560	-	590	590
Aroclor-1254	-	1,500	-	520	-	560	-	58	-	560	-	590	590
Aroclor-1260	1,600	1,500	680	520	670	560	220	58	590	560	690	590	590

PQL Practical Quantitation Limit
 - Non Detectable Concentrations
 J Estimated Value (less than PQL)

KIBER ENVIRONMENTAL SERVICES, INC.
 MARCOR ENVIRONMENTAL
 NEWTOWN CREEK TREATABILITY STUDY

TABLE 12
 Chemical Fixation Treatment
 Summary of Herbicide Analyses - EPA Method 8150
 (Treated Materials)

ANALYTICAL PARAMETER	RESULTS (ug/kg)												
	Untreated Sludge		1397-001		1397-002		1397-003		1397-004		1397-005		
	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	
I. TOTAL HERBICIDES													
2, 4-D	-	165	-	165	-	165	-	165	-	165	-	165	165
2, 4-DB	-	610	-	610	-	610	-	610	-	610	-	610	610
2, 4, 5-T	-	134	-	134	-	134	-	134	-	134	-	134	134
2, 4, 5-TP (Silvex)	-	330	-	330	-	330	-	330	-	330	-	330	330
Dalapon	-	3,886	-	3,886	-	3,886	-	3,886	-	3,886	-	3,886	3,886
Dicamba	-	181	-	181	-	181	-	181	-	181	-	181	181
Dichloroprop	-	436	-	436	-	436	-	436	-	436	-	436	436
Dinoseb	-	47	-	47	-	47	-	47	-	47	-	47	47
MCPA	-	167,000	-	167,000	-	167,000	-	167,000	-	167,000	-	167,000	167,000
MCPP	-	129,000	-	129,000	-	129,000	-	129,000	-	129,000	-	129,000	129,000

PQL Practical Quantitation Limit
 - Non Detectable Concentrations

KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY

TABLE 13
Chemical Fixation Treatment
Summary of TAL Metals Analyses - EPA Methods 6010A / 7471
(Treated Materials)

ANALYTICAL PARAMETER	TESTING RESULTS (mg/kg)												
	Untreated Sludge		1397-001		1397-002		1397-003		1397-004		1397-005		
	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	
I. TOTAL TAL METALS													
Aluminum	17,000	5.4	21,000	2.8	19,000	2.9	21,000	2.8	20,000	3.0	19,000	3.0	3.0
Antimony	-	0.35	-	0.53	-	0.56	-	0.55	-	0.35	-	0.35	0.58
Arsenic	-	1.1	-	0.55	-	0.58	-	0.56	-	0.6	-	0.6	0.59
Barium	210	0.77	230	0.4	220	0.42	330	0.41	230	0.44	240	0.44	0.43
Beryllium	-	0.22	-	0.34	-	0.35	-	0.35	-	0.22	-	0.22	0.37
Cadmium	-	0.75	22	0.39	22	0.41	22	0.4	-	0.43	25	0.43	0.42
Calcium	9,800	28	100,000	14	100,000	15	94,000	15	110,000	16	74,000	16	16
Chromium	340	0.1	240	0.16	230	0.17	230	0.16	200	0.1	270	0.1	0.17
Cobalt	15	0.04	14	0.06	12	0.07	12	0.06	13	0.04	15	0.04	0.07
Copper	1,000	0.1	720	0.15	700	0.16	690	0.15	610	0.1	780	0.1	0.16
Iron	31,000	19	32,000	10	30,000	11	27,000	10	26,000	11	28,000	11	11
Lead	560	0.21	400	0.33	420	0.34	380	0.34	310	0.21	470	0.21	0.35
Magnesium	9,000	10	15,000	4.9	14,000	5.2	14,000	5.1	15,000	5.4	13,000	5.4	5.3
Manganese	310	16	710	8.3	660	8.7	830	8.5	3,200	9.1	2,400	9.1	9.0
Mercury	3.1 J	6.5	2.2 J	4.5	1.2 J	4.8	1.6	5.1	1.8 J	4.9	2.1 J	4.9	4.7
Nickel	260	0.06	180	0.09	180	0.1	170	0.1	150	0.06	200	0.06	0.1
Potassium	5,100	10	4,400	15	3,900	16	4,100	16	4,000	10	4,200	10	16
Selenium	25	0.13	-	0.2	-	0.21	7.5	0.21	9.4	0.13	14	0.13	0.22
Silver	-	0.41	11	0.21	-	0.22	11	0.22	-	0.23	-	0.23	0.23
Sodium	14,000	1.1	7,400	1.7	8,100	1.8	6,500	1.8	6,200	1.1	7,800	1.1	1.8
Thallium	-	1.0	-	0.52	-	0.54	-	0.53	-	0.57	-	0.57	0.56
Vanadium	74	0.16	75	0.24	70	0.25	70	0.25	66	0.16	72	0.16	0.26
Zinc	1,600	0.27	1,200	0.42	1,100	0.44	1,100	0.43	930	0.27	1,300	0.27	0.46

