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NSWC CRANE
5090.3a

DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, INDIANA 47522-5000

IN REPLY REFER TO:

5090
Ser 095/9210

20 NOV 1999

2-26-199

U.S. Environmental Protection Agency, Region V
Waste, Pesticides, & Toxics Division
Waste Management Branch
Illinois, Indiana, and Michigan Section
Attn: Mr. Peter Ramanauskas (DW-8J)
77 West Jackson Blvd.
Chicago, IL 60604

Dear Mr. Ramanauskas:

Crane Division, Naval Surface Warfare Center (NAVSURFWARCENDIV Crane) submits for your review as enclosure (1) three copies of the Draft Toxicity Report for the Full Scale Bioremediation Project. Enclosure (2) is the required certification statement.

NAVSURFWARCENDIV Crane point of contact is Ms. Christine D. Freeman, Code 09511, telephone 812-854-4423.

Sincerely,

JAMES M. HUNSICKER, DIRECTOR
ENVIRONMENTAL PROTECTION DEPARTMENT
BY DIRECTION OF THE COMMANDER

Encl:
(1) Draft Toxicity Report
(2) Certification Statement

Copy to:
ADMINISTRATIVE RECORD
MK Cleveland (w/o encls)
SOUTHNAVFACENGCOM (Code 1864) (w/o encls)
TOLTEST Crane

COMMENT RESOLUTION ON THE INTERNAL DRAFT TOXICITY REPORT FOR FULL SCALE OPERATIONS

Comments by: Chris Freeman, NSWC Crane EPD

GENERAL COMMENT: For future volumes of this report, please double side the pages.

RESPONSE: Pages will be double-sided in future revisions to this report.

COMMENT 1: Executive Summary

(a) p. i ¶2 Rewrite the first sentence as follows, "... evaluation, a control windrow was formed utilizing non-contaminated soil ~~(control windrow)~~, chicken manure, and straw and subjected to similar windrow composting activities."

(b) p. i ¶4 Rewrite the first sentence as follows, "... 50% mortality of the sample...".

(c) p. i ¶6 Rewrite the first sentence as follows, "... sewage sludge may be used in...".

(d) p. ii ¶2 Rewrite the first sentence as follows, "The treated explosives ~~compound~~ contaminated soil ...".

(e) p. ii ¶2 Rewrite the last sentence as follows, "... considered acceptable for use as a top ~~dressing~~ soil or backfill for general land application."

RESPONSE 1: The text has been revised with the exception of item d. Explosive compound contaminated soil has been kept for consistency with other documents issued for this site.

COMMENT 2: Acronyms and Abbreviations

Make the following corrections to the list:

1. Correct "Kcl" to be "KCl".
2. Add- "MK" – Morrison Knudsen

RESPONSE 2: The list has been revised.

COMMENT 3: p. 1-1 §1.0 A background section needs to be added describing the contents and items monitored for windrow S-001 and the control windrow. Describe the location of the non-contaminated used in the control pile and include any analytical reports. Reference and include the daily monitoring and sampling results as an appendix.

RESPONSE 3: Background information describing the items monitored for windrow S-001 is included in section 1.2. Additional information has been added to section 1.2 to describe the control pile and reference the analytical summary of the data now contained in Appendix C.

COMMENT 4: p. 1-1 §1.1.1 List the goals and acceptable levels that were to be obtained by the Earthworm Toxicity Testing.

RESPONSE 4: Additional information has been added to this section to provide the results obtained during analysis and relate the results to the goals of the earthworm toxicity.

COMMENT 5: p 1-1 §1.1.2 List the goals and acceptable levels that were to be obtained by the Microtox® Analysis.

RESPONSE 5: Additional information has been added to this section to provide the results obtained during analysis and relate the results to the goals of the Microtox® analysis.

COMMENT 6: p. 1-3 §1.2 ¶2 Reference the results of the borrow soil analysis and include in the report.

RESPONSE 6: The borrow source results are referenced in this section and have been included in Appendix C.

COMMENT 7: p. 1-3 §1.2 Add paragraph or section on how S-001 and control windrows operated daily (temperature, oxygen, moisture, etc.). Include windrow daily sampling forms and explosive analysis results.

RESPONSE 7: This information has now been included in Appendices D through G and referenced throughout the text appropriately.

COMMENT 8: p. 2-1 §2.1 ¶1

(a) What procedure was followed to collect and ship the composted soil used in the toxicity testing to the lab? Were all the cross sections represented?

(b) Reference SOP and attach to the report. Spell out "SOP" (first time listed).

(c) Need to state the age of the worms when received from the supplier.

What is the average life span of a worm? Age of the worms when received (shipping), 5 day stabilization period, and 14 day testing cycle, so at the very least the worms were 20 days old.

(d) What type of water was used to saturate test media?

RESPONSE 8:

(a) The sampling procedure is described in the Full-Scale Operational Plan (FS-OP), however, a general summary of the procedure followed has been added to Section 1.2

(b) The SOP for Earthworm Toxicity is provided in the FS-QAPP. A reference to that SOP has been included in this section. The term SOP has been spelled out in the initial appearance of the term in the document. Further reference to standard operating procedures has been changed to SOP.

(c) The worms were at least 60 days of age upon receipt by the laboratory. Additional information regarding the source of the worms has been added. The life span of mature earthworms in the field is quite short, often no more than a few months, although it has been calculated that their potential longevity was 4-8 years. In culture, individuals of *Eisenia foetida* have been kept for 4 ½ years.

(d) Information regarding the hydration of the soil samples and the determination of the water holding capacity has been added to the report. Deionized water is used to hydrate the test media to 75% of its water holding capacity.

COMMENT 9: <u>p. 2-1 §2.2</u>

(a) There were 15 test vessels used, shouldn't there be 15 test results in the table? Please show the results from the different compost concentrations. How many replicates of each sample were tested? More explanation is needed here.

(b) What mortality rates in the control replicates is allowed for the test to be considered valid?

(c) Describe exactly how the LC50 was calculated.

RESPONSE 9:

(a) In this study, five samples were collected to represent the various window cross-sections and 15 test vessels were used for each sample. Therefore, there are a total of 75 test vessels for the analysis of the windrow. Additional test vessels were analyzed for both positive and negative controls, and the analysis of the control windrow. Table 2-1 summarizes the data. Results of each test vessel are contained in the raw data from the laboratory in Appendix A. A table has been added to Appendix H, which further summarizes the laboratory data. An additional explanation has also been added to the text.

(b) This information is contained in the FS-QAPP, however, additional

information has been included in this section to demonstrate that the control replicate mortality rate is acceptable for both positive and negative controls.

(c) The LC50 is calculated using a computer program developed by C.E. Stephans (Reference 3, SOP/SED/201 Page A-8 of Appendix G of FS-QAPP) to compute the point and interval estimate for the earthworms. The print-outs are included in Appendix A.

COMMENT 10: p. 2-2 §2.3 ¶3 Include pH charts and data in the report.

RESPONSE 10: The pH monitoring for the earthworm analysis is contained in Appendix A, and a table summarizing the pH values is included in Appendix H.

COMMENT 11: p. 2-3 §2.3 ¶4 Include temperature charts and data in the report.

RESPONSE 11: The temperature monitoring for the earthworm analysis is contained in Appendix A, and a table and chart summarizing the temperature monitoring is included in Appendix H.

COMMENT 12: p. 2-3 §2.3 ¶6

(a) Include potassium chloride testing charts and data in the report. Was temperature, pH, etc. monitored for during this test?

(b) What percent of control organisms must survive for a test to be valid?

RESPONSE 12:

(a) Data for the potassium chloride tests (positive controls) including temperature and pH monitoring are included in Appendix A of this report. This laboratory data has now been summarized and tabulated in Appendix H to further clarify the laboratory data.

(b) The objective of this test is to compare the LC-50 of the positive control to an established LC-50 in order to demonstrate that the earthworms for this test reacted similar to other earthworms. The LC-50 for the positive control was 6,826 mg/L of KCl. This is comparable with the published guideline of 6,340 mg/L of KCl, which verifies that the earthworms reacted at similar sensitivities as other groups of earthworms.

COMMENT 13: p. 2-4 §2.3 ¶8 In the first sentence, restate the objectives instead of referencing.

RESPONSE 13: The text has been revised.

COMMENT 14: p. 2-4 §2.4 What concentration of compost material is acceptable to backfill or spread on the ground without having toxic effects? More information is needed here.

RESPONSE 14: Since the treated contaminated soil, which contained the highest contaminant levels of explosives, meets the established objectives of all the toxicity testing performed, all concentrations of compost can be determined to be acceptable for use as backfill or spreading on the ground as top-soil.

COMMENT 15: p. 3-1 §3.0 Reference SOP and attach to the report.

RESPONSE 15: All laboratory SOPs have been included in the FS-QAPP. Procedures specific to the Microtox® analysis are included in Appendix G of the FS-QAPP. It would be redundant to include the SOPs in this report. Therefore, a reference has been added.

COMMENT 16: p. 3-1 §3.2

(a) Please show the results from the different compost concentrations. How many replicates of each sample were tested? More explanation is needed here.
(b) What mortality rates in the control replicates is allowed for the test to be considered valid?
(c) Describe exactly how the EC50 was calculated.

RESPONSE 16:

(a) The results of various test vessels are provided in Appendix A. Five concentration levels were tested for each sample. Concentrations of 0.00%, 5.625%, 11.25%, 22.5%, and 45.00% of contaminated compost were analyzed at both 5 and 15 minutes. A summary table of the light output for each concentration and each sample has been included in Appendix H.
(b) The Microtox® analysis monitors the changes in light output from luminescent bacteria as they are subjected to various concentrations of treated soil. The bacterial bioluminescence is tied directly to cell respiration, and any inhibition of cellular activity (toxicity) results in a decreased rate of respiration and a corresponding decrease in the rate of luminescence. The more toxic the sample, the greater the percent light loss. Mortality is not being monitored in the Microtox® analysis. The validity of the test is monitored using blank ratios and correlation coefficients of the linearity of the plot between the light output and the concentration.

(c) The EC-50 calculation is part of the proprietary Microtox® analysis. The EC50 is calculated using a computer program developed as part of this method. Print-outs from the computer program are included in Appendix A.

COMMENT 17: p. 3-2 §3.3 ¶3

(a) Include method blank result charts and data in the report. Was temperature, pH, etc. monitored for during this test?

(b) What percent of control organisms must survive for a test to be valid?

RESPONSE 17:

(a) Method blank results have been added to the detailed summary results provided in Appendix H. The Microtox® analysis was performed according to the SOP provided in Appendix G of the FS-QAPP that does not require monitoring of pH or temperature during this 15-minute test.

(b) The only control for the Microtox® analysis is the blank control. The effectiveness of the blank is monitored using the blank ratio calculated from the initial versus the final light output during the test. This value needs to be greater than 0.75. Proof that this ratio has been met for all blanks is contained in Appendix H.

COMMENT 18: p. 3-3 §3.4 What concentration of compost material is acceptable to backfill or spread on the ground without having toxic effects? More information is needed here.

RESPONSE 18: Since the treated contaminated soil, which contained the highest contaminant levels of explosives, meets the established objectives of all the toxicity testing performed, all concentrations of compost can be determined to be acceptable for use as backfill or spreading on the ground as top-soil.

COMMENT 19: p. 4-1 §4.1

(a) Break down this section into §4.1.1 Salmonella Analysis and §4.1.2 Fecal Coliform Analysis (as done in §5.1).

(b) Reference each SOP and attach to the report.

(c) Remove spelling of "SOP".

(d) State the total number of tubes analyzed for each of the tests. Salmonella (3x5?); fecal coliform (4x5?)

RESPONSE 19:

(a) Section 4.1 has been divided as specified.

(b) All laboratory SOPs have been included in the FS-QAPP. Procedures

specific to the Fecal Coliform and Salmonella analysis are in Appendix G of the FS-QAPP. It would be redundant to include the SOPs in this report, therefore, a reference to the SOP has been added.

(c) Text has been revised.

(d) Section 4.1.1 and 4.1.2 have been revised to include the number of samples analyzed.

COMMENT 20: p. 4-1 §4.2

(a) Please show the results from the different compost concentrations. How many replicates of each sample were tested? More explanation is needed here.

(b) What detection limits were used for the salmonella and fecal coliform tests. Include the exact data values if available.

RESPONSE 20:

(a) The procedure for fecal coliform requires the lab to utilize the greatest dilution that gives positive results in all five tests tubes, and then the next two higher concentrations. Since all samples from windrow S-001 had undetectable levels of fecal coliform, there were no series present that had positive results in all five replicates of that concentration. For the control windrow, positive results were obtained in the five replicates and as a result the most probable number (MPN) was calculated according to the formula in the SOP (Page A-33b, Appendix G, FS-QAPP).

(b) The reporting limits are 3 MPN per 4 grams Solids for salmonella and 1000 MPN per gram Solids for Fecal Coliform. Values below the reporting limit cannot be quantified.

COMMENT 21: p. 4-2 §4.3 ¶1 In the first sentence, restate the procedures instead of referencing.

RESPONSE 21: Section 9 of the FS-QAPP is lengthy and very comprehensive to restate in this report. Therefore, only a reference is made. However additional information related to the procedures utilized in the data verification has been added.

COMMENT 22: p. 4-2 §4.4 Please include a reason as to why the control windrow exhibited a value higher than the acceptable limit.

RESPONSE 22: The borrow source utilized for the control windrow was tested initially for explosive compounds, volatile and semivolatile organic compounds, pesticides, herbicides, and various metals to verify that soil utilized for this study was not contaminated. The soil was not

tested for the presence of fecal coliform. Fecal coliform are bacteria that live in the digestive tract of warm-blooded animals. They are excreted in the solids waste of humans and other mammals. The soil was not taken from an area populated by residential housing, therefore human waste is not considered a possible source. However, if the soil was taken from the surface of a field visited frequently by ducks or other birds, this could lead to the higher than expected levels found in the control windrow.

COMMENT 23: p. 5-1 §5.1.1 Reference SOP and attach to the report.

RESPONSE 23: All laboratory SOPs have been included in the FS-QAPP. Procedures specific to the toxicity analysis are included in Appendix G of the FS-QAPP. It would be redundant to include the SOPs in this report, therefore, a reference to the SOP has been added.

COMMENT 24: p. 5-1 §5.1.2 Reference SOP and attach to the report.

RESPONSE 24: All laboratory SOPs have been included in the FS-QAPP. Procedures specific to the toxicity analysis are included in Appendix G of the FS-QAPP. It would be redundant to include the SOPs in this report, therefore, a reference to the SOP has been added.

COMMENT 25: p. 5-1 §5.2

(a) Define "reporting limit". Is it the same as a detection limit?
(b) Reference where the analytical data can be found and attach to the report.
(c) List the total number of samples analyzed

RESPONSE 25:

(a) Reporting limit is the lowest concentration that can be reliably achieved within the specified limits of precision and accuracy provided in the FS-QAPP. This level is usually five to ten times greater than the detection limit which is the minimum concentration of a compound that can be measured and reported with confidence that the analyte concentration is greater than zero. This definition is consistent with the FS-QAPP and laboratory SOPs provided in Appendix C of the FS-QAPP.
(b) The analytical data is included in Appendix B of this report. A reference has been added to the text.
(c) Text has been revised to include total number of samples for each of the leachability results.

COMMENT 26: p. 5-5 §5.4 State the regulatory limits established. Why are all the leachability limits in Table 5-1 N/A? What was the purpose of this testing if no limits were set?

RESPONSE 26: The established regulatory limits are presented in Table 5-1, Leachability Results. Only two explosive compounds, Nitrobenzene and 2,4-Dinitrotoluene are characteristic compounds in the Toxicity Characteristic Leaching Procedure (TCLP), therefore, no leachability criteria exists for the other compounds. The results of these two compounds are significantly less than the regulatory level for TCLP analysis. All compounds that were analyzed for TCLP and Synthetic Precipitation Leaching Procedure (SPLP) demonstrate that leaching of the explosive contaminants did not occur in either test.

COMMENT 27: p. 6-1 §6.0 ¶1

(a) This entire section may have to be rewritten based on the values established for toxicity, Microtox, Pathogen, and leaching testing as stated in previous comments.

(b) Rewrite the first sentence as follows, "... bioremediated explosives ~~compound~~ contaminated soil ..."

RESPONSE 27:

(a) The conclusions are consistent with the values for all analyses performed for the toxicity testing.

(b) Explosive compound contaminated soil has been kept for consistency with other documents issued for this site.

COMMENT 28: p. 6-1 §6.0 ¶2 What concentration of compost material is acceptable to backfill or spread on the ground without having toxic effects? More information is needed here -- four pages of text, surely cannot be condensed to one sentence.

RESPONSE 28: Since the treated contaminated soil, which contained the highest contaminant levels of explosives, meets the established objectives of all the toxicity testing performed, all concentrations of compost can be determined to be acceptable for use as backfill or spreading on the ground as top-soil.

COMMENT 29: p. 6-1 §6.0 ¶4 Rewrite the last sentence as follows, "Because ~~it~~ the compost does not ... acceptable for use as backfill or a top ~~dressing for unrestricted general land application~~ soil in approved land application locations."

RESPONSE 29: The text has been revised as specified.

OTHER CHANGES MADE AS A RESULT OF COMMENTS TO THE FS-QAPP APPENDIX G DATED 2/12/99

Section 1.2	Additional information has been added regarding sample containers used for the collection of compost for earthworm toxicity analysis.
Section 2.1	Acclimation procedures used for the earthworms has been added to the text. Additional information regarding testing vessels has also been added to this section.
Section 2.2	Additional information has been added to describe the results and contents of laboratory reference soil as well as the control soil from the control windrow.

DRAFT

Toxicity Report

Full-Scale Bioremediation
NSWC Crane
Crane, Indiana

Unit Identification Code: N00164
Contract No. N62467-93-D-1106

February 1999

Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina
29419-9010

DRAFT

TOXICITY REPORT

FULL-SCALE BIOREMEDIATION
NSWC CRANE
CRANE, INDIANA

February 26, 1999

CONTRACT N62467-93-D-1106
DELIVERY ORDER #0009
STATEMENT OF WORK #0007

Prepared for

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NAVAL FACILITIES ENGINEERING COMMAND
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MK Project Engineer

APPROVAL:

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R. Scott Newman Date
Program Manager

EXECUTIVE SUMMARY

Explosive compound contaminated soil at NSWC Crane, Indiana, is being treated through a composting bioremediation process. While treatment of the soil in this process results in contaminant reduction to industrial use clean-up levels as established by the U.S. EPA Region 5, the toxic effect of the treated soil, or compost, on the environment is a concern. The result of this evaluation will be used in determining the final disposition of the compost.

In order to establish a non-prejudicial evaluation, a control windrow was formed utilizing non-contaminated soil, chicken manure, and straw and subjected to similar windrow composting activities. Data obtained was used to provide a comparison between the treated soil and the control windrow relative to the standards established by the evaluation methodologies below.

Toxicity testing was performed to determine potential toxic effects that composted soil may have on the environment. The windrow exhibiting the highest level of contamination (S-001) from the initial four full-scale windrows was utilized in this study. Environmental effects were evaluated using two toxicity methods: Earthworm and Microtox® Toxicity; two pathogen tests: fecal coliform and salmonella; and two leaching procedures: Toxicity Characteristic Leaching Procedure and Synthetic Precipitation Leaching Procedure.

The Earthworm Toxicity analysis subjected earthworms, *Eisenia foetida,* to various concentrations of compost to determine the concentration of compost that would result in 50% mortality of the sample population (LC-50). The average concentration of compost resulting in a LC-50 for the composted soil was higher than that obtained from the control windrow. The conclusion from this analysis is that the composted explosive compound contaminated soil is less toxic to earthworms than the compost from the control windrow.

Microtox® analysis was used to evaluate the toxic effects of the composted soil on the environment. The illuminance of marine bacteria, *Photobacterium phosphoreum,* was measured to determine the concentration of compost which resulted in a 50% reduction in the illuminance of the bacteria (EC-50). The results for the control windrow showed a less toxic effect on the marine bacteria than the composted soil. Since there are no federal guidelines established to evaluate the Microtox® results, it is interpreted that the 21% difference between the control windrow and the composted soil is comparable, and acceptable to demonstrate that the composted soil is no more toxic than the control windrow.

Pathogen analysis was performed based on specifications found in 40 CFR 503.32, which state that sewage sludge may be used in land application if it meets established

requirements for fecal coliform and salmonella analysis. The compost resulting from full-scale biofacility operations is intended to be used for land application, therefore, these same standards were applied to the compost. The results of all samples from Windrow S-001 met the requirements for use in land application.