PQL Practical Quantitation Limit
 - Non Detectable Concentrations
 J Estimated Value (less than PQL)

**KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 14
Chemical Fixation Treatment
Summary of Additional Analyses
(Treated Materials)**

KIBER SAMPLE No.	MATERIAL pH (s.u.)
Untreated Sludge (1)	7.41
1397-001	11.27
1397-002	11.18
1397-003	10.44
1397-004	10.71
1397-005	9.98

(1) Result is an average of three separate pH determinations.

**KIBER ENVIRONMENTAL SERVICES, INC.
 MARCOR ENVIRONMENTAL
 NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 15
 Glove Box Volatilization Evaluations
 Mixture Development and Testing Conditions**

KIBER SAMPLE No.	REAGENT TYPE	REAGENT ADDITION (%)	WATER ADDITION (%)	GLOVE BOX TESTING CONDITIONS (2)				Total Volume of Air Through Carbon Cartridges (L)	Initial PID (3),(4) (ppm)	Maximum PID (3),(4) (ppm)	Temperature Increase (3) (°C)
				Weight of Soil Treated (g)	Dry Weight of Soil Treated (g)	Inflow Rate (lpm)	Outflow Rate (lpm)				
1397-006	SWT-25	25	30	1000	340	4	3	360	0.2	0.6	6.1
1397-006 Dup	SWT-25	25	30	1000	340	4	3	360	0.2	0.6	6.7

(1) Percent reagent addition is based on the total weight of the untreated aliquot. For a mixture with 25% reagent addition and 30% water addition, 250 grams of reagent was slurred with 300 grams of water and added to 1000 grams of untreated material.
 (2) The glove bag was flushed with breathing quality air for approximately 12 minutes before the beginning of testing. Glove bag testing began approximately 5 minutes prior to mixing and continued for 120 minutes. The mixture was blended for approximately 3 minutes and was then sampled into glass sample jars.
 (3) Initial PID and temperature readings were taken prior to mixing. Maximum PID and temperature values were obtained when mixing started until 30 minutes after mixing ended.
 (4) PID - Photoionization Detector. The PID monitors for volatile organics.

KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY

TABLE 16
Glovebox Volatilization Evaluations
Summary of Total Volatile Organic Analyses - EPA Method 8260

ANALYTICAL PARAMETER	TESTING RESULTS (ug) (e)												
	TOTAL VOLATILES IN UNTREATED MATERIAL (f)			1397-006			1397-006 Dup			1397-006 Dup			
	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	Conc.	PQL	
I. TOTAL VOLATILES													
(g) Acetone	646	1.5	-	1.5	-	1.5	-	1.5	-	1.5	-	1.5	1.5
Benzene	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
Bromodichloromethane	<1,122	0.86	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
Bromoform	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
Bromomethane	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
2-Butanone (Methyl ethyl ketone)	<2,244	1.5	-	1.5	-	1.5	-	1.5	-	1.5	-	1.5	1.5
Carbon disulfide	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
Carbon tetrachloride	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
Chlorobenzene	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
Chloroethane	<2,244	1.5	3.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Chloroform	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
Chloromethane	<2,244	1.5	-	1.5	-	1.5	-	1.5	-	1.5	-	1.5	1.5
Dibromochloromethane	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
1,1-Dichloroethane	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
1,2-Dichloroethane	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
1,1-Dichloroethene	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
1,2-Dichloroethene (total)	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
1,2-Dichloropropane	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
cis-1,3-Dichloropropene	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
trans-1,3-Dichloropropene	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
Ethylbenzene	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
2-Hexanone	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
(g) Methylene chloride	2,244	3.9	1.5	7.7	1.5	9.5	1.5	1.5	20	1.5	0.32 J	0.75	0.75
4-Methyl-2-pentanone (MIBK)	<1,122	0.17 J	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
Styrene	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
1,1,2,2-Tetrachloroethane	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
Tetrachloroethene	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
Toluene	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
1,1,1-Trichloroethane	<1,122	0.53 J	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
1,1,2-Trichloroethane	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
Trichloroethene	<2,244	0.53 J	-	1.5	1.5	1.9	1.5	1.5	0.46 J	1.5	0.79	0.75	0.75
Vinyl Acetate	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75
Vinyl Chloride	<2,244	1.5	-	1.5	-	1.5	-	1.5	12	1.5	0.33 J	0.75	0.75
Xylene (total)	<1,122	0.75	-	0.75	-	0.75	-	0.75	-	0.75	-	0.75	0.75

(f) The numbers in this column represent the total amount of contaminant present in the aliquot of untreated sediment used for glovebox testing.

(g) Total volatile analyses were performed on three carbon cartridges sampled in series from each glovebox. "A" refers to the first cartridge in series for each mixture, "B" refers to the second cartridge, and "C" refers to the third cartridge.

Results presented indicate the total amount of compound detected in each cartridge.

(h) Values often represent laboratory contamination, and as such, should be considered with caution.

PQL: Practical Quantitation Limit

- Not Detected

J Estimated Value (less than PQL)

KIBER ENVIRONMENTAL SERVICES, INC.
 MARCOR ENVIRONMENTAL
 NEWTOWN CREEK TREATABILITY STUDY

TABLE 17
 Final Mixture Evaluations
 Mixture Development and Analyses

KIBER SAMPLE No.	REAGENT TYPE	REAGENT ADDITION (1) (%)	WATER ADDITION (1) (%)	PENETROMETER ANALYSES (tons/ft ²)						VOLUMETRIC EXPANSION (2) (%)	
				1 Day	2 Day	3 Day	5 Day	7 Day	14 Day		30 Day
1397-006	SWT-25	25	30	< 0.5	< 0.5	0.5	3.0	4.0	> 4.5	> 4.5	3

(1) For a mixture with 2.5% reagent addition and 30% water addition, 50 grams of reagent were slurred with 60 grams of water and added to 200 grams of untreated soil. Reagents were slurred with water before addition to the untreated soil.

(2) Volumetric expansion was determined after 30 days of curing. A positive value denotes expansion and a negative value denotes shrinkage.

**KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 18
Final Mixture Evaluations
Summary of Total Volatile Organic Analyses - EPA Method 8260
(Mixture 1397-006 - 30 Day Cure)**

ANALYTICAL PARAMETER	RESULTS (ug/kg)			
	Untreated Sludge		1397-006	
	Conc.	PQL	Conc.	PQL
I. TOTAL VOLATILES				
(1) Acetone	1,900 J	6,600	110	47
Benzene	-	3,300	-	24
Bromodichloromethane	-	3,300	-	24
Bromoform	-	3,300	-	24
Bromomethane	-	3,300	-	24
2-Butanone (Methyl ethyl ketone)	-	6,600	67	47
Carbon disulfide	-	3,300	-	24
Carbon tetrachloride	-	3,300	-	24
Chlorobenzene	-	3,300	-	24
Chloroethane	-	6,600	-	47
Chloroform	-	3,300	-	24
Chloromethane	-	6,600	-	47
Dibromochloromethane	-	3,300	-	24
1,1-Dichloroethane	-	3,300	-	24
1,2-Dichloroethane	-	3,300	-	24
1,1-Dichloroethene	-	3,300	-	24
1,2-Dichloroethene (total)	-	3,300	-	24
1,2-Dichloropropane	-	3,300	-	24
cis-1,3-Dichloropropene	-	3,300	-	24
trans-1,3-Dichloropropene	-	3,300	-	24
Ethylbenzene	-	3,300	12 J	24
2-Hexanone	-	3,300	11 J	24
(1) Methylene chloride	6,600	6,600	190	47
4-Methyl-2-pentanone (MIBK)	-	3,300	23 J	24
Styrene	-	3,300	-	24
1,1,2,2-Tetrachloroethane	-	3,300	-	24
Tetrachloroethene	-	3,300	-	24
Toluene	-	3,300	100	24
1,1,1-Trichloroethane	-	3,300	-	24
1,1,2-Trichloroethane	-	3,300	-	24
Trichloroethene	-	6,600	-	47
Vinyl Acetate	-	3,300	-	24
Vinyl Chloride	-	6,600	-	47
Xylene (total)	-	3,300	56	24