Leachability analysis showed no leachability of any SWMU-specific contaminants from the treated soil. The results satisfactorily demonstrate that leaching of explosive compounds would not occur in either a natural or sanitary landfill environment.

The treated explosive compound contaminated soil is suitable for reuse in accordance with 40 CFR 503.32 and does not contain leachable contaminants. In addition, the results of the Microtox® and earthworm toxicity analysis demonstrate comparability between the control windrow and explosive compound contaminated soil. The bioremediated explosive compound contaminated soil is no more toxic than non-contaminated soil which has been subjected to similar windrow composting activities. Therefore, the composted soil should be considered acceptable for use as a top soil or backfill for general land application.

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ACRONYMS AND ABBREVIATIONS

2A46DT	2-Amino-4,6-dintrotoluene
4A26DT	4-Amino-2,6-dinitrotoluene
°C	degrees Centigrade
EC	effective concentration
EPA	U.S. Environmental Protection Agency
FS-OP	Full-Scale Operations Plan for Soils Bioremediation Facility
FS-QAPP	Full-Scale Quality Assurance Project Plan
HMX	cyclotetremethylenetetranitramine
KCl	potassium chloride
LC	lethal concentration
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MFA	Mine Fill A
MS	matrix spike
MSD	matrix spike duplicate
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MK	Morrison Knudsen
MPN	most probable number
NSWC	Naval Surface Warfare Center
PETN	Pentaerythritol tetranitrate
QAPP	Quality Assurance Project Plan
QC	quality control
RDX	cyclotrimethylenetrinitramine
RPD	relative percent difference
SOP	Standard Operating Procedure
SWMU	Solid Waste Management Unit
SPLP	Synthetic Precipitation Leaching Procedure
su	standard unit
TNT	2,4,6-trinitrotoluene
TCLP	Toxicity Characteristic Leaching Procedure
ug/L	micrograms per liter
ug/kg	micrograms per kilogram

1.0
INTRODUCTION

1.1 PURPOSE AND OBJECTIVES

Full-scale operations of the Soils Bioremediation Facility began April 13, 1998 at the Naval Surface Warfare Center (NSWC) Crane Division in Crane, Indiana. Acute toxicity testing was performed on composted soil from Mine Fill A (MFA) to determine the toxic affects of the composted soil on the environment.

This report summarizes the activities for the toxicity testing performed on the windrow exhibiting the highest level of explosive compound contamination from the initial full-scale loading. The testing is intended to examine potential toxic effects that composted soil may have on the environment. These effects were studied using two toxicity methods: Earthworm and Microtox® Toxicity; two pathogen tests: fecal coliform and salmonella; and two leaching procedures: Toxicity Characteristic Leaching Procedure (TCLP) and Synthetic Precipitation Leaching Procedure (SPLP). The purpose of this evaluation is to demonstrate that contaminated soil compost from MFA is no more toxic than uncontaminated soil subjected to similar windrow composting activities. An uncontaminated soil compost windrow (control windrow) was formed during initial full-scale activities to provide this comparison data.

1.1.1 Earthworm Toxicity

The objective of earthworm toxicity testing is to assess the acute toxicity of the composted soil on earthworms. The goal is to determine if the treated contaminated soil windrow is more or less toxic than uncontaminated soil from a borrow source which has been treated in a similar manner. For this test, the lethal concentration (LC) of compost was estimated to determine the concentration of compost which causes 50% mortality of earthworms. This lethal concentration, referred to as the LC-50, was averaged for five samples collected from Windrow S-001 and compared to the LC-50 for the control windrow. The differences were then compared. LC-50 values for the treated compost should be greater than LC-50 values of the uncontaminated soil to demonstrate acceptable toxicity levels.

1.1.2 Microtox® Analysis

The objective of Microtox® toxicity testing is to assess the acute toxicity of the composted soil on marine bacteria. The goal is to determine if the treated contaminated soil windrow is more or less toxic than uncontaminated soil from a borrow which has been treated in a similar manner. For this test, the effective concentration (EC) of compost was estimated to determine the concentration of compost which causes a 50%

decrease in the illuminance of the test organisms. This effective concentration, referred to as the EC-50, was averaged for five samples collected from Windrow S-001 and compared to the EC-50 for the control windrow to examine any variances in toxicity from the composted soil compared to the control windrow. EC-50 values for the treated compost should be greater than the EC-50 values of the uncontaminated soil to demonstrate acceptable toxicity levels for the Microtox® analysis.

1.1.3 Pathogen Testing and Analysis

The objectives for pathogen testing were based on specifications found in 40 CFR 503.32, which pertain to the use or disposal of sewage sludge. These specifications state that sewage sludge may be prepared for sale used for land application if the sludge contains less than regulated amounts of fecal coliform and salmonella. The composted soil is intended to be returned to the land, therefore these same standards will be applied to the compost. Objectives for the density of fecal coliform in the compost are less than 1000 Most Probable Number (MPN) per gram of dry solids on a dry weight basis, and salmonella is less than three MPN per four grams of dry solids on a dry weight basis.

1.1.4 Explosive Leaching Analysis

Two tests were performed to determine the leachability of Solid Waste Management Unit (SWMU)-specific contaminants that were identified during initial excavation of the soil used to create the windrow. The soil used to create Windrow S-001 was analyzed for metals (EPA Methods 6010 and 7470), explosive compounds (EPA Method 8330), and volatile organic compounds (EPA Method 8260) prior to excavation. Levels of site-specific total metals and volatile contamination did not exceed any of the established Industrial Use Cleanup Goals (Table 1-2 of the *Quality Assurance Project Plan for Full-Scale Operations* (FS-QAPP) [MK, 1998a]) and therefore, further metal and volatile analysis were not required during composting activities. However, additional testing was required for explosive compound contamination during composting.

TCLP simulated the leachability of contamination expected in a sanitary landfill, while SPLP simulated the leachabililty of contamination expected in a natural environment. The values obtained from the analyses were compared to the limits of leachability for all SWMU-specific contaminants.

1.2 SAMPLE COLLECTION

In this study, five samples were collected from Windrow S-001 on Day Last of composting activities. Each cross-section was sampled at three locations and composited to form a single sample for each of the five cross-sections as specified in Section 3.0, Appendix G of the Approved Full-Scale Operations Plan for Soils

Bioremediation Facility (FS-OP). Samples for Microtox®, Pathogens, TCLP, and SPLP were all collected in 8 ounce glass jars. The sample for earthworm toxicity was collected in a 1 gallon unlined steel can as specified in the Final Draft Appendix G of the FS-QAPP Dated 7/14/98. Subsequent comments by the EPA recommended changing this container to a 3.5 gallon HDPE pail lined with two plastic bags. The sample collection had already been completed for MFA in the initially specified containers. However, since the analysis started within 48 hours of sample collection, there would be limited potential for metals to leach from the sample containers. Therefore, it is our recommendation that the data for MFA is acceptable.

Windrow S-001 initially contained the highest explosive compound concentrations on Day 0 of the treatment cycle. Cyclotetramethylenetetranitramine (HMX), cyclotrimethylenetrinitramine (RDX), and 2,4,6-trinitrotoluene (TNT) exhibited the highest concentrations at levels of 156 milligrams per kilogram (mg/kg), 1,215 mg/kg, and 122 mg/kg, respectively. Other contaminants present on Day 0 were 2-Amino-4,6-dintrotoluene (2A46DT) at a level of 8.6 mg/kg and 4-Amino-2,6-dinitrotoluene (4A26DT) at 15.3 mg/kg. This windrow was representative of the MFA SWMU and represents the worst-case scenario for composted soil based on the selection criteria utilized. Additional construction and operational details for Windrow S-001 are contained in the *Initial Batch Report* [MK, 1998b]. Daily monitoring summary reports of pH, temperature, water holding capacity, and oxygen are provided in Appendix E.

In addition to the five samples collected from the soil/compost blend from MFA, a control windrow was constructed to provide comparison control samples. This small control compost windrow was constructed during the first set of full-scale windrows using the same amendment recipe as the full-scale windrow. Soil from a borrow source, analyzed and documented as uncontaminated, and of similar soil characteristics to the contaminated soil, was used to construct the control windrow of approximately 10 feet x 10 feet x 5 feet high. Results of the borrow source material prior to composting are contained in Appendix C. The control windrow was turned at the same frequency as the full-scale windrow and monitored for temperature, oxygen, and moisture content at the same frequency as the full-scale windrow. Daily monitoring summary reports for these parameters are provided in Appendix D.

A single composite sample from the control windrow was collected after twenty-six days of composting to provide background data for comparison and interpretation of toxicity levels. The sample was collected from three sub-sections and composited to form a single sample from the cross-section of the control windrow Toxicity data from samples collected from the treated contaminated soil windrow were compared to the background sample to determine if there was an increase in toxicity levels in the composted soil. In addition, the control windrow was analyzed for explosives at the end of the cycle to verify that there was no cross-contamination from other windrows. The end of cycle for the control windrow was the same number of days that windrow S-001 was processed, which was 26 days.

2.0
EARTHWORM TOXICITY

The results of the Earthworm Toxicity Analysis are presented in this section as well as recommendations based on the interpretation of this analytical data.

2.1 TEST METHOD DESCRIPTION

Earthworm Toxicity analysis was performed at Aqua Survey, Incorporated using the test organism, *Eisenia foetida,* supplied by Carolina Biological Supply Company. The laboratory standard operating procedure (SOP) followed in performing the analysis is included in the FS-QAPP Appendix G, page A-4. Adult earthworms which were greater than 60 days of age were received at the laboratory in a healthy condition by overnight delivery from the supplier. The earthworms were maintained by the laboratory in artificial soil consisting of a mixture of sphagnum moss, clay and silica sand during the five day acclimation period. The earthworm environment was kept at a temperature of 20 ± 2 degrees Centigrade (°C), during which time the earthworms were fed with Magic Worm Food® prior to use in this analysis. Feedings were documented on the culture laboratory livestock record. After the five day stabilization period, the earthworms were exposed to five concentrations of the compost mix. Exposure concentrations were 6.25%, 12.5%, 25%, 50%, and 100%. The varying concentrations of compost were prepared using a grinder to homogenize the appropriate quantity of compost with artificial soil from the laboratory. Artificial soil was prepared from a homogenous mixture of 10% sphagnum peat, 20% colloidal kaolinite clay, and 70% grade 70 silica sand. Prior to initializing the test, the water holding capacity of the compost was determined and the test media was hydrated with deionized water to 75% of its water holding capacity.

For each exposure concentration, three testing vessels, each containing 200 grams of compost and artificial soil were prepared (total of 15 test vessels). Ten earthworms were placed in each testing vessel by sequential randomization where no more than two earthworms were added into each vessel at a time. The vessels consisted of a one liter cleaned canning jar with screw top lids with 1/16 inch diameter holes in the center top for air. The 150 earthworms were exposed to the compost for 14 days in order to permit a more accurate and complete assessment of the environmental impact of the compost. The earthworms were evaluated at 7-day and 14-day intervals from project initiation. The earthworms were not fed during the duration of the analysis.

2.2 TEST RESULTS

Each test vessel was analyzed separately at 7-day and 14-day intervals. Raw data from the laboratory is provided in Appendix A. A detailed summary of each test vessel result is provided in Appendix H. The three replicates from a single concentration were

added together to determine a live count for the thirty initial worms subjected to the concentration. Then using the five concentrations for a particular sample, the LC-50 was calculated for each sample. The five samples which were collected from the various cross-sections were analyzed individually. The results of these cross-sections for the earthworm toxicity analysis are summarized in Table 2-1. The values reported represent the concentration of compost which resulted in the mortality of 50% of the earthworms. Results for five samples collected from windrow S-001 have been averaged to provide a representative value for the windrow and the results of the control windrow have been provided for comparison.

In addition to the compost sample vessels, a positive control and a negative control was analyzed to demonstrate that the earthworms for this test reacted similar to other earthworms. The positive control utilized KCl as a reference toxicant. The LC-50 for KCl was 6,826 mg/L which is comparable to the published guideline of 6,340 mg/L. The negative control showed no mortality throughout the 14 day event which is less than the 10% mortality rate permitted by the method.

TABLE 2-1 EARTHWORM TOXICITY RESULTS (%)

	Cross Section 3	Cross Section 5	Cross Section 7	Cross Section 9	Cross Section 11	Sample Average
7-day LC-50 for windrow S-001	34.1	68.3	41.5	28.6	11.5	36.8
7-day LC-50 for Control Windrow	16.5					16.5
14-day LC-50 for windrow S-001	29.3	61.9	34.9	27.3	11.5	33.0
14-day LC-50 for Control Windrow	15.2					15.2

2.3 DATA QUALITY CONTROL

All data from the earthworm toxicity analysis were verified, and at least 10% of the samples were validated by Morrison Knudsen Corporation (MK) personnel per the procedures outlined in Section 9.0 of the *FS-QAPP* [MK, 1998a]. Data from windrow S-001 and the control windrow were compared with field and laboratory quality control (QC) sample data to assess its usability for supporting operational decisions. The results of data verification and validation are presented in this section.

Data associated with the earthworm toxicity were verified by reviewing chain-of-custody forms, sample preservation records, analytical holding times, requested turnaround times, and sample data in comparison to analytical quality assurance objectives. In addition, at least 10% of the samples were validated by performing a thorough review of the analytical data utilizing laboratory analytical records to assess laboratory performance in relation to the quality control criteria and procedural requirements. All samples from windrow S-001 were received by the laboratory in good condition (i.e., there were no broken containers, and custody seals were intact) and at a recorded temperature of 4°C ± 2°C. Samples from the control windrow were received at a temperature of 12.5°C. This would not have significantly impacted the earthworm analysis which is performed at a temperature range of 20°C to 29°C.

To monitor the conditions in which this analysis took place, the pH of the testing vessels was monitored. Initially, and at the completion of the analysis, the pH of the testing material was recorded. The pH of the compost samples ranged from 4.8 to 8.7 standard units (su) . Recommended test conditions for the earthworm are between 4 and 10 su. These values are considered acceptable for the test organisms and are not likely to have caused any adverse reactions. A detailed summary of the initial and final pH values for the earthworm analysis is located in Appendix H.

The temperature of the testing vessels was monitored daily during analysis. Temperatures did not show major fluctuations on any day of analysis, however temperatures usually exceeded the recommended test temperature established for this project by the end of the day. The laboratory recommended test temperature is 20°C ± 2°C with fluctuation not to exceed more than 3°C on any day of analysis. The highest temperature level recorded was 27.8°C. Although this temperature exceeded the target temperature for this test, it is not believed to have affected the outcome of the test since the test temperature for this methodology ranges from 20°C to 29°C [ASTM, 1995]. A detailed summary of the temperatures recorded during the analysis is located in Appendix H.

The laboratory performed method blank, laboratory control sample (LCS) and replicate analyses to evaluate accuracy and precision. A laboratory method blank was prepared from the artificial soil prepared in the laboratory which was utilized as a dilutant to the compost mixture. This blank was prepared and analyzed with the samples in order to evaluate potential interferences from laboratory equipment as well as to determine if the earthworms met established laboratory criteria. Two blanks were analyzed during this test, one showed 0% mortality of the earthworms in the artificial soil and the other showed 3% mortality. Both blanks were less than the 10% blank mortality rate defined for this project. Results of the method blanks are acceptable for all analysis.

The LCS is a sample prepared in the laboratory, consisting of artificial soil spiked with known amounts of target analytes which is processed through the same preparation as field samples. In this analysis, potassium chloride (KCl) was used as a reference

toxicant. The KCl was utilized as a positive control to evaluate the sensitivity of each batch of organisms. Varying concentrations of KCl contaminated soil were prepared to determine the LC-50 of the KCl contaminated soil. The LC-50 for the KCl was calculated to be 6,826 mg/L of KCl for both the 7-day and the 14-day testing period. This value represents the concentration of KCl which results in 50% mortality of the earthworms. This value is comparable with published guideline of 6,340 mg/L of KCl, as well as previous laboratory data and verifies that the earthworms reacted at similar sensitivities as other batches of *Eisenia foetida.* Temperature and pH monitoring of the KCl are provided in Appendix H. The accuracy of this LCS meets established acceptance limits for this procedure.

The consistency between the three vessels created for each compost concentration was evaluated to determine the precision of this analysis. Of the 31 replicates performed, there were three replicates where inconsistent mortality was observed. In these cases, two of the three vessels reacted similarly, however the third vessel showed more than 50% difference from the first two vessels. Because of the random approach used by the laboratory in storing the testing vials, it is highly unlikely that this inconsistency is due to laboratory error and is likely attributable to the variability of the earthworms. However, this may have resulted in the inconsistent observation seen in the dose responses, particularly for the sample collected from windrow S-001 at cross-section 11. A linear correlation should be seen in the dose responses and the observed mortality for the tests samples. This would be demonstrated by an increased mortality as a higher concentration of compost is utilized to create the mixture for the testing vessels. Most of the dilutions prepared exhibited this pattern of increased mortality as the concentration of compost increased. However, the sample collected from the cross-section 11 of windrow S-001 showed a varied mortality. After 14 days, mortality of 100, 0, 87, 43, and 100% was observed in the 6.25, 12.5, 25, 50, and 100% test concentrations, respectively. No explanation could be provided for this variable dose response. The LC-50 results for this sample are the only values which have levels lower than the control windrow. It is suspected that this value may be erroneously low because of the varied mortality seen in the concentrations of compost for this sample. However, the sample results were not rejected in order to show worst case scenario, and when averaged with the other column samples, the LC-50 value is higher than the LC-50 for the control windrow.

The QC data demonstrate that analyses exhibit acceptable accuracy and precision when compared to the project's data quality objectives specified in Appendix G of the *FS-QAPP* [MK, 1998a]. Acceptable values for both positive and negative controls as well as consistent values between replicates demonstrates that project data quality objectives have been met for the earthworm analysis. The data meets the data quality objectives established for this project and are, therefore, considered usable to support project decisions.

2.4 SUMMARY

The LC-50 for samples collected from windrow S-001 has been averaged to obtain an LC-50 of 36.8% for the 7-day toxicity, and an LC-50 of 33.0% for the 14-day toxicity level. The percent difference of less than 10% between these two values demonstrates that the compost did not become more toxic as it aged. By comparing these values to the results obtained for the control windrow, it is clear that the treated windrow is less toxic than the un-contaminated borrow soil that has undergone windrow composting.

3.0
MICROTOX® ANALYSIS

The results of the Microtox® Analysis are presented in this section as well as recommendations based on the interpretation of this analytical data.

3.1 TEST METHOD DESCRIPTION

In this analysis, the marine bacterium *Photobacterium phosphoreum* was exposed to various concentrations of elutriate of compost mix for 15 minutes according the the SOP in FS-QAPP Appendix G page A-11. The elutriate was prepared by adding 50 grams dry weight of compost to 500 ml of deionized water which was agitated in the dark for 48 hours at 20± 2°C. After agitation, the suspension was centrifuged and the elutriate fraction was decanted and used to prepare the test solutions.

The organisms were obtained from Azur Environmental in a freeze-dried culture. The organisms were reconstituted and maintained in a reagent well at a temperature of 5°C for a period of less than two hours prior to analysis. During that time, volumes of organisms were transferred to test cuvettes and acclimated to Mircotox® diluent at the test temperature of 15°C for 15 minutes prior to test initiation. The test began as the organisms were introduced to four elutriate test concentrations of 5.63%, 11.25%, 22.5%, and 45.0% and a blank. Observations of light output for each sample were made five and fifteen minutes after test initiation using the Microtox® Model 500.

3.2 TEST RESULTS

The results of the Microtox® Toxicity Analysis performed by Aqua Survey, Inc. are summarized in Table 3-1. The raw data from Aqua Survey is provided in Appendix A and a detailed summary of all testing vessels has been provided in Appendix H. The values reported represent the concentration of compost which resulted in a 50% reduction in the light output of the marine bacterium *Photobacterium phosphoreum*. Results for five samples collected from windrow S-001 have been averaged to provide a representative value for the windrow. In addition, the results of the control windrow have been provided for comparison.

3.3 DATA QUALITY CONTROL

All data from the Microtox® Toxicity Analysis were verified, and at least 10% of the samples were validated by MK personnel per the procedures outlined in Section 9.0 of the *FS-QAPP* [MK, 1998a]. Data from windrow S-001 and the control windrow were compared with field and laboratory QC sample data to assess its usability for supporting operational decisions. The results of data verification and validation are presented in this section.