(1) Values often represent laboratory contamination, and as such, should be considered with caution.

PQL Practical Quantitation Limit

- Non Detectable concentrations

J Estimated Value (less than PQL)

**KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 19
Final Mixture Evaluations
Summary of TCLP Volatile Organic Analyses - EPA Methods 1311/8260
(Mixture 1397-006 - 30 Day Cure)**

ANALYTICAL PARAMETER	TCLP REGULATORY LEVEL (ug/L)	RESULTS (ug/L)	
		Concentration	PQL
I. TCLP VOLATILES			
(1) Acetone	5,000	18	10
Benzene	*	-	5.0
Bromodichloromethane	*	-	5.0
Bromoform	*	-	5.0
Bromomethane	*	-	5.0
2-Butanone (Methyl ethyl ketone)	200,000	46	10
Carbon disulfide	*	-	5.0
Carbon tetrachloride	500	-	5.0
Chlorobenzene	100,000	-	5.0
Chloroethane	*	-	10
Chloroform	6,000	1.0 J	5.0
Chloromethane	*	-	5.0
Dibromochloromethane	*	-	5.0
1,1-Dichloroethane	*	-	5.0
1,2-Dichloroethane	500	-	5.0
1,1-Dichloroethene	700	-	5.0
1,2-Dichloroethene (total)	*	-	5.0
1,2-Dichloropropane	*	-	5.0
cis-1,3-Dichloropropene	*	-	5.0
trans-1,3-Dichloropropene	*	-	5.0
Ethylbenzene	*	-	5.0
2-Hexanone	*	1.2 J	5.0
(1) Methylene chloride	*	13	10
4-Methyl-2-pentanone (MIBK)	*	3.6 J	5.0
Styrene	*	-	5.0
1,1,2,2-Tetrachloroethane	*	-	5.0
Tetrachloroethene	700	-	5.0
Toluene	*	4.6 J	5.0
1,1,1-Trichloroethane	*	-	5.0
1,1,2-Trichloroethane	*	-	5.0
Trichloroethene	500	-	10
Vinyl Acetate	*	-	5.0
Vinyl Chloride	200	-	10
Xylene (total)	*	1.1 J	5.0

(1) Values often represent laboratory contamination, and as such, should be considered with caution.

PQL Practical Quantitation Limit

- Non Detectable concentrations

J Estimated Value (less than PQL)

* No TCLP Regulatory Level

**KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 20
Final Mixture Evaluations
Summary of Total Semivolatile Organic Analyses - EPA Method 8270A
(Mixture 1397-006 - 30 Day Cure)**

ANALYTICAL PARAMETER	RESULTS (ug/kg)			
	Untreated Sludge		1397-006	
	Conc.	PQL	Conc.	PQL
I. TOTAL PAHs				
Acenaphthene	2,500 J	27,000	300 J	1,800
Acenaphthylene	-	27,000	230 J	1,800
Anthracene	7,600 J	27,000	1,100 J	1,800
Benzo(a)anthracene	8,500 J	27,000	1,600 J	1,800
Benzo(b)fluoranthene	8,100 J	27,000	1,300 J	1,800
Benzo(k)fluoranthene	-	27,000	760 J	1,800
Benzo(g,h,i)perylene	-	27,000	540 J	1,800
Benzo(a)pyrene	5,000 J	27,000	1,000 J	1,800
Chrysene	7,300 J	27,000	1,800	1,800
Dibenz(a,h)anthracene	-	27,000	-	1,800
Dibenzofuran	-	27,000	220 J	1,800
Fluoranthene	20,000 J	27,000	3,800	1,800
Fluorene	3,200 J	27,000	-	1,800
Indeno(1,2,3-cd)pyrene	2,400 J	27,000	-	1,800
2-Methylnaphthalene	2,000 J	27,000	320 J	1,800
Naphthalene	2,300 J	27,000	330 J	1,800
Phenanthrene	13,000 J	27,000	2,500	1,800
Pyrene	19,000 J	27,000	3,400	1,800

PAH Polycyclic Aromatic Hydrocarbons

PQL Practical Quantitation Limit

- Non Detectable Concentrations

J Estimated Value (less than PQL)

KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY

TABLE 21
Final Mixture Evaluations
Summary of TCLP Semivolatile Organic Analyses - EPA Methods 1311/8270A
(Mixture 1397-006 - 30 Day Cure)

ANALYTICAL PARAMETER	TCLP REGULATORY LEVELS (ug/L)	TESTING RESULTS (ug/L)	
		Conc.	PQL
I. TCLP SEMIVOLATILES			
Acenaphthene	*	1.2 J	6.7
Acenaphthylene	*	-	6.7
Anthracene	*	-	6.7
Benzo(a)anthracene	*	-	6.7
Benzo(b)fluoranthene	*	-	6.7
Benzo(k)fluoranthene	*	-	6.7
Benzoic Acid	*	120	8.0
Benzo(g,h,i)perylene	*	-	6.7
Benzo(a)pyrene	*	-	6.7
Benzyl Alcohol	*	17	6.7
bis(2-Chloroethoxy)methane	*	-	6.7
bis(2-Chloroethyl)ether	*	-	6.7
bis(2-Chloroisopropyl)ether	*	-	6.7
bis(2-Ethylhexyl)phthalate	*	6.6 J	6.7
4-Bromophenyl-phenylether	*	-	6.7
Butylbenzylphthalate	*	-	6.7
4-Chloroaniline	*	-	6.7
4-Chloro-2-methylphenol	*	-	6.7
2-Chloronaphthalene	*	-	6.7
2-Chlorophenol	*	-	6.7
4-Chlorophenyl-phenylether	*	-	6.7
Chrysene	*	-	6.7
Dibenz(a,h)anthracene	*	-	6.7
Dibenzofuran	*	-	6.7
Di-n-butylphthalate	*	-	6.7
1,2-Dichlorobenzene	*	-	6.7
1,3-Dichlorobenzene	*	-	6.7
1,4-Dichlorobenzene	7,500	-	6.7
3,3-Dichlorobenzidine	*	-	6.7
2,4-Dichlorophenol	*	-	6.7
Diethylphthalate	*	-	6.7
2,4-Dimethylphenol	*	-	6.7
Dimethylphthalate	*	-	6.7
4,6-Dinitro-2-methylphenol	*	-	6.7
2,4-Dinitrophenol	*	-	6.7
2,4-Dinitrotoluene	130	-	6.7

KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY

TABLE 21
Final Mixture Evaluations
Summary of TCLP Semivolatile Organic Analyses - EPA Methods 1311/8270A
(Mixture 1397-006 - 30 Day Cure)