TABLE 3-1 MICROTOX® RESULTS (%)						
	Cross Section 3	Cross Section 5	Cross Section 7	Cross Section 9	Cross Section 11	Sample Average
5-minute EC-50 for windrow S-001	52.9	40.3	31.5	20.9	34.3	36.0
5-minute EC-50 for Control Windrow	45.9					45.9
15-minute EC-50 for windrow S-001	52.5	46.5	31.6	19.6	38.8	37.8
15-minute EC-50 for Control Windrow	>45					>45

Data associated with the Microtox® toxicity were verified by reviewing chain-of-custody forms, sample preservation records, analytical holding times, requested turnaround times, and sample data in comparison to analytical quality assurance objectives. In addition, at least 10% of the samples were validated by performing a thorough review of the analytical data utilizing laboratory analytical records to assess laboratory performance in relation to the quality control criteria and procedural requirements. All samples from windrow S-001 were received by the laboratory in good condition (i.e., there were no broken containers, and custody seals were intact) and at a recorded temperature of 4°C ± 2°C. Samples from the control windrow were received at a temperature of 12.5°C which would not have significantly impacted the Microtox® analysis which is performed at a temperature of 15°C.

Laboratory method blanks consisting of dilutant water were analyzed with each sample. Blank ratios were calculated by dividing the initial blank reading by the blank reading at the appropriate time interval. Blank ratios for the 5-minute interval ranged from 1.31 to 1.55. Blank ratios for the 15-minute interval ranged from 1.44 to 1.72. Results of the blank ratio calculations is provided in Appendix H. These values demonstrate consistent readings between analyses and also meet method criteria for blank ratios which should be greater than 0.75.

The results of most of the Microtox® EC-50 values fell within the range of the test concentrations. Concentrations up to 45% elutriate were analyzed during this analysis.

The highest EC-50 value obtained was 52.9% which is 18% greater than the highest concentration analyzed. The impact of this value which exceeded the concentration range of this analysis is insignificant after examining the correlation coefficients for this procedure. Correlation coefficients between concentration and light readings need to be greater than 0.90 as required by the method. In this analysis, all correlation coefficients were greater than 0.9770 indicating a linear correlation between concentration and light readings that can remain linear beyond the highest concentration analyzed. However, values were not extrapolated for the 15-minute EC-50 value for the control windrow. An approximated value of greater than 45% was reported by the laboratory. This approximated value is between 45% and 52%, however, it can not be accurately quantified.

The quality control performed for the Microtox® analysis has met method requirements for completion and acceptable precision for this analysis. The data meets the data quality objectives established in Appendix G of the *FS-QAPP* [MK, 1998a] for this project and are therefore, considered usable to support project decisions.

3.4 SUMMARY

The EC-50 for samples collected from windrow S-001 has been averaged to obtain an EC-50 of 36.0% for the 5-minute toxicity, and an EC-50 of 37.85 % for the 15-minute toxicity level. The percent difference of less than 5% between these two values demonstrates that the compost did not become more toxic as it aged. It is important to compare these values to the results obtained for the control windrow, which were 45.9% for the 5-minute toxicity and greater than 45% for the 15-minute toxicity. The results for the control windrow showed a less toxic effect on the marine bacteria than the full-scale operations compost. The percent difference between the control windrow and windrow S-001 for the 5-minute Microtox® analysis is 21%. This value, however, is based on limited data supplied from only one sample of the control windrow. Federal guidelines have not been established for evaluating EC-50 values. The only comparison which can be made is between the control windrow and the results from windrow S-001. The 21% difference was considered insufficient to demonstrate significant difference between the control windrow and the composted soil. It is our opinion that these results are comparable, and acceptable to demonstrate that the composted soil is no more toxic than the control windrow for this marine bacterium.

4.0
PATHOGEN TESTING AND ANALYSIS

The results of the pathogen tests performed for this project are presented in this section as well as recommendations based on the interpretation of this analytical data for both salmonella and fecal coliform analysis.

4.1 TEST METHOD DESCRIPTION

4.1.1 SALMONELLA ANALYSIS

Salmonella analysis was performed according to the Pure Earth Environmental Laboratory, Incorporated SOP located in Appendix G of the FS-QAPP. For the salmonella analysis, each sample was prepared with three dilution series. Each dilution consisted of a series of five replicate tubes for analysis for a total of 15 tubes for each sample. Tubes were incubated for 24 hours in a water bath at 35.0°C after which time they were examined for turbidity and/or gas production which would indicate a positive result for salmonella.

4.1.2 FECAL COLIFORM ANALYSIS

Fecal Coliform analysis was performed according to the Pure Earth Environmental Laboratory, Incorporated SOP located in Appendix G of the FS-QAPP. In the fecal coliform procedure, four dilutions were performed and a series of five replicate tubes were prepared for each dilution for a total of 20 tubes for each sample. Tubes were incubated for 24 hours in a water bath at 44.5°C after which time they were examined for turbidity and/or gas production which would indicate a positive result for fecal coliform.

4.2 TEST RESULTS

None of the tubes analyzed for salmonella or fecal coliform for windrow S-001 had turbidity and/or gas production. The results for salmonella analyses were less than three MPN per four grams of solid for both windrow S-001 and the control windrow. The value of the fecal coliform analyses were less than 1,000 MPN per gram of solid for samples from windrow S-001 A positive value of 1,968 MPN per gram of solid was obtained from the control windrow using the MPN calculation in the SOP on page A-33b of Appendix G of the FS-QAPP. A summary of these results is shown in Table 4-1.

4.3 DATA QUALITY CONTROL

All data from the pathogen analysis were verified by MK personnel per the procedures outlined in Section 9.0 of the *FS-QAPP* [MK, 1998a]. Data from windrow S-001 and the control windrow were compared with field and laboratory QC sample data to assess its

usability for supporting operational decisions. The results of data verification are presented in this section.

TABLE 4-1 PATHOGEN ANALYSIS						
	Cross Section 3	Cross Section 5	Cross Section 7	Cross Section 9	Cross Section 11	Sample Average
Salmonella (MPN per 4 grams Solids)						
Windrow S-001	<3	<3	<3	<3	<3	<3
Control Windrow	<3					<3
Fecal coliform (MPN per gram Solids)						
Windrow S-001	<1,000	<1,000	<1,000	<1,000	<1,000	<1,000
Control Windrow	1,968					1,968

Data associated with the pathogen analysis were verified by reviewing chain-of-custody forms, sample preservation records, analytical holding times, requested turnaround times, and sample data in comparison to analytical quality assurance objectives. All samples from windrow S-001 were received by the laboratory in good condition (i.e., there were no broken containers, and custody seals were intact) and at a recorded temperature of 4°C ± 2°C. Samples from the control windrow were received at a temperature of 12.5°C which would not have significantly impacted the salmonella and fecal coliform analysis which is performed at temperatures of 35.0°C and 44.5°C, respectively.

An empty bottle shipped to the site and returned during sample transport accompanied the samples as a blank control to verify that contamination did not occur during transport. Fecal coliform and Salmonella were not detected in the blank.

Other quality control testing performed for both pathogen tests include the analysis of replicates through the use of dilution series. All replicates showed no presence of salmonella or fecal coliform which demonstrates acceptable precision for this analysis.

4. 4 SUMMARY

Pathogen tests were performed to evaluate the compost against "503 Class A" sludge. The 40 CFR 503.32 has established standards for pathogenic bacteria in sewage sludge for both salmonella and fecal coliform of less than 3 MPN per 4 grams dry solid and less than 1,000 MPN per 1 gram dry solids, respectively. The treated compost has

met the established criteria for salmonella and fecal coliform while the control windrow showed an exceedence for the established fecal coliform standard. Because these standards have been met, the composted soil should be considered for reuse and application to the land similar to other sewage sludge material.

The control windrow in this study exhibited a value higher than the acceptable limit for fecal coliform. The borrow source utilized for the control windrow was tested initialy for explosive compounds, volatile and semivolatile organic compounds, pesticides, herbicides, and various metals to verify that contaminated soil was not being utilized for this study. However, the soil was not tested for the presence of fecal coliform. Fecal coliform are bacteria that live in the digestive tract of warm-blooded animals. The soil was not taken from an area populated by residential housing, therefore human waste is not considered a possible source. Additionally, if the soil was taken from the surface of a field visited frequently by ducks or other birds, this could lead to the higher than expected levels found in the control windrow.

5.0
EXPLOSIVE LEACHING ANALYSIS

The results of the explosive leaching analysis are presented in this section as well as recommendations based on the interpretation of this analytical data. Two tests were performed by Southwest Laboratories to demonstrate the leachability of explosive compound contamination to the ground.

5.1 TEST METHOD DESCRIPTION

5.1.1 Toxicity Characteristic Leaching Procedure

TCLP extraction was performed to simulate leachability of explosive compound contamination expected in a sanitary landfill. In this procedure, the composted soil from Day Last was extracted with an extraction fluid equal to 20 times the weight of the sample. The fluid was acidic, as specified in the laboratory Southwest Laboratories' SOP, provided in Appendix G of the FS-QAPP on page A-41, and represents the conditions which would be encountered in a sanitary landfill. Following the rotation of the sample and extraction fluid for a period of 18±2 hours in a rotator capable of 30±2 revolutions per minute, the liquid phase was removed through filtering. This extract was analyzed for explosives by EPA Method 8330.

5.1.2 Synthetic Precipitation Leaching Procedure

SPLP extraction was performed to simulate leachability of explosive compound contamination expected in a natural environment. This procedure used a comparable volume of compost from Day Last and extraction fluid. The fluid used, as specified in Southwest Laboratories' SOP provided in Appendix G of the FS-QAPP on page A-41, represents the conditions which would be encountered in a natural environment and is not as acidic as the TCLP extraction fluid. Following the rotation schedule as described for TCLP extraction, the liquid phase of the SPLP extraction was also filtered. This subsequent extract was analyzed for explosives by EPA Method 8330.

5.2 TEST RESULTS

The results of the TCLP and SPLP extracts analyzed for explosive compound contaminants are summarized in Table 5-1. Raw data of the explosive analysis is provided in Appendix B, and a detailed explosive concentration summary for windrow S-001 and the control windrow are provided in Appendix G and F, respectively. No explosive compound contaminant was detected above the reporting limit in both the SPLP and TCLP extractions. Total analysis of the explosive compounds was also performed for both windrow S-001 and the control windrow. Composite samples were collected for explosive analysis as a composite of three sub-samples for each cross-section of the windrow. . Windrow S-001 had five cross-sections, and therefore five

TABLE 5-1 LEACHABILITY RESULTS					
	Average Concentration in Windrow S-001 Day Last			Concentration of Control Windrow Day Last	Leachability Limit
Compound	TCLP (ug/L)	SPLP (ug/L)	Total (mg/kg)	Total (mg/kg)	TCLP/SPLP (ug/L)
HMX	13.0 U	13.0 U	3.72	2.20 U	N/A
RDX	14.0 U	14.0 U	11.6	1.20 P	N/A
TNB	7.30 U	7.30 U	0.31 U	0.25 U	N/A
DNB	4.00 U	4.00 U	0.31 U	0.25 U	N/A
TETRYL	10.0 U	10.0 U	0.81 U	0.65 U	N/A
NB	7.00 U	7.00 U	0.32 U	0.26 U	2,000
TNT	6.40 U	6.40 U	4.99	0.25 U	N/A
4A26DT	7.00 U	7.00 U	0.31 U	0.25 U	N/A
2A46DT	12.0 U	12.0 U	0.31 U	0.25 U	N/A
26DNT	9.40 U	9.40 U	0.32 U	0.26 U	N/A
24DNT	5.70 U	5.70 U	0.31 U	0.25 U	130
2NT	12.0 U	12.0 U	0.31 U	0.25 U	N/A
4NT	8.00 U	8.00 U	0.31 U	0.25 U	N/A
3NT	7.90 U	7.90 U	0.31 U	0.25 U	N/A
PETN	20.0 U	20.0 U	0.31 U	0.25 U	N/A

Notes: U = non-detected
N/A = Not Applicable
P = greater than 40% deviation between primary and confirmation analysis

samples analyzed while the control windrow had only one composite sample analyzed. All cross-section results were averaged to provide a single value for each explosive compound for the specific windrow. One compound, RDX, was detected in the control windrow at a concentration one order of magnitude below the industrial clean-up level. RDX was not present in the Day 0 analysis of this windrow, however, the confirmation analysis of this sample qualitatively indicated the presence of RDX. The confirmation quantitation of RDX had a greater than 40% difference from the primary column, and the value has been flagged accordingly. The sample could not be re-extracted within

the analytical holding time to verify that laboratory contamination did not occur. Since the Day Last sample collection time for the control pile was predetermined by the duration of windrow S-001, and since RDX levels are well below the clean-up level, the sample was not re-collected in the field to verify the sampling technique.

5.3 DATA QUALITY CONTROL

Data from the leachability analysis and sampling events were verified and at least 10% of the samples were validated by MK personnel per the procedures outlined in Section 9.0 of the *FS-QAPP* [MK, 1998a]. Data was compared with field and laboratory QC sample data to assess its usability for supporting operational decisions. The results of data verification and validation are presented in this section.

The data were verified by reviewing chain-of-custody forms, sample preservation records, analytical holding times, requested turnaround times, sample data in comparison to QC data, and reporting requirements. In addition, at least 10% of the samples were validated by performing a thorough review of the analytical data utilizing laboratory analytical records to assess laboratory performance in relation to quality control criteria, data quality objectives, and procedural requirements. All samples were received by the laboratory in good condition (i.e., there were no broken containers, and custody seals were intact) and at a recorded temperature of 4°C ± 2°C.

Analytical results for the field blanks and equipment rinsates were evaluated to identify potential sources of error introduced during sampling, transportation, and storage. These field QC parameters were collected at the frequency required in Table 4-3 of the *FS-QAPP* [MK, 1998a].

Field blank sample results were evaluated to identify any sources of contamination in the reagent grade rinse water and/or general atmospheric conditions in the field. Reagent grade water (from the same source used for sampling equipment decontamination) was poured into appropriate sample containers to verify the water source. Explosive compound contaminants of concern were not detected in the field blank indicating that no cross-contamination occurred from the reagent grade water or during shipping and storage.

The equipment rinsate blanks were collected by rinsing decontaminated sampling equipment with reagent grade water, collecting the rinse water in appropriate sample containers then submitting the rinse water for analysis. One rinsate blank was collected for every twenty samples collected. Results were used to evaluate the effectiveness of decontamination procedures in preventing sample cross-contamination. No explosive compound contaminants were detected in the equipment rinsate blanks associated with this sampling event. These results indicate that decontamination procedures have been properly implemented to prevent cross-contamination.

The laboratory performed method blank, sample matrix spike (MS), sample matrix spike duplicate (MSD), surrogate, laboratory control sample (LCS), and laboratory control sample duplicate (LCSD) analyses to evaluate laboratory accuracy and precision.

Laboratory method blanks were prepared and analyzed with the samples in order to evaluate potential target compounds or interferences from laboratory glassware, reagents, and/or solvents used in the preparation and analysis of samples. Laboratory method blanks did not show the presence of any target analytes above the reporting limits. Results of the method blanks are acceptable for all analyses.

The LCS and LCSD are samples prepared in the laboratory, consisting of clean soil or water spiked with known amounts of target analytes which is processed through the same preparation as field samples. Evaluation of the spike recoveries, and the variability between the LCS and LCSD, gives an indication of analysis accuracy and precision in a clean matrix. Laboratory control spike precision and accuracy results were acceptable for all but one of the target analytes associated with leachability samples. During the TCLP analysis, an elevated recovery of 149% for TNT was seen in the LCS. TNT recovered within acceptable limits in the LCSD. Because all of the samples showed non-detectable levels of TNT in the TCLP extract, the data are not adversely affected.

Sample MS and MSD are field samples which have been spiked with a known amount of target analytes and processed through the preparation and analysis with the field samples. Evaluation of the spike recoveries, and the variability between the MS and MSD, gives an indication of analysis accuracy and precision in the sample matrix. MS/MSD accuracy and precision can be affected by concentrations of both target and non-target compounds present in the original field sample, as well as the matrix of the sample itself. Recoveries for MS/MSD analyses were acceptable for the target analytes.

Surrogate spikes are known amounts of non-target compounds which are spiked into all samples prior to sample preparation in order to evaluate the efficiency of the sample preparation and analysis. Surrogate recoveries were generally acceptable for windrow S-001 samples. Two samples collected on Day 0 from the control windrow showed chromatographical interferences on the instrument which has impacted the quantification of the surrogate. Based upon the technical review of the chromatograms, corresponding method blank, LCS, and MS data, it is believed that the samples were prepared appropriately and that the variability of the recovery is due to these interferences.

The QC data demonstrate acceptable accuracy and precision when compared to the project's data quality objectives established in Appendix G of the *FS-QAPP* [MK, 1998a]. The data meet the data quality objectives and are therefore considered usable to support project decisions.

5.4 SUMMARY

The explosive compound concentrations from the TCLP and SPLP extractions show no leachability of any these SWMU-specific contaminants into the soil. The reporting levels are significantly less than the regulatory limits, where established. These results demonstrate that leaching of explosive compounds is not likely to occur in a natural or sanitary landfill environment.

6.0
CONCLUSION

Acute toxicity testing was performed on bioremediated explosives contaminated soil from NSWC Crane to determine the toxic affects of the resultant composted soil when in the environment. These effects were studied using two toxicity methods: Earthworm and Microtox® Toxicity; two pathogen tests: fecal coliform and salmonella; and two leaching procedures: TCLP and SPLP. Comparisons were made between a full-scale operations windrow created with explosive compound contaminated soil and a control windrow utilizing uncontaminated soil.

The earthworm toxicity analysis demonstrated that the contaminated, composted soil is no more toxic than uncontaminated soil which has been subjected to similar composting activities. The Microtox® results for the control windrow showed a less toxic effect on the marine bacteria than the full-scale operations compost. However, federal guidelines have not been established for evaluating Microtox® EC-50 values and the only comparison which can be made is between the control windrow and the results from windrow S-001. A 21% difference between the control windrow and windrow S-001 for the 5-minute Microtox® analysis was considered insufficient to demonstrate significant difference between the control windrow and the composted soil. These results are comparable, and acceptable to demonstrate that the composted soil is no more toxic than the control windrow for this marine bacterium.

The results of the two pathogen tests meet the specifications pertaining to the disposal and use of sewage sludge for both fecal coliform and salmonella. Fecal coliform results were less than 1,000 MPN per gram of solid and salmonella results were less than three MPN per four grams of solid for all samples from windrow S-001. The results of the leaching procedures show non-detectable levels of explosive compounds in both the SPLP and TCLP extraction procedures which are less than the regulatory limits when established for the SWMU-specific compounds.

The composting process has demonstrated that the bioremediation technology using windrows is a safe and effective treatment alternative for detoxifying soil contaminated with explosive compounds. The composted soil, over a period of time, should allow the re-establishment of plant and animal populations in land applications. The compost is suitable for recycling and reuse in accordance with 40 CFR 503.32. Because the compost does not contain leachable contaminants and the compost meets the same requirements as sewage sludge, the composted soil should be considered acceptable for use as backfill or a top soil in approved land application locations.

7.0
REFERENCES

ASTM, 1995 *Pesticides, Resource Recovery, Hazardous Substances and Oil Spill Responses, Waste Disposal, Biological Effects. Standard Guide for Conducting a Laboratory Soil Toxicity Test with Lumbricoid Earthworm, Eisenia foetida.* American Society for Testing Materials. Volume 11.04.

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MK, 1998b *Windrow S-001, Initial Batch Report*, Full-Scale Bioremediation, NSWC Crane, Crane, Indiana. Delivery Order Number 0009, Contract N62467-93-D-1106. Prepared by Morrison Knudsen Corporation, September 25, 1998.

APPENDIX A

TOXICITY AND PATHOGEN TESTING REPORT

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DESCRIPTION	PAGES
Microtox®, Earthworm Toxicity, and Pathogen Testing Report	15 pages
Raw Data	87 pages

FINAL REPORT

MICROTOX, EARTHWORM TOXICITY AND PATHOGEN TESTING OF SOIL/COMPOST MIX FOR PROJECT #4324-0009-07-35 (NSWC CRANE BIOFACILITY)

June 23, 1998

STUDY # 98-164

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MICROTOX, EARTHWORM TOXICITY AND PATHOGEN TESTING OF SOIL/COMPOST MIX FOR PROJECT #4324-0009-07-35 (NSWC CRANE BIOFACILITY)

DATA REQUIREMENT

Microtox -Proprietary Method
Earthworm Toxicity - EPA 600/3-88/029
Pathogen Testing - 40 CFR 503.32

AUTHOR

York Terrell

STUDY COMPLETION DATE

June 23, 1998

PERFORMING LABORATORIES

Aqua Survey, Inc.
499 Point Breeze Road
Flemington, New Jersey 08822

Pure Earth Environmental Laboratory, Inc.
7184 North Park Drive
Pennsauken, NJ 08110

SPONSOR

Morrison Knudsen Corp.
1500 West 3rd Street
Cleveland, OH 44113-1406

LABORATORY PROJECT ID

STUDY #98-164

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APPENDICES
  1. Raw Data: Microtox Testing
  2. Raw Data: Earthworm Toxicity Testing
  3. Raw Data: Pathogen Testing

MICROTOX, EARTHWORM TOXICITY AND PATHOGEN TESTING OF SOIL/COMPOST MIX FOR PROJECT #4324-0009-07-35 (NSWC CRANE BIOFACILITY)

I. SUMMARY

Six (6) samples of soil/compost mix were received by this laboratory (ASI) for Microtox and Earthworm toxicity testing. A representative of each sample was shipped to Pure Earth Environmental Laboratory, Inc. for pathogen testing. For microtox testing, test organisms were exposed to four (4) concentrations of elutriate prepared by adding deionized water to the soil/compost mix. Earthworms were exposed to five (5) concentrations of the soil/compost mix. Exposure concentrations used throughout this report and in all endpoint calculations are nominal concentrations as percent elutriate for microtox testing or percent soil/compost mix for the earthworm toxicity testing. Exposure concentrations were 5.63, 11.25, 22.5 and 45 percent and 6.25, 12.5, 25, 50 and 100 percent for the microtox and earthworm test, respectively. Results for pathogen testing are reported as percent total solids (dry weight). For salmonella sp. results are reported as per 4 grams total solids (dry weight) and for fecal coli/biosolids results are reported as mpn per gram total solids. The results are as follows:

Table 1: Summary of Results

Sample ID #	Earthworm Toxicity (%)		Microtox %		Pathogen Testing		
	7-Day LC_{50}	14-Day LC_{50}	5 min EC_{50}	15 min EC_{50}	Salmonella (per 4 g) (mpn)	Total Solid (% Dry Wt.)	Fecal Coliform (per g solids) (mpn)
Bio 12/14-5001-3	34.1	29.3	52.9	52.5	<3	76.6	<1,000
Bio 12/14-5001-5	68.3	61.9	40.3	46.5	<3	78.3	<1,000
Bio 12/14-5001-7	41.5	34.9	31.5	31.6	<3	76.2	<1,000
Bio 12/14-5001-9	28.6	27.3	20.9	19.6	<3	73.9	<1,000
Bio 12/14-5001-11	11.5	11.5	34.3	38.8	<3	73.9	<1,000
Bio 12/14 Control	16.5	15.2	45.9	>45	<3	81.3	1,968

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II. INTRODUCTION

The marine bacterium, *Photobacterium phosphoreum* was exposed to concentrations of elutriate of soil/compost mix or the soil/compost mix for 15 minutes and the earthworm *Eisenia foetida*was exposed to concentrations of a soil/compost mix for14 days in order to permit a more accurate and complete assessment of its environmental impact. In addition, the density of fecal coliform and Salmonella bacteria in the soil/compost mix was also determined. Test organisms used for testing were chosen on the basis of their ecological importance. The objectives of the test were:

1) To determine if acute exposure to concentrations of elutriate or soil/compost mix would adversely affect *Photobacterium phosphoreum* or *Eisenia foetida*.

2) If appropriate, provide an estimate of the five (5) and 15 minute EC_{50} for *Photobacterium phosphoreum* and seven (7) and 14-day LC_{50} for *Eisenia foetida*.

3) To confirm if pathogenic bacteria were killed during the compost process.

For the purpose of calculating or estimating an EC_{50} or LC_{50} a reduction in light levels or mortalitywould serve as the requisite end point. For the purpose of confirming that pathogenic bacteria were killed during the compost process, the density of fecal coliform and salmonella bacteria would serve as the requisite end point.

III. TEST ADMINISTRATION

A. Sponsor

Morrison Knudson Corporation
1500 West 3rd Street
Cleveland, OH 44113-1406

B. Testing Facility

Biology
Aqua Survey, Inc.
499 Point Breeze Road
Flemington, NJ 08822

Pathogen
Pure Earth Environmental Laboratory, Inc.
7184 Worth Park Drive
Pennsauken, New Jersey 08110

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C. Dates of Experiment

Sample ID	Collection Date	Microtox	Earthworm	Pathogen
Bio 12/14-5001-3	5/11/98	5/24/98	5/13/98	5/13/98
Bio 12/14-5001-5	5/11/98	5/24/98	5/13/98	5/13/98
Bio 12/14-5001-7	5/11/98	5/24/98	5/13/98	5/13/98
Bio 12/14-5001-9	5/11/98	5/24/98	5/13/98	5/13/98
Bio 12/14-5001-11	5/11/98	5/24/98	5/13/98	5/13/98
Bio 12/14 Control	5/20/98	5/24/98	5/22/98	5/21/98

D. Study Participants

Thomas Dolce
Amy Novotny
Robert Fristrom
G. Stephen Hornberger
Michelle Thomas
York Terrell

IV. TEST AND CONTROL SUBSTANCES

A. Test Substance

The soil/compost mix used in this test was received by Aqua Survey on May 11, and May 20, 1998. Samples were received in coolers containing ice. The temperature of the environment in the cooler was 6°C, and 12.5°C, respectively. Two containers, a one-gallon steel can and an eight-ounce glass jar, were received from each location. An additional sample, an eight-ounce jar, from each sampling location was shipped to Pure Earth Environmental Laboratory, Inc. for pathogen testing. The one-gallon and eight-ounce samples received by this laboratory (ASI) were used for the earthworm and microtox testing, respectively. The samples were identified as follows and assigned the following ASI sample numbers:

Sample ID #	ASI Sample ID #
Bio 12/14-5001-3	80885
Bio 12/14-5001-5	80886
Bio 12/14-5001-7	80887
Bio 12/14-5001-9	80888
Bio 12/14-5001-11	80889
Bio 12/14 Control	81036

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B. Control Substance(s)

Negative Control
Microtox: Diluent Control
Earthworm: Control Soil

C. Reference Toxicant

Earthworm: Potassium Chloride (KCl)

V. MATERIALS AND METHODS

A. Test System

The Microtox test system utilizes the marine bacterium, *Photobacterium phosphoreum*. These organisms were obtained from Azur Environmental, F.O.B., Carlsbad, California USA.

The earthworms utilized in these tests were adult *Eisenia foetida* obtained from Carolina Biological Supply Company, Burlington, North Carolina 27215-3398.

B. Source of Diluent/Control Soil

Microtox diluent is a 2% NaCl solution, used for diluting the samples and reagent. All Microtox diluent was obtained from Azur Environmental, Carlsbad, CA.

The control soil used to dilute test soil samples for the earthworm toxicity test was artificial soil prepared by this laboratory (ASI), and consisted of, by weight 10% (approximately 2.5 mm screened) sphagnum peat moss, 20% colloidal Kaolinite Clay, and 70% grade 70 silica sand.

C. Acclimation Procedure

The Microtox Reagent (organisms) is a freeze-dried culture of a specially developed strain of the marine bacterium, *Photobacterium phosphoreum*. One vial of reagent contains roughly one hundred million test organisms. Organisms were reconstituted in one mL of diluent, and placed in the reagent well with the temperature maintained at 5°C. The sensitivity of the reagent remains essentially unchanged for 1-2 hours after reconstitution at this temperature. A 10 μL volume of organisms was transferred to each test cuvettes via a pipette and acclimated to Microtox diluent and test temperature (15°C) for 15 minutes prior to test initiation.
Earthworms were acclimated to test conditions (i.e. temperature and control soil) for a minimum of five days prior to testing.

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D. Diet

E. foetida was fed Magic Worm Food® during holding, and were not fed throughout the duration of testing.

E. Apparatus and Test Conditions

The Microtox Toxicity Test was conducted using a Model 500 Microtox Unit. Organisms were exposed in 2.5 mL cuvettes containing 1 mL of test solution and the test temperature was 15°C.

The Earthworm Toxicity Test was conducted in one-quart canning jars with screw-top lids with 1/16 inch diameter holes for air. The test was conducted under continuous illumination, The test temperature was 22±2°C.

F. Preparation of Test Solution and Concentrations

The elutriate used for Microtox testing was prepared by adding 50 grams dry weight of test soil/compost mix to 500 mL of deionized water. Test samples were agitated for 48 hours at 20±2°C in total darkness. After agitation was complete, the suspension was poured into centrifuge bottles and centrifuged at approximately 4200 rpm for approximately 20 minutes. The elutriate fraction was decanted and used to prepare the test solutions.

Test solution was prepared by adding appropriate volumes of elutriate to Microtox diluent in test cuvettes. Test concentrations were 5.63, 11.25, 22.5, and 45.0%.

The concentrations for the Earthworm Toxicity test were prepared by determining the moisture fractions and water holding capacity of the soil/compost mix as well as the control/diluent soil (e.g., artificial soil). Appropriate amounts of test soil were added to artificial soil to prepare 700 grams of a geometric series of test soil concentrations (e.g., 6.25, 12.5, 25.0, 50.0, and 100.0% dry weight.) An artificial soil (only) control was also prepared. All test concentrations as well as controls were homogenized using a blender. After homogenization, 200 grams (dry weight) of each control and test concentration was placed in each of three replicate vessels for each concentration, at which time all replicate concentrations were hydrated to 75% of its respective water holding capacity using deionized water.

G. Test Procedure

The procedures used for these test were based on accepted methodologies (1-4). Observation for light output (bioluminescence) of the Microtox organisms were made at five and fifteen minutes after test initiation. The test was initiated when the test organisms were challenged with each of four test concentrations plus diluent control.

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Observation of earthworm survival was made on days seven and fourteen after test initiation. The pH of the soil was measured at test initiation on day 0 and upon test termination, on day 14 in test concentrations in which organisms survived. The temperature of the test room environment was measured continuously for the duration of the test. The test started when ten test organisms were placed into each of three replicate test and control vessels. In addition, ten organisms were placed into each of three replicates for each of five concentrations of a reference toxicant (KCl) to determine the sensitivity of the test organisms.

H. EC_{50} and LC_{50} Calculations

The Microtox system is most frequently used to find the effective concentration (EC_{50}) of a sample at which the light output of the reagent is reduced by a specified percentage (i.e., the EC_{50} is the effect concentration of a sample causing a 50% decrease in the Microtox Reagent light output under defined conditions of exposure time). A computer program supplied by Microbics corporation (Azur Environmental) was used to compute point and interval (i.e., confidence interval) estimate of the EC_{50} (see Appendix One).

A computer program developed by C.E. Stephans and ASTM was used to compute point and interval (confidence) estimate of the LC_{50} for earthworms. The program requires the following data: the concentration of the test substance; the number of organisms exposed; and the number of organisms that died (see Appendix Two). In this test, the LC_{50} is the concentration of test substance, calculated from experimentally-derived mortality that is lethal to 50% of the test population during continuous exposure over a specified period of time.

VI. Test Results

The EC_{50} value for Microtox and LC_{50} value for earthworms and results for pathogen testing are summarized in Table 1. Mortality and pH for the earthworm Toxicity Tests are summarized in Tables 3-7. Raw data and EC_{50} calculations for the Microtox is presented in Appendix One. Raw data and LC_{50} calculations for the earthworm test is presented in Appendix Two. Data for the pathogen test is presented in Appendix Three.

VII. Test Validity

The following criteria for a valid test were met during the study:

A. Mean survival for the earthworm controls was ≥ 90%

B. No abnormal occurrences (i.e., laboratory accidents) that might have influenced the outcome of the test were noted.

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VII. Discussion

During Microtox testing, observation for light output was made at five and fifteen minutes. Nothing noteworthy was observed.

Earthworms were observed for mortality at days seven and fourteen. A dose response was observed for mortality for all test samples with the exception of sample number Bio 12/14-5001-11. After fourteen days, 100, 0, 87, 43, and 100% mortality was observed in the 6.25, 12.5, 25, 50, and 100% test concentrations, respectively. No explanation is provided for this dose response. The pH of soil samples measured at test initiation and at day fourteen ranged from 4.8 to 8.7. These values are considered to be acceptable for these organisms (1) and are not likely to have caused any adverse effects. The temperature of the test room was recorded continuously (hourly) for the duration of the test. On several occasions the temperature rose above the test temperature of 22±2°C, with the extreme being 27.8°C. Although this temperature exceeded the target temperature for this test, it is not believed to have affected the outcome of the test. Since the recommended test temperature for *Eisenia foetida* ranges from 20-29°C (2).

IX. References

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2. American Society for Testing and Materials (ASTM). Annual Book of ASTM Standards. 1995 Volume 11.04 "Pesticides, Resource Recovery, Hazardous Substances and Oil Spill Responses, Waste Disposal, Biological Effects. Standard Guide for Conducting a Laboratory Soil Toxicity Test with Lumbricoid Earthworm, *Eisenia foetida*.

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Results of Toxicity Testing with *Eisenia foetida*

All tests were stocked with 3 replicates per concentration, 10 organisms per replicate.

Table 2: Standard Reference Toxicant Test Results: *E. foetida*
Initial/Final pH: 4.6/5.0

Sample # 80890 Concentration KCl	7-day Total Live Count	14-day Total Live Count
Control	30	30
1250 ppm	30	30
2500 ppm	30	29
5000 ppm	29	29
10000 ppm	0	0
20000 ppm	0	0
LC_{50}	6826.02 %	6826.02 %

Table 3: Results of Toxicity Testing with *E. foetida*, Sample # 80885

Concentration	Initial pH	Final pH	7-day Total Live Count	14-day Total Live Count
6.25 %	4.9	6.6	30	30
12.5 %	4.9	6.8	28	27
25 %	5.4	7.2	29	29
50 %	6.9	8.4	3	0
100 %	8.3	-	0	0
LC_{50}	-	-	34.09 %	29.25 %

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Table 4: Results of Toxicity Testing with *E. foetida*, Sample # 80886

Concentration	Initial pH	Final pH	7-day Total Live Count	14-day Total Live Count
6.25 %	4.8	6.9	30	30
12.5 %	5.0	6.5	30	30
25 %	5.7	8.0	30	30
50 %	6.6	8.4	29	24
100 %	8.4	-	0	0
LC_{50}	-	-	68.26 %	61.92 %

Table 5: Results of Toxicity Testing with *E. foetida*, Sample # 80887

Concentration	Initial pH	Final pH	7-day Total Live Count	14-day Total Live Count
6.25 %	5.7	7.0	29	27
12.5 %	5.6	7.8	27	26
25 %	6.2	7.8	27	27
50 %	6.7	8.3	10	10
100 %	8.4	-	0	0
LC_{50}	-	-	41.46 %	34.91 %

Table 6: Results of Toxicity Testing with *E. foetida*, Sample # 80888

Concentration	Initial pH	Final pH	7-day Total Live Count	14-day Total Live Count
6.25 %	5.0	6.8	30	29
12.5 %	5.4	7.8	26	25
25 %	6.2	7.9	29	29
50 %	6.7	-	0	0
100 %	8.6	-	0	0
LC_{50}	-	-	28.55 %	27.27 %

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Table 7: Results of Toxicity Testing with *E. foetida*, Sample # 80889

Concentration	Initial pH	Final pH	7-day Total Live Count	14-day Total Live Count
6.25 %	5.5	-	0	0
12.5 %	5.9	*	30	30
25 %	6.5	-	6	4
50 %	6.8	*	19	17
100 %	8.7	-	0	0
LC_{50}	-	-	11.51 %	11.51 %

*pH not recorded

Table 8: Results of Toxicity Testing with *E. foetida*, Sample # 81036

Concentration	Initial pH	Final pH	7-day Total Live Count	14-day Total Live Count
Control	5.9	5.5	29	29
6.25 %	5.8	5.8	30	29
12.5 %	6.1	8.1	24	22
25 %	6.1	-	3	3
50 %	6.4	-	0	0
100 %	7.5	-	0	0
LC_{50}	-	-	16.48 %	15.24 %

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Results of Microtox Testing with *Photobacterium phosphoreum*

Table 9: Results of Microtox Testing

Sample	5 Minute EC_{50}	15 Minute EC_{50}
80885	52.85 %	52.49 %
80886	40.31 %	46.48 %
80887	31.53 %	31.55 %
80888	20.86 %	19.56 %
80889	34.31 %	38.80 %
81036	45.87 %	>45 %

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SIGNATURE PAGE

MICROTOX, EARTHWORM TOXICITY AND PATHOGEN TESTING
OF SOIL/COMPOST MIX FOR PROJECT # 4324-0009-07-35
(NSWC CRANE BIOFACILITY)

Amy Novotny — 23 June 1998
Amy Novotny
Project Manager
Date

York Terrell — 6/23/98
York Terrell
Study Director
Date

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Appendix One

Raw Data: Microtox Testing

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

BO-015

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 386-5000

Project No.: 4324-009-07-35

Project Name: NSWC Crane Biofacility

Samplers: (Signature) Ken Phillips

Sampler: (Print) KEN PHILLIPS

Analysis Required: Microtox, Pathogen Tox, Pathogens

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	Microtox	Pathogen Tox	Pathogens	Remarks
compost	column 3	5/11/98	1006	BO-12/14-S001-3		✓	✓	✓	✓	Soil Toxicity
	5		1026	BO-12/14-S001-5		✓	✓	✓	✓	
	7		0945	BO-12/14-S001-7		✓	✓	✓	✓	
	9		0936	BO-12/14-S001-9		✓	✓	✓	✓	
	11		0919	BO-12/14-S001-11		✓	✓	✓	✓	
										~~Pathogen bpc~~ ~~40CFR 503.32~~
										AQUA Survey

Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company	Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company
Ken Phillips	5/11/98 1530	York Russell 5/12/98			
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Received for Laboratory By: (Signature) / Company:	Date/Time	Total No. Samples This Shipping Container / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:

Soil #s 73019 20

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 386-5000

BIO - 22

Project No.: 4324-0009-01-35
Project Name: NSWC Crane Bioreactor
Samplers: (Signature)
Sampler: (Print) Mike Maddox

Analysis Required: Microtox, Earthworm TOX

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	Microtox	Earthworm TOX	Remarks
Compost	Control Pile, 25% Dry Lost (26)	5/20/98	1245	B10-12/14-Control		-	✓	✓	
									AQUA Survey

Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
	5/20/98 1530	5/21			
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Received for Laboratory By: (Signature) / Company:	Date/Time	Total No. Samples This Shipping Container / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:

00066
00100

FedEx USA Airbill 8008118247 65

9N/21

0200 FedEx Retrieval Copy

1 From

Date 5/11/98 Sender's FedEx Account Number 1768-6278-5

Sender's Name RITA DAWSON Phone (812) 854-6941

Company MORRISON KNUDSEN CORP

Address NSWC CTR12 300 HWY 361 Dept./Floor/Suite/Room

City CRANE State IN ZIP 47522

2 Your Internal Billing Reference Information

3 To

Recipient's Name JAMES TODD Phone 908) 788-8700

Company AQUA SURVEY, INC

Address 499 POINT BREEZE ROAD Dept./Floor/Suite/Room

(To HOLD at FedEx location, print FedEx address here)

☐ Check here if residence (Extra charge applies for FedEx Express Saver)

City FLEMINGTON State NJ ZIP 08822

For HOLD at FedEx Location check here

1[ ] Hold Weekday (Not available with FedEx First Overnight) 3[ ] Hold Saturday (Not available at all locations) (Available for FedEx Priority Overnight and FedEx 2Day only)

For Saturday Delivery check here

3[ ] (Extra Charge. Not available to all locations) (Available for FedEx Priority Overnight and FedEx 2Day only)

4a Express Package Service *Packages under 150 lbs.* Delivery commitment may be later in some areas

1[X] FedEx Priority Overnight (Next business day afternoon) 5[ ] FedEx Standard Overnight (Next business day afternoon) 3[ ] FedEx 2Day* (Second business day) 20[ ] FedEx Express Saver* (Third business day)

6[ ] FedEx First Overnight (Earliest next business morning delivery to select locations) (Higher rates apply)

*FedEx Express Rate not available. Minimum charge: One pound rate

4b Express Freight Service *Packages over 150 lbs.* Delivery commitment may be later in some areas

7[ ] FedEx Overnight Freight (Next business day) 8[ ] FedEx 2Day Freight (Second business day) 83[ ] FedEx Express Saver Freight (Up to 3 business days)

(Call for delivery schedule. See back for detailed descriptions of freight services.)