ANALYTICAL PARAMETER	TCLP REGULATORY LEVELS (ug/L)	TESTING RESULTS (ug/L)	
		Conc.	PQL
I. TCLP SEMIVOLATILES			
2,6-Dinitrotoluene	*	-	6.7
Di-n-octylphthalate	*	-	6.7
Fluoranthene	*	-	6.7
Fluorene	*	-	6.7
Hexachlorobenzene	130	-	6.7
Hexachlorobutadiene	500	-	6.7
Hexachlorocyclopentadiene	*	-	6.7
Hexachloroethane	3,000	-	6.7
Indeno(1,2,3-cd)pyrene	*	-	6.7
Isophorone	*	-	6.7
2-Methylnaphthalene	*	1.3 J	6.7
2-Methylphenol	200,000	-	6.7
3,4-Methylphenol	200,000	10	6.7
Naphthalene	*	2.3 J	6.7
2-Nitroaniline	*	-	6.7
3-Nitroaniline	*	-	6.7
4-Nitroaniline	*	-	6.7
Nitrobenzene	2,000	-	6.7
2-Nitrophenol	*	-	6.7
4-Nitrophenol	*	-	6.7
N-Nitrosodiphenylamine	*	-	6.7
N-Nitroso-di-n-propylamine	*	18	6.7
Pentachlorophenol	100,000	-	6.7
Phenanthrene	*	-	6.7
Phenol	*	39	6.7
Pyrene	*	-	6.7
Pyridine	5,000	-	6.7
1,2,4-Trichlorobenzene	*	-	6.7
2,4,5-Trichlorophenol	400,000	-	6.7
2,4,6-Trichlorophenol	2,000	-	6.7

PQL Practical Quantitation Limit
- Non Detectable Concentrations
J Estimated Value (less than PQL)
* No TCLP Regulatory Level

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**KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 22
Final Mixture Evaluations
Summary of Total Pesticides / PCBs Analyses - EPA Method 8080
(Mixture 1397-006 - 30 Day Cure)**

ANALYTICAL PARAMETER	RESULTS (ug/kg)			
	Untreated Sludge		1397-006	
	Conc.	PQL	Conc.	PQL
I. TOTAL PESTICIDES				
alpha-BHC	-	200	-	53
gamma-BHC (Lindane)	-	200	-	53
Heptachlor	-	400	-	53
Endosulfan I	-	990	-	53
Dieldrin	-	200	-	110
Endrin	-	400	-	110
4,4'-DDD	140 J	400	-	110
4,4'-DDT	-	400	-	110
Methoxychlor	-	600	-	530
beta-BHC	-	200	-	53
delta-BHC	-	200	-	53
Aldrin	-	200	-	53
Heptachlor epoxide	-	400	-	53
4,4'-DDE	-	400	-	110
Endosulfan II	-	990	-	110
Endrin aldehyde	-	400	-	110
Endosulfan sulfate	-	990	-	110
Endrin ketone	-	400	-	110
alpha-Chlordane	-	1,000	-	53
gamma-Chlordane	-	1,000	-	53
Toxaphene	-	4,000	-	2,700
II. TOTAL PCBs				
Aroclor-1016	-	1,500	-	530
Aroclor-1221	-	3,000	-	1,100
Aroclor-1232	-	1,500	-	530
Aroclor-1242	2,500	1,500	2,000	530
Aroclor-1248	-	1,500	-	530
Aroclor-1254	-	1,500	1,800 E	530
Aroclor-1260	1,600	1,500	930 E	530

PQL Practical Quantitation Limit
 - Non Detectable Concentrations
 J Estimated Value (less than PQL)
 E Results Estimated Due to Coelution

KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY

TABLE 23
Final Mixture Evaluations
Summary of TCLP Pesticides Analyses - EPA Methods 1311/8080
(Mixture 1397-006 - 30 Day Cure)

ANALYTICAL PARAMETER	TCLP REGULATORY LEVELS (ug/L)	RESULTS (ug/L)	
		Concentration	PQL
I. TCLP PESTICIDES			
alpha-BHC	*	-	0.13
gamma-BHC (Lindane)	400	-	0.13
Heptachlor	8	-	0.13
Endosulfan I	*	-	0.13
Dieldrin	*	-	0.27
Endrin	20	-	0.27
4,4'-DDD	*	-	0.27
4,4'-DDT	*	-	0.27
Methoxychlor	10,000	-	1.3
beta-BHC	*	-	0.13
delta-BHC	*	-	0.13
Aldrin	*	-	0.13
Heptachlor epoxide	*	-	0.13
4,4'-DDE	*	-	0.13
Endosulfan II	*	-	0.27
Endrin aldehyde	*	-	0.27
Endosulfan sulfate	*	-	0.27
Endrin ketone	*	-	0.27
alpha-Chlordane	0	-	0.13
gamma-Chlordane	0	-	0.27
Toxaphene	500	-	6.7