5 Packaging 6[ ] FedEx Letter 2[ ] FedEx Pak (Declared value limit $500) 3[ ] FedEx Box 4[ ] FedEx Tube 1[X] Other Pkg

6 Special Handling

Does this shipment contain dangerous goods? 4[ ] Yes (Shipper's Declaration not required) [ ] Yes (Shipper's Declaration not required)

6[ ] Dry Ice (Dry Ice ___ lbs. UN 1845) (Dangerous Goods Shipper's Declaration not required) CA[ ] Cargo Aircraft Only

7 Payment [ ] Obtain Recipient FedEx Account No.

Bill to: 1[X] Sender (Account No. in Section 1 will be billed) 2[ ] Recipient 3[ ] Third Party 4[ ] Credit Card 5[ ] Cash/Check

(Enter FedEx account no. or Credit Card no. below)

FedEx Account No.

Credit Card No. Exp. Date

Total Packages 1 Total Weight 32 Lb [redacted] Total Charges $

When declaring a value higher than $100 per shipment, you pay an additional charge. See INVOICE CONDITIONS, DEFINITIONS AND LIMIT OF LIABILITY section for further information

Credit Card Auth.

8 Release Signature

Your signature authorizes Federal Express to deliver this shipment without obtaining a signature and agrees to indemnify and hold harmless Federal Express from any resulting claims

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Rev. Date 5/97
Part #150304
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8 0 0 8 1 1 8 2 4 7 6 5

003196427 2

ASI, INC.
SAMPLE RECEIVING FORM

Client: Marisa Knudson Comp

Shipped Via: Fed Ex | # of Shipping Containers: 1

Type of Shipping Container: Cooler | Custody Seal Present ✓ Absent _ Broken _ | Condition of Shipping Containers: Acceptable ✓ Unacceptable _

	ASI # 98-164	Sample ID	Type of Container	Number of Containers	Condition of Sample*	Temp. °C	Ice -	Type of Sample*
1.	80885	Column 3	Jar/Can	2	A	6	T	S
2.	80886	" 5	↓	↓	↓	↓	↓	↓
3.	80887	" 7						
4.	80888	" 9						
5.	80889	" 11						
6.								
7.								
8.								
9.								
10.								

Notes: (Discrepancies Between Sample Labels and COC Record)

Opened /Received by: [illegible] | Date/Time: 5/12/98 1500

S - Soil
Se - Sediment
Sl - Sludge
W - Water
E - Effluent

A - Acceptable
U - Unacceptable or Compromised

I - Ice
D - Dry Ice
B - Blue Ice
N - None

7/96

ASI, INC.
SAMPLE RECEIVING FORM

Client: Morrison Knudsen Corp.

Shipped Via: Fedex | # of Shipping Containers: 1

Type of Shipping Container: Cooler | Custody Seal: Present ✓ Absent ___ Broken ___ | Condition of Shipping Container: Acceptable ✓ Unacceptable ___

	ASI # 95-164	Sample ID	Type of Container	Number of Containers	Condition of Sample	Temp. °C	Ice -	Type of Sample
1.	81036	BO-12/14 Control	Glass Jar / Tin Can	2	A	12.5	I	S
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								

Notes: (Discrepancies Between Sample Labels and COC Record)

Received/Removed by: [signature] | Date/Time:

S - Soil
Sd - Sediment
Sl - Sludge
W - Water
E - Effluent

A - Acceptable
U - Unacceptable or Compromised

I - Ice
D - Dry Ice
B - Blue Ice
N - None

7/96

Microtox Data Sheet

Client: MKC Job #: 98-164

Date Sample Collected: 5/11/98, 5/20/98 Received: 5/12/98, 5/21/98 Tested: 5/24/98

Osmotic Adjustment

Sample #	Light Reading	Blank	5.6	11.3	22.5	45	Initial	Osmotic Adjustment
80885	Initial (1,0)	93	66	71	66	60	TD 5/24/98	No ___
	5 minute (1,5)	64	47	41	34	22		Yes ✓
	15 minute (1,15)	57	43	39	32	20		
Sample #	**Light Reading**	**Blank**	**5.6**	**11.3**	**22.5**	**45**	**Initial**	
80886	Initial (1,0)	72	68	67	62	61	TD 5/24/98	No ___
	5 minute (1,5)	50	47	39	31	19		Yes ✓
	15 minute (1,15)	45	43	36	29	19		
Sample #	**Light Reading**	**Blank**	**5.6**	**11.3**	**22.5**	**45**	**Initial**	
80887	Initial (1,0)	64	64	70	69	65	TD 5/24/98	No ___
	5 minute (1,5)	44	42	39	29	17		es ✓
	15 minute (1,15)	40	39	36	27	15		
Sample #	**Light Reading**	**Blank**	**5.6**	**11.3**	**22.5**	**45**	**Initial**	
80888	Initial (1,0)	59	58	59	54	54	TD 5/24/98	No ___
	5 minute (1,5)	~~62~~ 45	~~52~~ 38	~~60~~ 29	21	11		s ✓
	15 minute (1,15)	41	34	27	18	09		
Sample #	**Light Reading**	**Blank**	**5.6**	**11.3**	**22.5**	**45**	**Initial**	
80889	Initial (1,0)	62	52	60	55	54	TD 5/24/98	No ___
	5 minute (1,5)	40	36	33	23	14		s ✓
	15 minute (1,15)	36	33	30	22	14		
Sample #	**Light Reading**	**Blank**	**5.6**	**11.3**	**22.5**	**45**	**Initial**	
81036	Initial (1,0)	58	54	56	54	57	TD 5/24/98	No ___
	5 minute (1,5)	43	40	38	30	22		✓
	15 minute (1,15)	39	38	36	29	20		
Sample #	**Light Reading**	**Blank**					**Initial**	
	Initial (1,0)							___
	5 minute (1,5)							
	15 minute (1,15)							___

MICROTOX DATA REPORT
Basic Test

FILE: MKC.K5
Column 3 80885

Test Time: 5 minutes Osmotic Adjustment:y

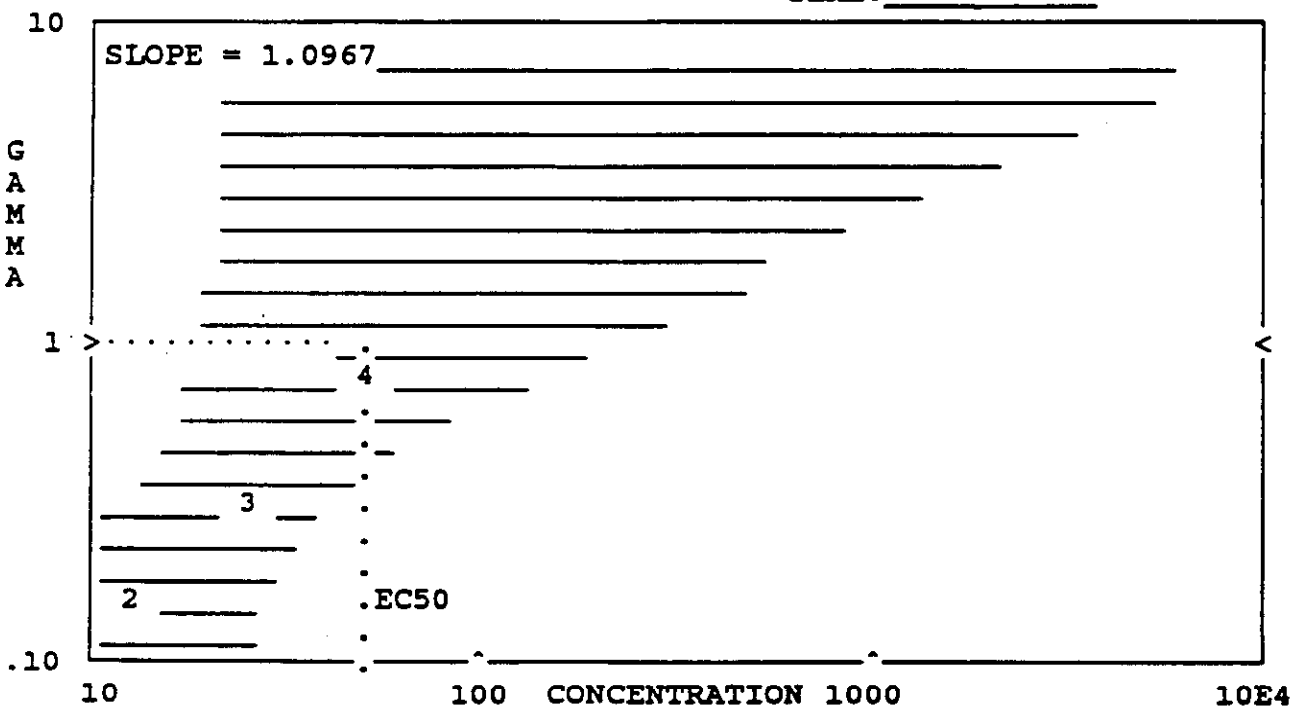
NUMBER	I0/IT	CONC.	CR/GAMMA	% EFFECT
Control	93.00/ 64.00	0.0	0.6882 #	
1	66.00/ 47.00	5.6250	-0.034 *	
2	71.00/ 41.00	11.2500	0.192 #	16.1
3	66.00/ 34.00	22.5000	0.336 #	25.1
4	60.00/ 22.00	45.0000	0.877 #	46.7

CR = Control Ratio CORRECTION FACTOR = 0.6882
# Used for calculations * Invalid data or controls

EC50 52.85 % (95% CONFIDENCE RANGE: 7.41 TO %377.18)

(NOTE: EC50 is an extrapolated value.)

Signature _____ TEST DATE:_____
TIME:_____



ESTIMATING EQUATION: LOG C = 0.8914 x LOG Γ +1.7231
95% CONFIDENCE FACTOR: 7.13621 FOR EC50
COEFFICIENT OF DETERMINATION: R^2 = 0.97757

JR 5/28

MICROTOX DATA REPORT
Basic Test

FILE: MKC.K15
Column 3 80885

Test Time: 15 minutes Osmotic Adjustment:y

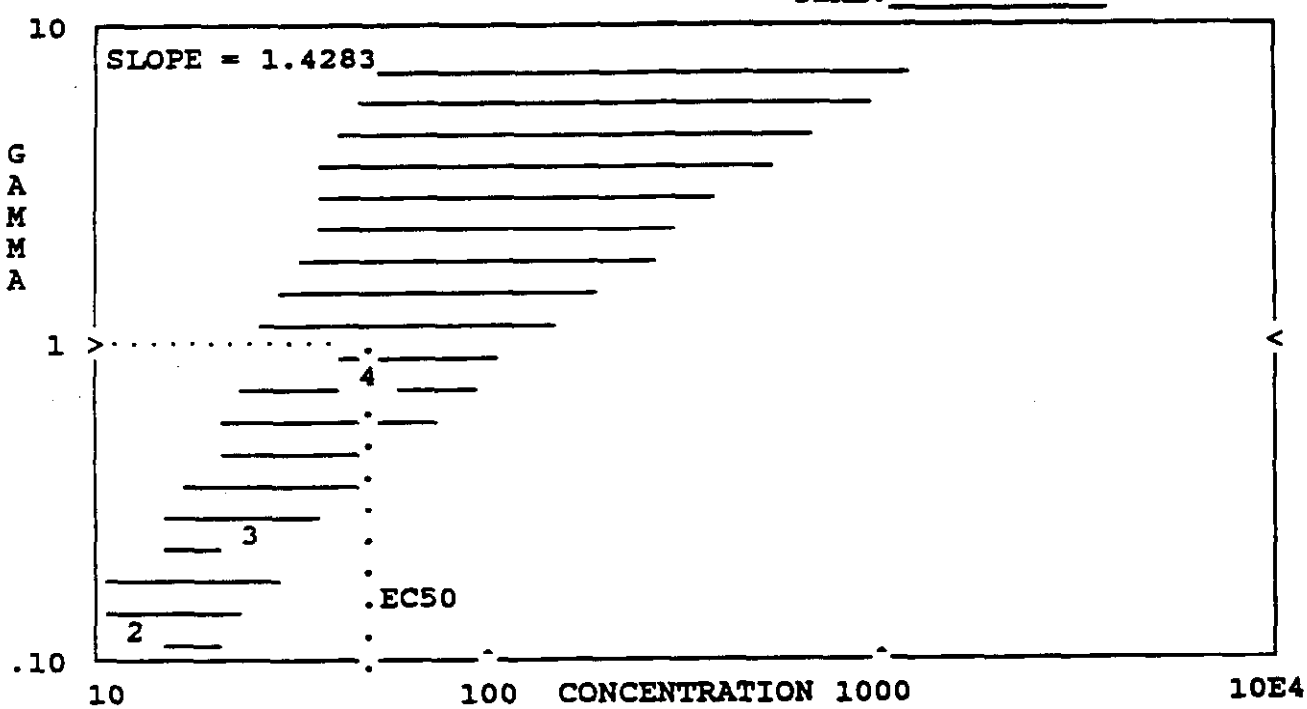
NUMBER	I0/IT	CONC.	CR/GAMMA	% EFFECT
Control	93.00/ 57.00	0.0	0.6129 #	
1	66.00/ 43.00	5.6250	-0.059 *	
2	71.00/ 39.00	11.2500	0.116 #	10.4
3	66.00/ 32.00	22.5000	0.264 #	20.9
4	60.00/ 20.00	45.0000	0.839 #	45.6

CR = Control Ratio CORRECTION FACTOR = 0.6129
# Used for calculations * Invalid data or controls

EC50 52.49 % (95% CONFIDENCE RANGE:15.08 TO %182.69)

(NOTE: EC50 is an extrapolated value.)

Signature _____ TEST DATE:_____
TIME:_____



ESTIMATING EQUATION: LOG C = 0.6937 x LOG Γ +1.7200
95% CONFIDENCE FACTOR: 3.48080 FOR EC50
COEFFICIENT OF DETERMINATION: R^2 = 0.99077

5/2

MICROTOX DATA REPORT
Basic Test

FILE: MKC.K5
Column 5 80886

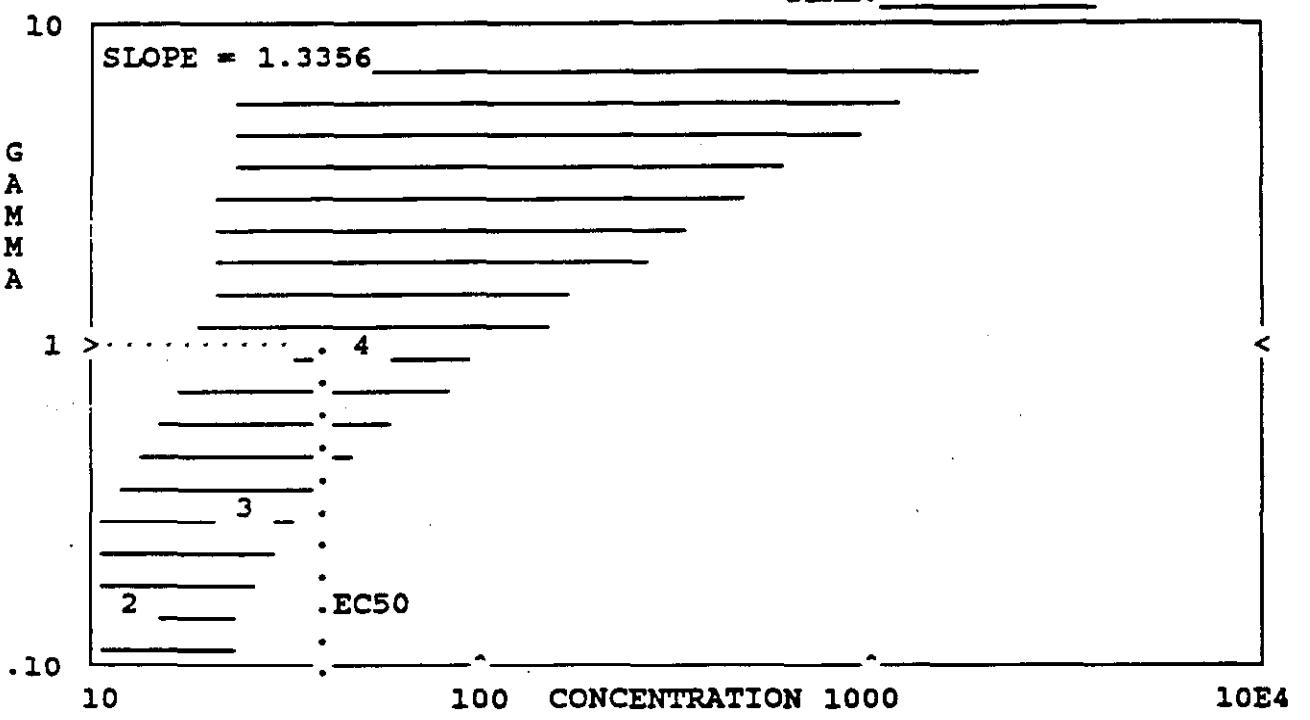
Test Time: 5 minutes Osmotic Adjustment:y

NUMBER	I0/IT	CONC.	CR/GAMMA	% EFFECT
Control	72.00/ 50.00	0.0	0.6944 #	
1	68.00/ 47.00	5.6250	0.005 *	
2	67.00/ 39.00	11.2500	0.193 #	16.2
3	62.00/ 31.00	22.5000	0.389 #	28.0
4	61.00/ 19.00	45.0000	1.230 #	55.1

CR = Control Ratio CORRECTION FACTOR = 0.6944
# Used for calculations * Invalid data or controls

EC50 40.31 % (95% CONFIDENCE RANGE: 9.51 TO %170.81)

Signature _____ TEST DATE:_____
TIME:_____



ESTIMATING EQUATION: LOG C = 0.7342 x LOG Γ +1.6054
95% CONFIDENCE FACTOR: 4.23711 FOR EC50
COEFFICIENT OF DETERMINATION: R^2 = 0.98064

JP 6/28

MICROTOX DATA REPORT
Basic Test

FILE: MKC.K15
Column 5 80886

Test Time: 15 minutes Osmotic Adjustment:y

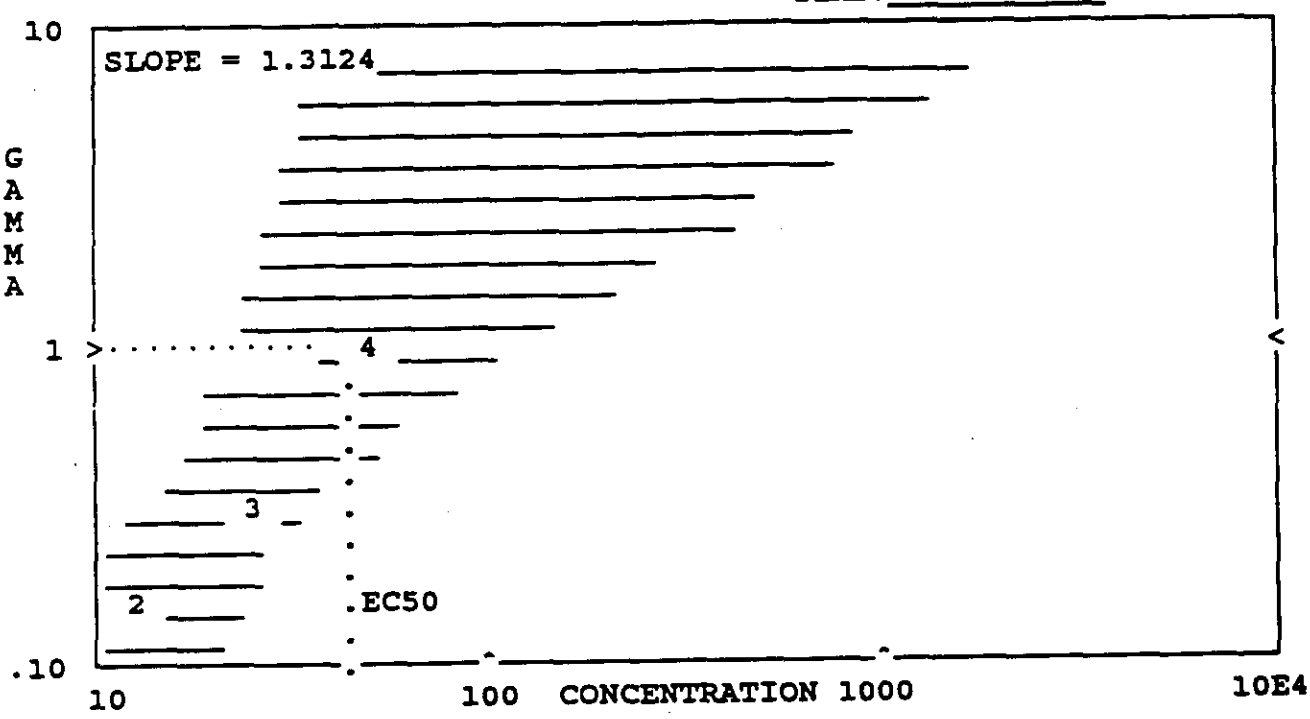
NUMBER	I0/IT	CONC.	CR/GAMMA	% EFFECT
Control	72.00/ 45.00	0.0	0.6250 #	
1	68.00/ 43.00	5.6250	-0.012 *	
2	67.00/ 36.00	11.2500	0.163 #	14.0
3	62.00/ 29.00	22.5000	0.336 #	25.2
4	61.00/ 19.00	45.0000	1.007 #	50.2

CR = Control Ratio CORRECTION FACTOR = 0.6250
# Used for calculations * Invalid data or controls

EC50 46.48 % (95% CONFIDENCE RANGE:11.66 TO %185.28)

(NOTE: EC50 is an extrapolated value.)

Signature _____ TEST DATE:_____
TIME:_____



ESTIMATING EQUATION: LOG C = 0.7514 x LOG Γ +1.6672
95% CONFIDENCE FACTOR: 3.98665 FOR EC50
COEFFICIENT OF DETERMINATION: R^2 = 0.98613

JC
5/25

MICROTOX DATA REPORT
Basic Test

FILE: MKC.K5
Column 7 80887

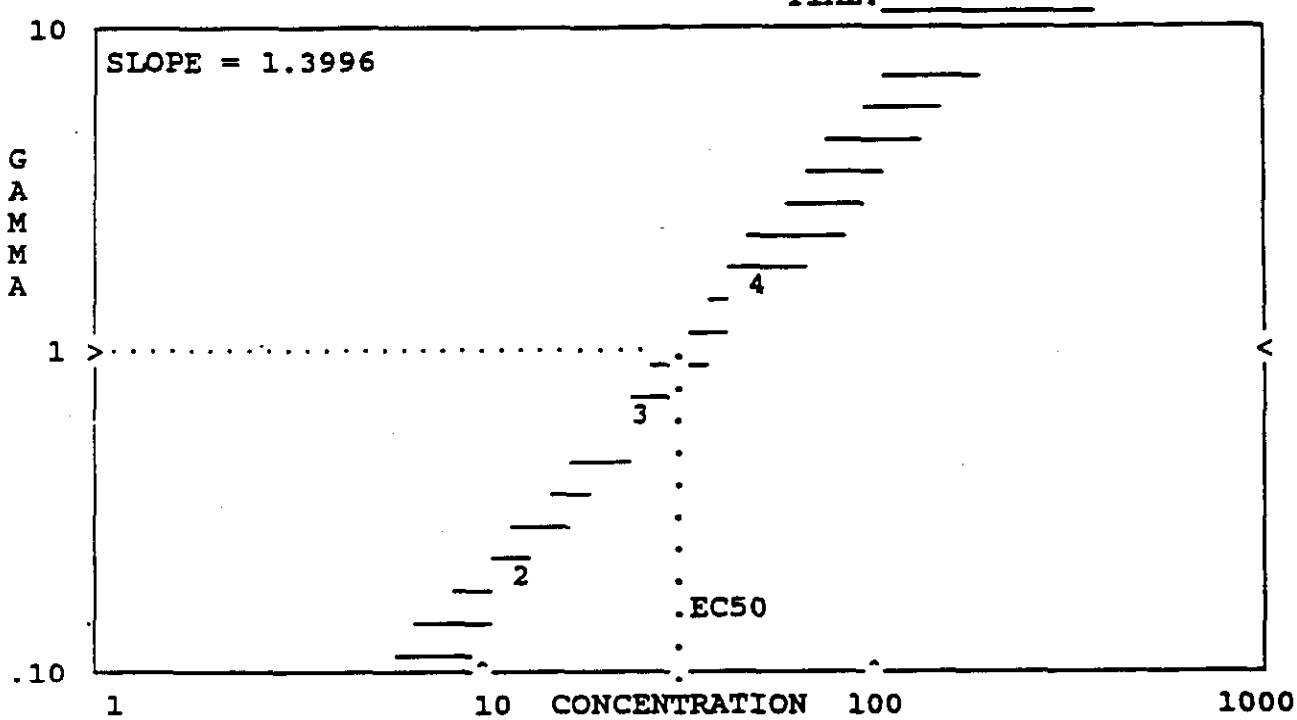
Test Time: 5 minutes Osmotic Adjustment:y

NUMBER	I0/IT	CONC.	CR/GAMMA	% EFFECT
Control	64.00/ 44.00	0.0	0.6875 #	
1	64.00/ 42.00	5.6250	0.048 *	
2	70.00/ 39.00	11.2500	0.234 #	19.0
3	69.00/ 29.00	22.5000	0.636 #	38.9
4	65.00/ 17.00	45.0000	1.629 #	62.0

CR = Control Ratio CORRECTION FACTOR = 0.6875
# Used for calculations * Invalid data or controls

EC50 31.53 % (95% CONFIDENCE RANGE:27.24 TO 36.51)

Signature _____ TEST DATE:_____
TIME:_____



ESTIMATING EQUATION: LOG C = 0.7143 x LOG Γ +1.4988
95% CONFIDENCE FACTOR: 1.15781 FOR EC50
COEFFICIENT OF DETERMINATION: R^2 = 0.99969

5/28

MICROTOX DATA REPORT
Basic Test

FILE: MKC.K15
Column 7 80887

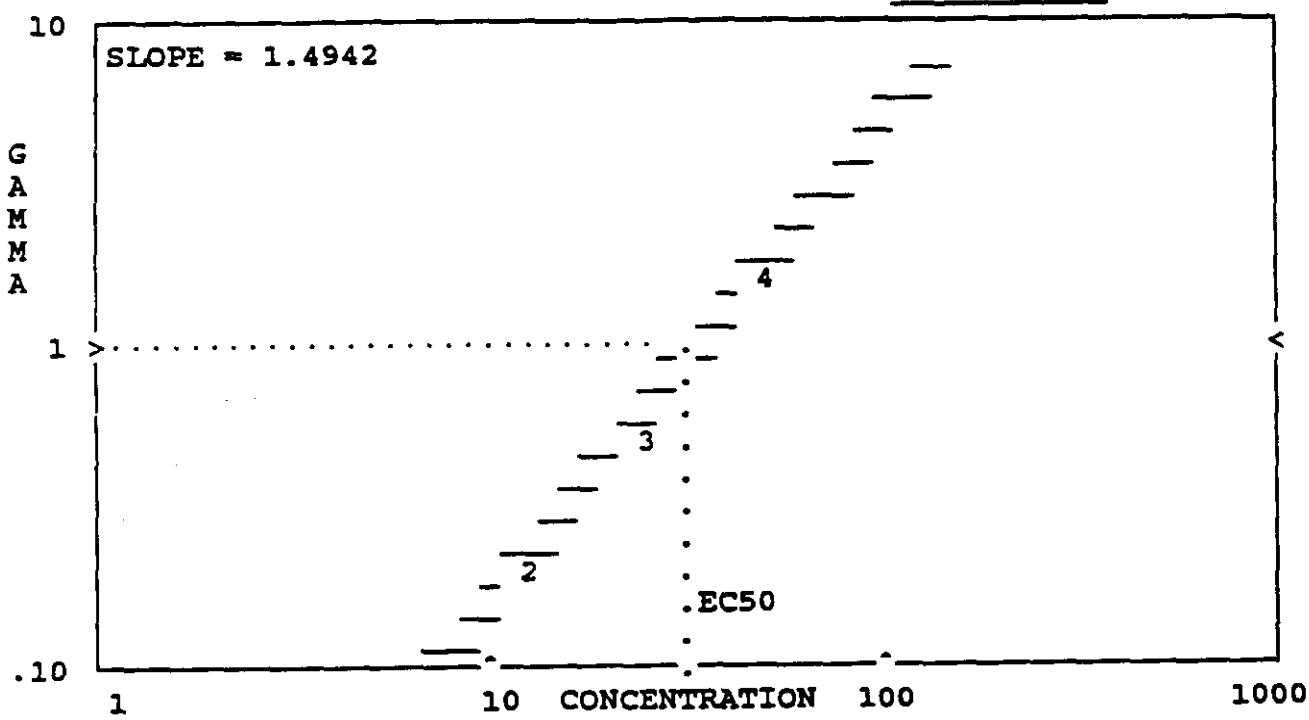
Test Time: 15 minutes Osmotic Adjustment:y

NUMBER	I0/IT	CONC.	CR/GAMMA	% EFFECT
Control	64.00/ 40.00	0.0	0.6250 #	
1	64.00/ 39.00	5.6250	0.026 *	
2	70.00/ 36.00	11.2500	0.215 #	17.7
3	69.00/ 27.00	22.5000	0.597 #	37.4
4	65.00/ 15.00	45.0000	1.708 #	63.1

CR = Control Ratio CORRECTION FACTOR = 0.6250
# Used for calculations * Invalid data or controls

EC50 31.55 % (95% CONFIDENCE RANGE:29.38 TO 33.88)

Signature _____ TEST DATE:_____
TIME:_____



ESTIMATING EQUATION: LOG C = 0.6692 x LOG Γ +1.4990
95% CONFIDENCE FACTOR: 1.07381 FOR EC50
COEFFICIENT OF DETERMINATION: R^2 = 0.99993

MICROTOX DATA REPORT
Basic Test

FILE: MKC.K5
Column 9 80888

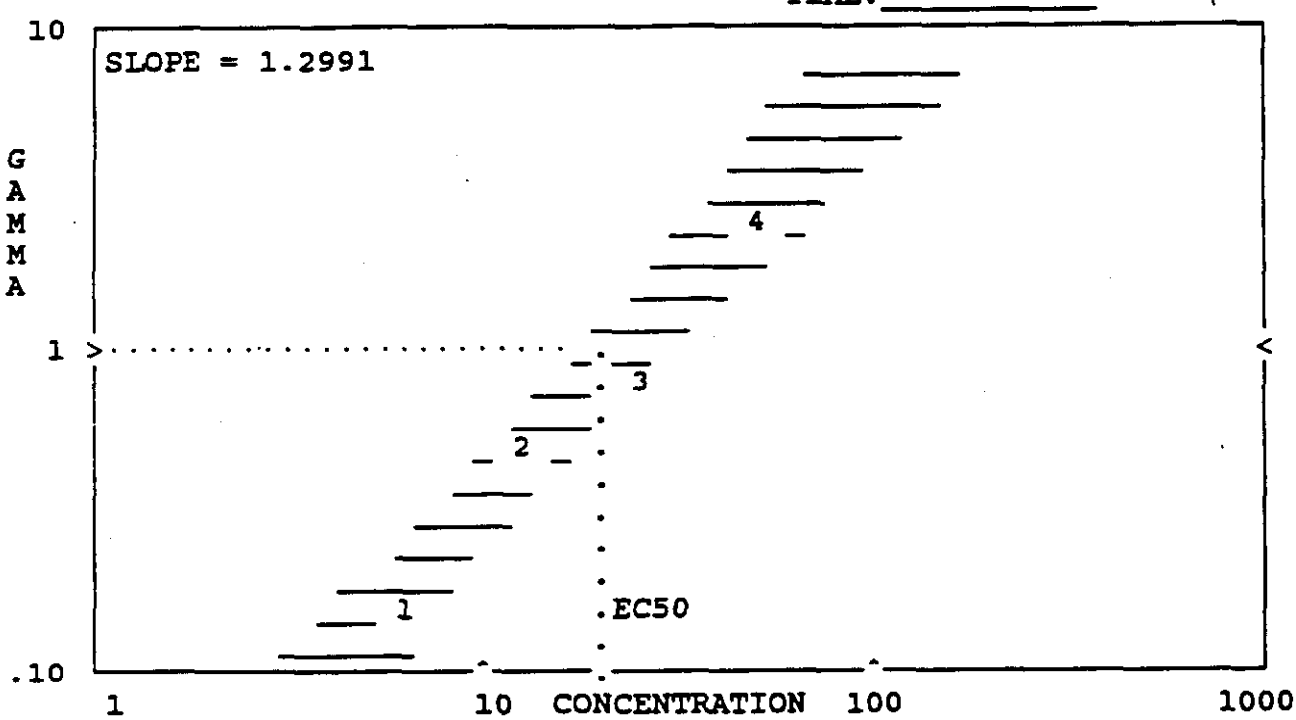
Test Time: 5 minutes Osmotic Adjustment:y

NUMBER	I0/IT	CONC.	CR/GAMMA	% EFFECT
Control	59.00/ 45.00	0.0	0.7627 #	
1	58.00/ 38.00	5.6250	0.164 #	14.1
2	59.00/ 29.00	11.2500	0.552 #	35.6
3	54.00/ 21.00	22.5000	0.961 #	49.0
4	54.00/ 11.00	45.0000	2.744 #	73.3

CR = Control Ratio CORRECTION FACTOR = 0.7627
# Used for calculations

EC50 20.86 % (95% CONFIDENCE RANGE:14.96 TO 29.07)

Signature _____ TEST DATE:_____
TIME:_____



ESTIMATING EQUATION: LOG C = 0.7562 x LOG Γ +1.3192
95% CONFIDENCE FACTOR: 1.39413 FOR EC50
COEFFICIENT OF DETERMINATION: R^2 = 0.98234

JN 5/24

MICROTOX DATA REPORT
Basic Test

FILE: MKC.K15
Column 9 80888

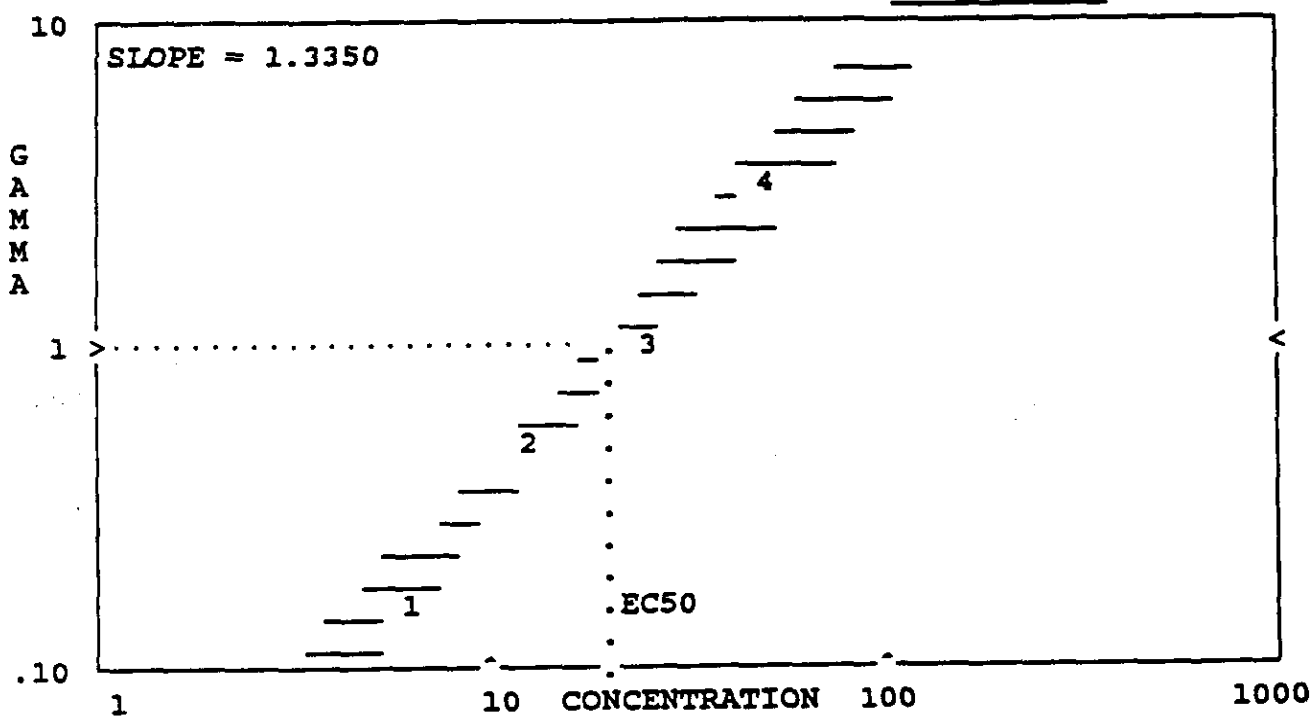
Test Time: 15 minutes Osmotic Adjustment:y

NUMBER	I0/IT	CONC.	CR/GAMMA	% EFFECT
Control	59.00/ 41.00	0.0	0.6949 #	
1	58.00/ 34.00	5.6250	0.185 #	15.6
2	59.00/ 27.00	11.2500	0.519 #	34.1
3	54.00/ 18.00	22.5000	1.085 #	52.0
4	54.00/ 9.00	45.0000	3.169 #	76.0

CR = Control Ratio CORRECTION FACTOR = 0.6949
# Used for calculations

EC50 19.56 % (95% CONFIDENCE RANGE:16.56 TO 23.09)

Signature _____ TEST DATE:_____
TIME:_____



ESTIMATING EQUATION: LOG C = 0.7456 x LOG Γ +1.2913
95% CONFIDENCE FACTOR: 1.18087 FOR EC50
COEFFICIENT OF DETERMINATION: R^2 = 0.99536

MICROTOX DATA REPORT
Basic Test

FILE: MKC.K5
Column 11 80889

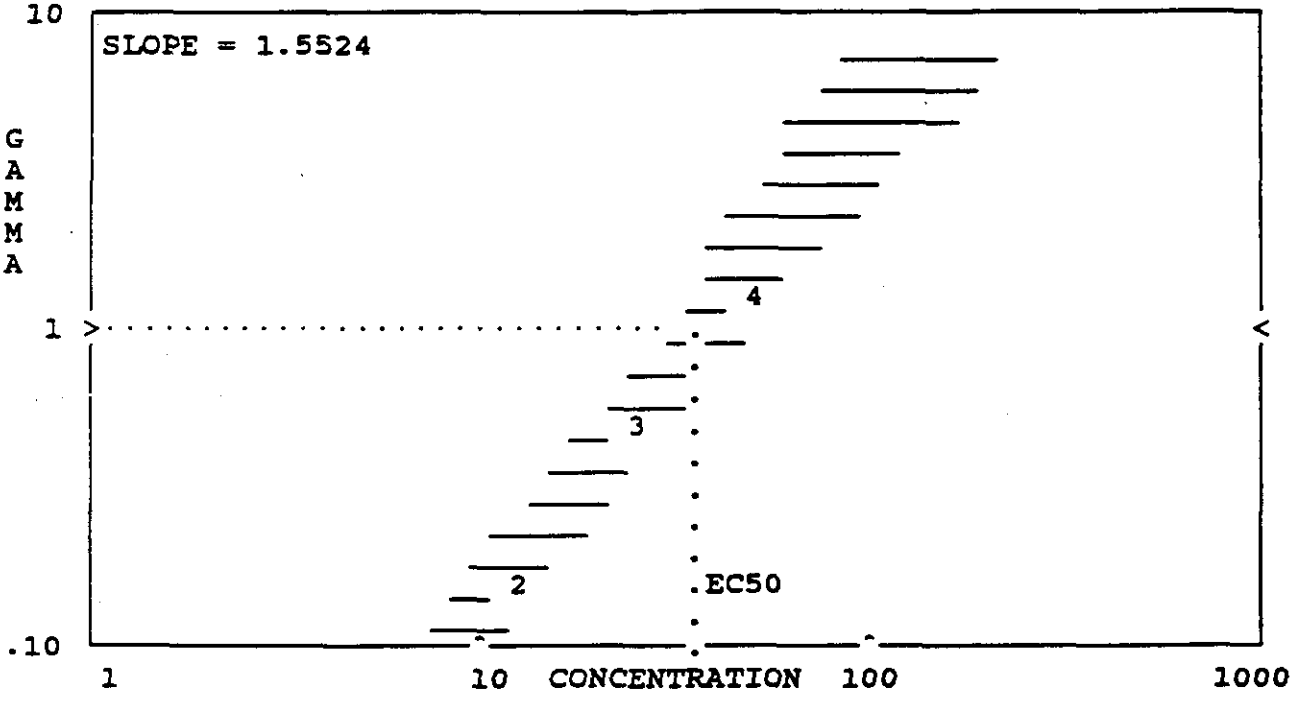
Test Time: 5 minutes Osmotic Adjustment:y