PQL Practical Quantitation Limit
- Non Detectable Concentrations
* No TCLP Regulatory Level

KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY

TABLE 24
Final Mixture Evaluations
Summary of Total Herbicide Analyses - EPA Method 8150
(Mixture 1397-006 - 30 Day Cure)

ANALYTICAL PARAMETER	RESULTS (ug/kg)			
	Untreated Sludge		1397-006	
	Conc.	PQL	Conc.	PQL
I. TOTAL HERBICIDES				
2, 4-D	-	165	-	170
2, 4-DB	-	610	-	17
2, 4, 5-T	-	134	-	1.3
2, 4, 5-TP (Silvex)	-	330	-	330
Dalapon	-	3,886	-	83
Dicamba	-	181	-	26
Dichloroprop	-	436	-	17
Dinoseb	-	47	-	130
MCPA	-	167,000	-	1,700
MCPA	-	129,000	-	2,300

PQL Practical Quantitation Limit
- Non Detectable Concentrations

KIBER ENVIRONMENTAL SERVICES, INC.
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 NEWTOWN CREEK TREATABILITY STUDY

TABLE 25
Final Mixture Evaluations
Summary of TCLP Herbicide Analyses - EPA Methods 1311/8150
(Mixture 1397-006 - 30 Day Cure)

ANALYTICAL PARAMETER	TCLP REGULATORY LEVELS (ug/L)	RESULTS (ug/L)	
		Concentration	PQL
I. TCLP HERBICIDES			
2, 4-D	10,000	-	0.05
2, 4, 5-TP (Silvex)	1,000	-	0.10

PQL Practical Quantitation Limit
 - Non Detectable Concentrations

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KIBER ENVIRONMENTAL SERVICES, INC.
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NEWTOWN CREEK TREATABILITY STUDY

TABLE 26
Final Mixture Evaluation
Summary of Dioxin / Furan Analyses - EPA Method 8290
(Mixture 1397-006 - 30 Day Cure)

ANALYTICAL PARAMETER	RESULTS (ug/kg)			
	Untreated Sludge		1397-006	
	Conc.	PQL	Conc.	PQL
I. DIOXINS RESULTS				
SPECIFIC ANALYTES				
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	0.08	0.02	-	0.15
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	0.12	0.05	-	1.04
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	-	0.10	-	0.224
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	0.15	0.08	-	0.0748
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	0.25	0.09	-	0.224
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	1.65	0.16	2.25	0.299
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	19	0.63	16.4	0.385
TOTAL ANALYTES				
Total TCDD	0.35	0.02	-	0.15
Total PeCDD	0.94	0.05	-	1.04
Total Hx CDD	0.75	0.10	3.07	0.224
Total HpCCDD	3.53	0.16	8.05	0.299
II. FURANS RESULTS				
SPECIFIC ANALYTES				
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	0.38	0.02	-	0.128
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	0.40	0.03	-	0.502
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	0.18	0.03	-	0.609
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	2.42	0.09	-	0.107
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	0.70	0.06	-	0.171
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	0.27	0.09	-	0.107
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	-	0.10	-	0.267
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	5.15	0.10	2.25	0.203
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	0.10	0.18	-	0.0321
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	4.19	0.57	1.45	0.235
TOTAL ANALYTES				
Total TCDF	2.73	0.02	0.445	0.128
Total PeCDF	4.56	0.03	0.92	0.609
Total HxCDF	9.36	0.10	1.31	0.171
Total HpCDF	6.01	0.18	2.25	0.0321

PQL Practical Quantitation Limit
- Non Detectable Concentrations

**KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 27
Final Mixture Evaluations
Summary of Total TAL Metals Analyses - EPA Methods 6010A / 7471
(Mixture 1397-006 - 30 Day Cure)**

ANALYTICAL PARAMETER	RESULTS (mg/kg)			
	Untreated Sludge		1397-006	
	Conc.	PQL	Conc.	PQL
I. TOTAL TAL METALS				
Aluminum	17,000	5.4	14,000	1.9
Antimony	-	0.35	-	0.37
Arsenic	-	1.1	-	0.38
Barium	210	0.77	180	0.28
Beryllium	-	0.22	-	0.23
Cadmium	-	0.75	19	0.27
Calcium	9,800	28	95,000	10
Chromium	340	0.1	180	0.11
Cobalt	15	0.04	10	0.04
Copper	1,000	0.1	540	0.10
Iron	31,000	19	23,000 E	7.0
Lead	560	0.21	300	0.23
Magnesium	9,000	10	12,000 E	3.4
Manganese	310	16	730	5.8
Mercury	3.1 J	6.5	1.5	1.5
Nickel	260	0.06	140	0.06
Potassium	5,100	10	3,000	11
Selenium	25	0.13	-	0.14
Silver	-	0.41	8.1	0.15
Sodium	14,000	1.1	10,000	1.2
Thallium	-	1.0	-	0.36
Vanadium	74	0.16	51	0.17
Zinc	1,600	0.27	1,300	0.29

PQL Practical Quantitation Limit

- Non Detectable Concentrations

E Concentration exceed calibration range (results estimated)

J Estimated Value (less than PQL)

**KIBER ENVIRONMENTAL SERVICES, INC.
 MARCOR ENVIRONMENTAL
 NEWTOWN CREEK TREATABILITY STUDY**

**TABLE 28
 Final Mixture Evaluations
 Summary of TCLP RCRA Metals Analyses - EPA Methods 1311/6010A/7470
 (Mixture 1397-006 - 30 Day Cure)**

PARAMETER	TCLP REGULATORY LEVELS (mg/L)	TESTING RESULTS (mg/L)	
		Conc.	PQL
I. TCLP RCRA METALS			
Arsenic	5.0	-	0.23
Barium	100	0.28	0.009
Cadmium	1.0	-	0.02
Chromium	5.0	0.01 J	0.02
Lead	5.0	-	0.17
Mercury	0.2	0.006	0.002
Selenium	1.0	-	0.15
Silver	5.0	0.08	0.01

PQL Practical Quantitation Limit
 - Non Detectable Concentrations
 J Estimated Value (less than PQL)

KIBER ENVIRONMENTAL SERVICES, INC.
MARCOR ENVIRONMENTAL
NEWTOWN CREEK TREATABILITY STUDY

TABLE 29
Final Mixture Evaluations
Additional Analyses
(Mixture 1397-006 - 30 Day Cure)

ANALYTICAL PARAMETER	UNIT	TCLP REGULATORY LEVELS	RESULTS			
			Untreated Sludge		1397-006	
			Conc.	PQL	Conc.	PQL
I. CHEMICAL ANALYSES						
Total Organic Carbon	mg/kg	-	5,700	50	8,800	50
Material pH	s.u.	-	7.31	-	10.53	-
Reactive Cyanide	mg/kg	250	-	-	2.5	1.0
Total Sulfide	mg/kg	500	-	-	5.9	0.8
II. PHYSICAL PROPERTIES						
Moisture Content, Dry Basis	%	-	194	-	5	-
Bulk Density	lb/ft ³	-	71	-	49	-
Bulk Specific Gravity	-	-	1.1	-	0.8	-
Ignitability	°F	140	-	-	>140	140

- Not analyzed or not applicable.

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 NEWTOWN CREEK TREATABILITY STUDY

TABLE 30
Final Mixture Evaluations
Unconfined Compressive Strength & Permeability
(1397-006 - 30 Day Cure)

TESTING PARAMETER	UNITS	TEST RESULTS	
		1397-006	1397-006 Dup
I. STRENGTH TESTING			
Bulk Unit Weight	lbs/ft ³	46	-
Dry Unit Weight	lbs/ft ³	36	-
Moisture Content	%	56	-
Unconfined Compressive Strength	lbs/in ²	78	-
II. PERMEABILITY TESTING			
Bulk Unit Weight	lbs/ft ³	49	45
Dry Unit Weight	lbs/ft ³	46	46
Moisture Content	%	5	5
Hydraulic Conductivity	cm/sec	4.2E-5	4.6E-5

- Testing not performed