NUMBER	IO/IT	CONC.	CR/GAMMA	% EFFECT
Control	62.00/ 40.00	0.0	0.6452 #	
1	52.00/ 36.00	5.6250	-0.068 *	
2	60.00/ 33.00	11.2500	0.173 #	14.7
3	55.00/ 23.00	22.5000	0.543 #	35.2
4	54.00/ 14.00	45.0000	1.488 #	59.8

CR = Control Ratio CORRECTION FACTOR = 0.6452
# Used for calculations * Invalid data or controls

EC50 34.31 % (95% CONFIDENCE RANGE:24.83 TO 47.41)

Signature _____ TEST DATE:_____
TIME:_____



ESTIMATING EQUATION: LOG C = 0.6433 x LOG Γ +1.5354
95% CONFIDENCE FACTOR: 1.38172 FOR EC50
COEFFICIENT OF DETERMINATION: R^2 = 0.99870

JN 6/28

MICROTOX DATA REPORT
Basic Test

FILE: MKC.K15
Column 11 80889

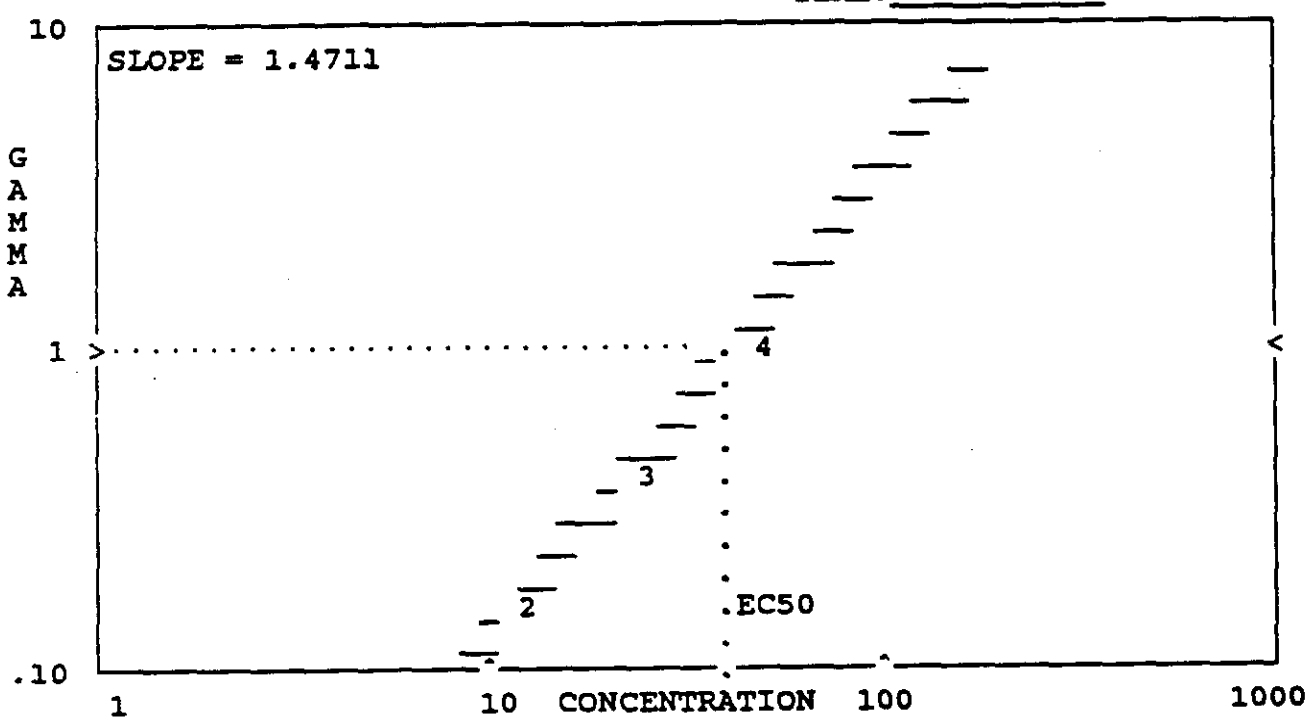
Test Time: 15 minutes Osmotic Adjustment:y

NUMBER	I0/IT	CONC.	CR/GAMMA	% EFFECT
Control	62.00/ 36.00	0.0	0.5806 #	
1	52.00/ 33.00	5.6250	-0.085 *	
2	60.00/ 30.00	11.2500	0.161 #	13.9
3	55.00/ 22.00	22.5000	0.452 #	31.1
4	54.00/ 14.00	45.0000	1.240 #	55.3

CR = Control Ratio CORRECTION FACTOR = 0.5806
# Used for calculations * Invalid data or controls

EC50 38.80 % (95% CONFIDENCE RANGE:36.73 TO 40.98)

Signature _____ TEST DATE:_____
TIME:_____



ESTIMATING EQUATION: LOG C = 0.6797 x LOG Γ +1.5888
95% CONFIDENCE FACTOR: 1.05632 FOR EC50
COEFFICIENT OF DETERMINATION: R^2 = 0.99997

JN 8/28

MICROTOX DATA REPORT
Basic Test

FILE: MKC.K5
Control 8/0 3 6

Test Time: 5 minutes Osmotic Adjustment:y

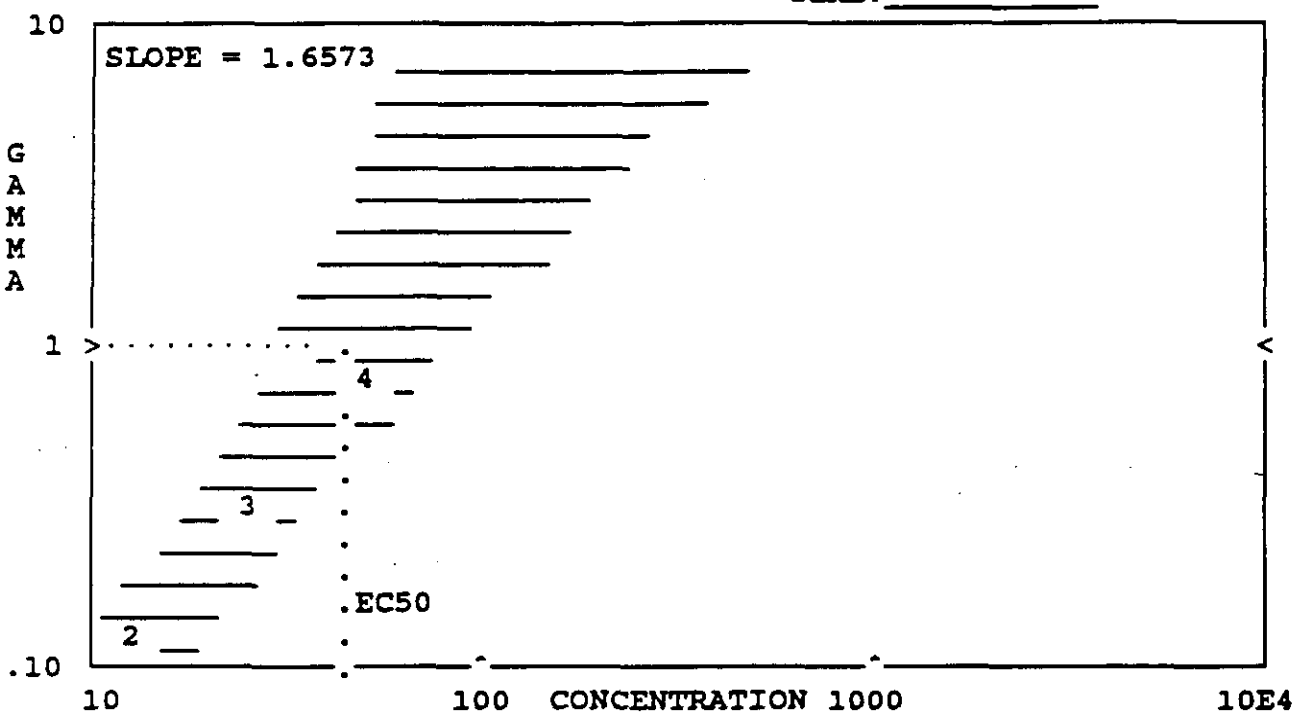
NUMBER	I0/IT	CONC.	CR/GAMMA	% EFFECT
Control	58.00/ 43.00	0.0	0.7414 #	
1	54.00/ 40.00	5.6250	0.001 *	
2	56.00/ 38.00	11.2500	0.093 #	8.5
3	54.00/ 30.00	22.5000	0.334 #	25.1
4	57.00/ 22.00	45.0000	0.921 #	47.9

CR = Control Ratio CORRECTION FACTOR = 0.7414
# Used for calculations * Invalid data or controls

EC50 45.87 % (95% CONFIDENCE RANGE:20.83 TO %100.99)

(NOTE: EC50 is an extrapolated value.)

Signature _____ TEST DATE:_____
TIME:_____



ESTIMATING EQUATION: LOG C = 0.6006 x LOG Γ +1.6615
95% CONFIDENCE FACTOR: 2.20175 FOR EC50
COEFFICIENT OF DETERMINATION: R^2 = 0.99535

JD
5/2

MICROTOX DATA REPORT
Basic Test

FILE: MKC.K15
Control 81036

Test Time: 15 minutes

Osmotic Adjustment:Y

NUMBER	I0/IT	CONC.	CR/GAMMA	% EFFECT
Control	58.00/ 39.00	0.0	0.6724 #	
1	54.00/ 38.00	5.6250	-0.044 *	
2	56.00/ 36.00	11.2500	0.046 *	
3	54.00/ 29.00	22.5000	0.252	0.0
4	57.00/ 20.00	45.0000	0.916	0.0

CR = Control Ratio

CORRECTION FACTOR = 0.6724
* Invalid data or controls

EC50 IS GREATER THAN HIGHEST CONCENTRATION

Signature _____

TEST DATE:_____
TIME:_____

5/25

Appendix Two

Raw Data: Earthworm Toxicity Testing

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

BO-015

720 Park Blvd., PO Box 73
Boise, Idaho 83729
(208) 386-5000

Project No.: 1321-009-07-35

Project Name: NSWC Crane Biofacility

Samplers: (Signature) Ken Phillips

Sampler: (Print) KEN PHILLIPS

Analysis Required

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	Microtox	Pathogen Tox	Pathogen*	Remarks
compost	column 3	5/11/98	1006	BO-12/14-S001-3		✓	✓	✓	✓	S/CSI Toxicity
	5		1026	BO-12/14-S001-5		✓	✓	✓		
	7		0945	BO-12/14-S001-7		✓	✓	✓		
	9		0936	BO-12/14-S001-9		✓	✓	✓		
	11		0919	BO-12/14-S001-11		✓	✓	✓		
								TOC		

~~*Pathogen bpt 40CFR 503.32~~

AQUA Survey

Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Ken Phillips	5/11/98 1530	York			
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Received for Laboratory By: (Signature) / Company:	Date/Time	Total No. Samples This Shipping Container / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

BIO - 22

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 386-5000

Project No.: 4324-0009-01-35

Project Name: NSWC Crane Bioreactor Facility

Samplers: (Signature)

Sampler: (Print) Mike Maddox

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	Microtox	Earthworm Tox	Remarks
Compost	Control Pile, 25% Dry Lost (26)	5/20/98	1245	B10-12/14-Control		-	-	-	
									AQUA Survey

Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
[signature]	5/20/98 1530	[signature] 5/21			
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Received for Laboratory By: (Signature) / Company:	Date/Time	Total No. Samples This Shipping Container / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:

Ser. # 7777 7777

00066
00100

FedEx. USA Airbill 8008118247 65

0200 FedEx Retrieval Copy

9N/21

1 From

Date 5/11/98 Sender's FedEx Account Number 1768-6278-5

Sender's Name RITA DAWSON Phone (812) 854-6941

Company MORRISON KNUDSEN CORP

Address NSWC CTR12 300 HWY 361 Dept./Floor/Suite/Room

City CRANE State IN ZIP 47522

2 Your Internal Billing Reference Information

3 To

Recipient's Name JAMES TODD Phone (908) 788-8700

Company AQUA SURVEY, INC

Address 499 POINT BREEZE ROAD Dept./Floor/Suite/Room

(No "HOLD" at FedEx location, print FedEx address here)

☐ Check here if residence (Extra charge applies for FedEx Express Saver)

City FLEMINGTON State NJ ZIP 08822

For HOLD at FedEx Location check here

1 [ ] Hold Weekday (Not available with FedEx First Overnight)

3 [ ] Hold Saturday (Not available at all locations) (Available for FedEx Priority Overnight and FedEx 2Day only)

For Saturday Delivery check here

3 [ ] (Extra Charge. Not available to all locations) (Available for FedEx Priority Overnight and FedEx 2Day only)

4a Express Package Service Packages under 150 lbs. Delivery commitment may be later in some areas

1 [X] FedEx Priority Overnight (Next business morning)

5 [ ] FedEx Standard Overnight (Next business afternoon)

3 [ ] FedEx 2Day* (Second business day)

20 [ ] FedEx Express Saver* (Third business day)

6 [ ] FedEx First Overnight (Earliest next business morning delivery to select locations) (Higher rates apply)

*FedEx Letter Rate not available. Minimum charge: One pound rate.

4b Express Freight Service Packages over 150 lbs. Delivery commitment may be later in some areas

7 [ ] FedEx Overnight Freight (Next business day)

8 [ ] FedEx 2Day Freight (Second business day)

9 [ ] FedEx Express Saver Freight (Up to 5 business days)

(Call for delivery schedule. See back for detailed descriptions of freight services.)

5 Packaging 6 [ ] FedEx Letter 7 [ ] FedEx Pak (Declared value limit $500) 3 [ ] FedEx Box 4 [ ] FedEx Tube 1 [X] Other Pkg

6 Special Handling

Does this shipment contain dangerous goods? 4 [ ] Yes (Shipper's Declaration not required) [ ] Yes (Shipper's Declaration not required)

6 [ ] Dry Ice (Dry Ice ___ lbs. ___ kg) (Dangerous Goods Shipper's Declaration not required)

CA [ ] Cargo Aircraft Only

7 Payment [ ] Obtain Recipient FedEx Account No.

Bill to: 1 [X] Sender (If used, sign in Section 8 below) 2 [ ] Recipient 3 [ ] Third Party 4 [ ] Credit Card 5 [ ] Cash/Check

FedEx Account No.

Credit Card No. Exp. Date

Total Packages 1 Total Weight 32 Lb Total Charges $

When declaring a value higher than $100 per shipment, you pay an additional charge. See service conditions, DECLARED VALUE, and LIMIT OF LIABILITY section for further information.

Credit Card Auth.

8 Release Signature

Your signature authorizes Federal Express to deliver this shipment without obtaining a signature and agrees to indemnify and hold harmless Federal Express from any resulting claims.

287

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Rev. Date 5/97
Part #150364
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003196427 2

ASI, INC.
SAMPLE RECEIVING FORM

Client: Morrison Knudsen Corp

Shipped Via: Fed Ex | # of Shipping Containers: 1

Type of Shipping Container: Cooler | Custody Seal Present ✓ Absent __ Broken __ | Condition of Shipping Container: Acceptable ✓ Unacceptable __

ASI # 98-164	Sample ID	Type of Container	Number of Containers	Condition of Sample	Temp. °C	Ice -	Type of Sample
1. 80885	Column 3	Jar/Jar	2	A	6	I	S
2. 80886	" 5	↓	↓	↓	↓	↓	↓
3. 80887	" 7						
4. 80888	" 9						
5. 80889	" 11						
6.							
7.							
8.							
9.							
10.							

Notes: (Discrepancies Between Sample Labels and COC Record)

Opened/Received by: [illegible] | Date/Time: 5/1/98 1300

S - Soil
Se - Sediment
Sl - Sludge
W - Water
E - Effluent

A - Acceptable
U - Unacceptable or Contaminated

I - Ice
D - Dry Ice
B - Blue Ice
N - None

7/96

ASI, INC.
SAMPLE RECEIVING FORM

Client: Morrison Knudsen Corp.

Shipment Via: FedEx | # of Shipping Containers: 1

Type of Shipping Container: Cooler | Custody Seal Present ✓ Absent ___ Broken ___ | Condition of Shipping Container: Acceptable ✓ Unacceptable ___

	ASI # 98-164	Sample ID	Type of Container*	Number of Containers	Condition of Sample**	Temp. °C	Ice –	Type of Sample*
1.	81036	BD-W/14 Control	Glass Jar / Tix Cul	2	A	12.5	I	S
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								

Notes: (Discrepancies Between Sample Labels and COC Record)

Opened/Received by: [signature] | Date/Time:

* S - Soil
Sd - Sediment
Sl - Sludge
W - Water
E - Effluent

** A - Acceptable
U - Unseen or Contaminated

I - Ice
D - Dry Ice
B - Blue Ice
N - None

7/96

E. foetida 14 day LC50 test 98-164

Position	Conc	ASI No	Code
92	control	80890	0.1
85		*	0.2
3		*	0.3
71	1250 ppm	*	1.1
22		*	1.2
31		*	1.3
35	2500 ppm	*	2.1
29		*	2.2
43		*	2.3
60	5000 ppm	*	3.1
57		*	3.2
75		*	3.3
59	10000 ppm	*	4.1
19		*	4.2
26		*	4.3
62	20000 ppm	*	5.1
17		*	5.2
86		*	5.3
6	6.25%	80885	6.1
38		*	6.2
55		*	6.3
90	12.5%	*	7.1
81		*	7.2
67		*	7.3
70	25%	*	8.1
56		*	8.2
37		*	8.3
34	50%	*	9.1
45		*	9.2
28		*	9.3
82	100%	*	10.1
32		*	10.2
8		*	10.3
50	6.25%	80886	11.1
23		*	11.2
89		*	11.3
10	12.5%	*	12.1
21		*	12.2
69		*	12.3
48	25%	*	13.1
4		*	13.2
93		*	13.3
13	50%	*	14.1
27		*	14.2
51		*	14.3
53	100%	*	15.1
2		*	15.2
68		*	15.3
33	6.25%	80887	16.1
74		*	16.2
30		*	16.3
15	12.5%	*	17.1
77		*	17.2
40		*	17.3
87	25%	*	18.1
79		*	18.2
49		*	18.3

E. foetida 14 day LC50 test 98-164

Position	Conc	ASI No	Code
36	50%	*	19.1
16		*	19.2
25		*	19.3
39	100%	*	20.1
54		*	20.2
88		*	20.3
73	6.25%	80888	21.1
5		*	21.2
84		*	21.3
41	12.5%	*	22.1
~~1~~		*	22.2
72		*	22.3
7	25%	*	23.1
83		*	23.2
44		*	23.3
80	50%	*	24.1
18		*	24.2
24		*	24.3
58	100%	*	25.1
78		*	25.2
9		*	25.3
52	6.25%	80889	26.1
11			26.3
42			26.3
66	12.5%		27.1
47			27.2
20			27.3
14	25%		28.1
64			28.2
65			28.3
76	50%		29.1
12			29.2
91			29.3
46	100%		30.1
63			30.2
61			30.3

E. foetida 14 day job # 98-164

Position	Conc	Sample
11	0.00	81036
1	*	
3	*	
16	6.25	
13	*	
4	*	
9	12.50	
6	*	
17	*	
18	25.00	
12	*	
5	*	
7	50.00	
10	*	
14	*	
2	100.00	
15		
8		

AQUA SURVEY, INC
PERCENT MOISTURE & HYGROSCOPIC CORRECTION FACTOR
BENCHSHEET

Balance #: N/A Calibration ? Yes __ No __ Client: 98-164

Drying Oven: Model 40 Temperature: 105°C Job #: 98-164

Sample #	Pan Weight (g)	Wet Sample + Pan Weight (g)	Air Dry Sample + Pan Weight (g)	First Oven Dry Sample + Pan Weight (g)	Second Oven Dry Sample Weight + pan (g)	% Moisture	HMCF**
80885	66.5	282.2		238.0		20.5	
80886	74.86	281.0		241.5		19.1	
80887	66.8	270.9		227.2		21.4	
80888	68.4	264.8		216.1		24.8	
80889	61.6	264.7		222.3		20.9	
80890	68.2	229.4		226.1		2.05	
Initials/Date	YT 5/12/98	YT 5/12/98		YT 5/13/98		ON 5/13	

Percent Moisture = $\frac{[\text{wet weight} + \text{pan (g)} - \text{2nd oven dry weight} + \text{pan (g)}]}{[\text{wet weight} + \text{pan (g)} - \text{pan}]} \times 100$

** Hygroscopic moisture correction factor = $\frac{\text{2nd oven dry sample (g)}}{\text{air dry sample (g)}}$

Determination of Water Holding Capacity of Soils and Sediments

ASI #	Initial Dry Wt. (g) A	Funnel Wt. (g) B	Total Wt. (g) C	Water added (mL) D	Funnel Wt. after 3 hs. E	Water holding capacity F
80885	100	170.6	270.6	100	343.2	72.6
80886	100	170.7	270.7	100	340.8	70.1
80887	100	171.5	271.5	100	335.2	63.7
80888	100	170.8	270.8	100	356.8	86.0
80889	100	170.3	270.3	100	348.1	77.8
80890	100	171.6	271.6	100	334.9	63.3
				YT 5/13/98		

A = Dry weight of soil

B = Funnel weight including wet filter paper

C = Total weight of dry soil and funnel including weight of filter paper (A + B)

D = Volume of deionized water added to dry soil (A)

E = Total weight of funnel containing wet soil after 3-hours (A + B + C)

F = Water holding capacity mL/100g (E - C)

Calculation of Hydration Water For Soil Tests Soil ASI # 80885

Just replace the soil characteristics and the concentrations in the shaded areas and the spreadsheet will do the rest!

NOTE: Hydration Water is for 100 gm, adjust accordingly!!!

Water Holding Capacity of Test Soil =	76.2	mL/100 g
Water Holding Capacity of Control Soil =	68.3	mL/100 g
Moisture Fraction of Test Soil =	20.5	mL/100 g
Moisture Fraction of Control Soil =	20.5	mL/100 g
Fraction of Hydration Needed = (0.85 for lettuce, 0.75 for earthworms)	0.75	

Concentration Series Needed	Hydration Water Needed (mL
0 percent	45
6.25 percent	45
12.5 percent	44
25 percent	43
50 percent	41
100 percent	37

Calculation of Hydration Water For Soil Tests Soil ASI 8089G

Just replace the soil characteristics and the concentrations in the shaded areas and the spreadsheet will do the rest!

NOTE: Hydration Water is for 100 gm, adjust accordingly!!!

Water Holding Capacity of Test Soil =	70.1	mL/100 g
Water Holding Capacity of Control Soil =	63.5	mL/100 g
Moisture Fraction of Test Soil =	19.1	mL/100 g
Moisture Fraction of Control Soil =	2.05	mL/100 g
Fraction of Hydration Needed = (0.85 for lettuce, 0.75 for earthworms)	0.75	

Concentration Series Needed		Hydration Water Needed (mL
0	percent	45
6.25	percent	45
12.5	percent	44
25	percent	42
50	percent	39
100	percent	33

Calculation of Hydration Water For Soil Tests

Soil ASI 50987

Just replace the soil characteristics and the concentrations in the shaded areas and the spreadsheet will do the rest!

NOTE: Hydration Water is for 100 gm, adjust accordingly!!!

Water Holding Capacity of Test Soil =	63.7	mL/100 g
Water Holding Capacity of Control Soil =	53.3	mL/100 g
Moisture Fraction of Test Soil =	21.4	mL/100 g
Moisture Fraction of Control Soil =	2.05	mL/100 g
Fraction of Hydration Needed = (0.85 for lettuce, 0.75 for earthworms)	0.75	

Concentration Series Needed		Hydration Water Needed (mL
0	percent	45
6.25	percent	44
12.5	percent	43
25	percent	41
50	percent	36
100	percent	26

Calculation of Hydration Water For Soil Tests Soil ASI [illegible]

Just replace the soil characteristics and the concentrations in the shaded areas and the spreadsheet will do the rest!

NOTE: Hydration Water is for 100 gm, adjust accordingly!!!

Water Holding Capacity of Test Soil =	86	mL/100 g
Water Holding Capacity of Control Soil =	63.3	mL/100 g
Moisture Fraction of Test Soil =	24.8	mL/100 g
Moisture Fraction of Control Soil =	2.05	mL/100 g
Fraction of Hydration Needed = (0.85 for lettuce, 0.75 for earthworms)	0.75	

Concentration Series Needed	Hydration Water Needed (mL
3.0 percent	45
6.25 percent	45
12.5 percent	45
25 percent	44
50 percent	43
100 percent	40

Calculation of Hydration Water For Soil Tests Soil ASI 50559

Just replace the soil characteristics and the concentrations in the shaded areas and the spreadsheet will do the rest!

NOTE: Hydration Water is for 100 gm, adjust accordingly!!!

Water Holding Capacity of Test Soil =	77.5	mL/100 g
Water Holding Capacity of Control Soil =	63.3	mL/100 g
Moisture Fraction of Test Soil =	20.9	mL/100 g
Moisture Fraction of Control Soil =	2.05	mL/100 g
Fraction of Hydration Needed = (0.85 for lettuce, 0.75 for earthworms)	0.75	

Concentration Series Needed		Hydration Water Needed (mL
0	percent	45
6.25	percent	45
12.5	percent	44
25	percent	43
50	percent	41
100	percent	37

8/10 6

Calculation of Hydration Water For Soil Tests
Just replace the soil characteristics and the concentrations in the shaded areas and the spreadsheet will do the rest!

NOTE: Hydration Water is for 100 gm, adjust accordingly!!!

Water Holding Capacity of Test Soil =	86	mL/100 g
Water Holding Capacity of Control Soil =	63.3	mL/100 g
Moisture Fraction of Test Soil =	20.8	mL/100 g
Moisture Fraction of Control Soil =	2.05	mL/100 g
Fraction of Hydration Needed =	0.75	
(0.85 for lettuce, 0.75 for earthworms)		

Concentration Series Needed		Hydration Water Needed (mL
0	percent	45
6.25	percent	45
12.5	percent	45
25	percent	44
50	percent	42
100	percent	39

AQUA SURVEY, INC
PERCENT MOISTURE & HYGROSCOPIC CORRECTION FACTOR
BENCHSHEET

Balance #: Acculab V-1200 Calibration ? Yes __ No ✓ Client: NKC

Drying Oven: model 40 GC Temperature: 105°C Job #: 98-164

Sample #	Pan Weight (g)	Wet Sample + Pan Weight (g)	Air Dry Sample + Pan Weight (g)	First Oven Dry Sample + Pan Weight (g)	Second Oven Dry Sample Weight + pan (g)	% Moisture	HMCF**
81036	73.6	276.9	—	234.6	—	20.81	—
Initials/Date	YT 5/21/98	YT 5/21/98		YT 5/22/98		YT 5/22/98	

Percent Moisture = $\frac{\text{[wet weight + pan (g) - 2nd oven dry weight + pan (g)]}}{\text{[wet weight + pan (g) - pan]}} \times 100$

** Hygroscopic moisture correction factor = $\frac{\text{2nd oven dry sample (g)}}{\text{air dry sample (g)}}$

Determination of Water Holding Capacity of Soils and Sediments

ASI #	Initial Dry Wt. (g) A	Funnel Wt. (g) B	Total Wt. (g) C	Water added (mL) D	Funnel Wt. after 3 hs. E	Water holding capacity F
81036	100g	79.9	179.9	approx. 100 mL	260.7	80
				YT 5/22/98		

A = Dry weight of soil

B = Funnel weight including wet filter paper

C = Total weight of dry soil and funnel including weight of filter paper (A + B)

D = Volume of deionized water added to dry soil (A)

E = Total weight of funnel containing wet soil after 3-hours (A + B + C)

F = Water holding capacity mL/100g (E - C)

AQUA SURVEY, INC.

Client: MKC

Test Start Date: 5/13/98

Job #: 98-164

Organism: *E. foetida*

Test Chamber #	ID	Initial pH	Final pH	Initial Live Count	7 Day Live Count	14 Day Live Count
1		5.4	7.8	10	9	9
2		8.4	—	10	—	—
3		4.6	5.0	10	10	10
4		5.7	8.0	10	10	10
5		5.0	6.8	10	10	10
6		4.9	6.6	10	10	10
7		6.2	7.9	10	10	10
8		8.3	—	10	—	—
9		8.6	—	10	—	—
10				10	10	10
11		5.5	—	10	0	—
12		6.8		10	9	8
13		6.6	8.4	10	10	9
14		6.5	—	10	—	—
15		5.6	7.8	10	8	8
16		~~6.7~~	—	10	—	—
17				10	—	—
18		6.7	—	10	0	—
19				10	—	—
20		5.9		10	10	10
Date				5/13/98	5/20/98	5/27/98
Initials				KF/AN/YT	TD/AN	TD/YT

① worms column YT 5/27/98

AQUA SURVEY, INC.

Client: MKC

Test Start Date: 5/13/98

Job #: 98-164

Organism: *E. foetida*

Test Chamber #	ID	Initial pH	Final pH	Initial Live Count	7 Day Live Count	14 Day Live Count
21		5.6	6.5	10	10	10
22				10	~~9~~ 10	10
23		4.8	6.9	10	10	10
24				10	—	
25				10	0	
26				10	—	
27				10	9	9
28		~~8.4~~ 6	~~8.4~~ 8.4	10	1	0
29				10	10	9
30		5.7	7.0	10	10	9
31				10	10	10
32				10	—	
33				10	10	10
34		① ~~6.9~~	—	10	—	
35				10	10	10
36		6.7	8.3	10	10	10
37		5.4	7.2	10	10	10
38				10	10	10
39		8.4	—	10	—	
40				10	9	9
Date				5/13/98	5/20/98	5/27/98
Initials				RF/AN/YT	AN/TD	TD/YT

① mistake wrong column YT 5/27/98

AQUA SURVEY, INC.

Client: MKC

Test Start Date: 5/13/98

Job #: 98-164

Organism: *E. foerida*

Test Chamber #	ID	Initial pH	Final pH	Initial Live Count	7 Day Live Count	14 Day Live Count
41				10	8	7
42				10	0	
43				10	10	10
44				10	10	10
45				10	2	0
46		8.7	—	10	—	
47				10	10	10
48				10	10	10
49		6.2	7.8	10	8	8
50				10	10	10
51				10	10	6
52				10	—	
53				10	—	
54				10	—	
55				10	10	10
56				10	9	9
57				10	10	10
58				10	—	
59				10	—	
60				10	9	9
Date				5/13/98	5/20/98	5/27/98
Initials				RF/AW/JT	TD/AM	TD/JT

AQUA SURVEY, INC.

Client: MKC

Test Start Date: 5/13/98

Job #: 98-164

Organism: *E. foerida*

Test Chamber #	ID	Initial pH	Final pH	Initial Live Count	7 Day Live Count	14 Day Live Count
61				10	—	
62				10	—	
63				10	—	
64				10	—	
65				10	6	4
66				10	10	10
67		4.9	6.8	10	10	9
68				10	—	
69				10	10	10
70				10	10	10
71				10	10	10
72				10	9	9
73				10	10	9
74				10	9	8
75				10	10	10
76				10	—	
77				10	10	9
78				10	—	
79				10	9	9
80				10	—	
Date				5/13/98	5-20-98	5/27/98
Initials				RF/AN/YT	TD/AN	TD/YT

AQUA SURVEY, INC.

Client: MKC

Test Start Date: 5/13/98

Job #: 98-164

Organism: *E. foetida*

Test Chamber #	ID	Initial pH	Final pH	Initial Live Count	7 Day Live Count	14 Day Live Count
81				10	10	10
82				10	—	
83				10	9	9
84				10	10	10
85				10	10	10
86				10	—	
87				10	~~9~~ 10	10
88				10	—	
89				10	10	10
90				10	8	8
91				10	10	9
92				10	10	10
93				10	10	10
94						
95						
96						
97						
98						
99						
100						
Date				5/13/98	5/20/98	5/27/98
Initials				RF/AW/YT	TD/AW	TD/YT

AQUA SURVEY, INC.

Client: MKC

Test Start Date: 5/22/98

Job #: 98-164

Organism: *E. foetida*

Test Chamber #	ID	Initial pH	Final pH	Initial Live Count	7 Day Live Count	14 Day Live Count
1		5.9	5.52	10	9	9
2		7.5		10	0	—
3				10	10	10
4		5.8	5.84	10	10	10
5		6.1	-	10	0	—
6		6.1	8.06	10	7	7
7		6.4		10	0	—
8				10	0	—
9				10	7	7
10			8.58	10	0	—
11				10	10	10
12			8.13	10	3	3
13				10	10	10
14				10	0	—
15				10	0	—
16				10	10	9
17				10	10	8
18				10	0	—
19						
20						
Date		5/22/98	6/5/98	5/22/98	5/29/98	6/5/98
Initials		TD	[illegible]	M/RF	[illegible]	[illegible]

Recorder ID: 7004062 Deployment #: 40 Interval: 1 hour Samples: 623
Start: 05/13/98 14:12:22 Recover: 06/08/98 13:40:00 Min/Max Window: -39/ 87C
Description: Job #98-164 E. foetida 15 day LC50 test and SRT

State: Deployed

Overall Summary

Data File: 7004062.040

Temperature Extremes: 27.8 C 22:12:22 05/19/98
20.3 C 19:12:22 05/31/98

^ Over Temperature Window
Time: 0 days 00:00:00
# of Samples: 0

v Under Temperature Window
Time: 0 days 00:00:00
# of Samples: 0

Daily Summary

Date	# Samples	Min Temp C	Max Temp C	# Under Window	# Over Window
05/13/98	9	22.3	23.3	0	0
05/14/98	24	20.8	24.3	0	0
05/15/98	24	22.8	27.3	0	0
05/16/98	24	23.3	26.3	0	0
05/17/98	24	23.3	23.8	0	0
05/18/98	24	22.8	27.3	0	0
05/19/98	24	23.8	27.8	0	0
05/20/98	24	23.8	27.8	0	0
05/21/98	24	24.3	27.3	0	0
05/22/98	24	22.8	25.3	0	0
05/23/98	24	21.8	24.8	0	0
05/24/98	24	22.8	25.3	0	0
05/25/98	24	23.3	27.3	0	0
05/26/98	24	24.3	27.8	0	0
05/27/98	24	23.3	27.3	0	0
05/28/98	24	21.8	27.3	0	0
05/29/98	24	22.3	27.3	0	0
05/30/98	24	20.8	24.8	0	0
05/31/98	24	20.3	23.8	0	0
06/01/98	24	21.8	25.3	0	0
06/02/98	24	21.8	26.3	0	0
06/03/98	24	21.3	25.8	0	0
06/04/98	24	20.8	25.8	0	0
06/05/98	24	21.8	27.8	0	0
06/06/98	24	22.8	24.8	0	0
06/07/98	24	22.3	24.3	0	0
06/08/98	14	21.8	23.8	0	0

Instrument Data

Date/Time	Temp C	Date/Time	Temp C	Date/Time	Temp C	Date/Time	Temp C
05/13/98							
15:12:22	22.8	16:12:22	22.8	17:12:22	22.8	18:12:22	22.3
19:12:22	22.8	20:12:22	22.8	21:12:22	22.8	22:12:22	23.3
23:12:22	23.3						

Recorder ID: 7004062 Deployment #: 40 Interval: 1 hour Samples: 623
Start: 05/13/98 14:12:22 Recover: 06/08/98 13:40:00 Min/Max Window: -39/ 87C
Description: Job #98-164 E. foetida 15 day LC50 test and SRT

State: Deployed

Date/Time	Temp C	Date/Time	Temp C	Date/Time	Temp C	Date/Time	Temp C
05/14/98							
00:12:22	22.8	01:12:22	22.8	02:12:22	22.3	03:12:22	21.8
04:12:22	21.3	05:12:22	21.3	06:12:22	20.8	07:12:22	20.8
08:12:22	20.8	09:12:22	21.3	10:12:22	20.8	11:12:22	21.3
12:12:22	21.3	13:12:22	21.8	14:12:22	22.3	15:12:22	22.3
16:12:22	22.8	17:12:22	22.8	18:12:22	22.8	19:12:22	23.8
20:12:22	24.3	21:12:22	24.3	22:12:22	24.3	23:12:22	24.3
05/15/98							
00:12:22	24.3	01:12:22	24.3	02:12:22	23.8	03:12:22	23.8
04:12:22	23.3	05:12:22	23.3	06:12:22	23.3	07:12:22	23.3
08:12:22	23.3	09:12:22	23.3	10:12:22	22.8	11:12:22	22.8
12:12:22	23.3	13:12:22	23.8	14:12:22	23.8	15:12:22	24.3
16:12:22	24.3	17:12:22	24.3	18:12:22	24.8	19:12:22	25.8
20:12:22	26.8	21:12:22	27.3	22:12:22	27.3	23:12:22	27.3
05/16/98							
00:12:22	26.3	01:12:22	25.3	02:12:22	24.8	03:12:22	24.3
04:12:22	23.8	05:12:22	23.8	06:12:22	23.8	07:12:22	23.8
08:12:22	23.8	09:12:22	23.8	10:12:22	24.3	11:12:22	24.3
12:12:22	24.8	13:12:22	24.8	14:12:22	24.8	15:12:22	24.3
16:12:22	24.3	17:12:22	23.8	18:12:22	23.8	19:12:22	23.3
20:12:22	23.3	21:12:22	23.3	22:12:22	23.3	23:12:22	23.3
05/17/98							
00:12:22	23.8	01:12:22	23.8	02:12:22	23.8	03:12:22	23.8
04:12:22	23.8	05:12:22	23.8	06:12:22	23.8	07:12:22	23.3
08:12:22	23.3	09:12:22	23.3	10:12:22	23.8	11:12:22	23.8
12:12:22	23.8	13:12:22	23.8	14:12:22	23.8	15:12:22	23.8
16:12:22	23.8	17:12:22	23.3	18:12:22	23.3	19:12:22	23.3
20:12:22	23.3	21:12:22	23.3	22:12:22	23.3	23:12:22	23.3
05/18/98							
00:12:22	23.8	01:12:22	23.8	02:12:22	23.3	03:12:22	23.3
04:12:22	23.3	05:12:22	23.3	06:12:22	22.8	07:12:22	22.8
08:12:22	23.3	09:12:22	23.3	10:12:22	23.3	11:12:22	23.3
12:12:22	23.8	13:12:22	23.8	14:12:22	24.3	15:12:22	24.3
16:12:22	24.8	17:12:22	24.3	18:12:22	24.3	19:12:22	25.3
20:12:22	26.3	21:12:22	26.8	22:12:22	27.3	23:12:22	27.3
05/19/98							
00:12:22	26.8	01:12:22	26.8	02:12:22	26.3	03:12:22	26.3
04:12:22	25.8	05:12:22	25.8	06:12:22	25.8	07:12:22	25.3
08:12:22	24.3	09:12:22	23.8	10:12:22	23.8	11:12:22	23.8
12:12:22	24.3	13:12:22	24.8	14:12:22	25.3	15:12:22	25.3
16:12:22	25.3	17:12:22	25.3	18:12:22	25.3	19:12:22	26.3
20:12:22	26.8	21:12:22	27.3	22:12:22	27.8	23:12:22	27.8
05/20/98							
00:12:22	27.3	01:12:22	26.8	02:12:22	26.8	03:12:22	26.3
04:12:22	26.3	05:12:22	25.8	06:12:22	25.8	07:12:22	25.3
08:12:22	24.8	09:12:22	24.3	10:12:22	23.8	11:12:22	24.3

Recorder ID: 7004062 Deployment #: 40 Interval: 1 hour Samples: 623
Start: 05/13/98 14:12:22 Recover: 06/08/98 13:40:00 Min/Max Window: -39/ 87C
Description: Job #98-164 E. foetida 15 day LC50 test and SRT

State: Deployed

Date/Time	Temp C	Date/Time	Temp C	Date/Time	Temp C	Date/Time	Temp C
12:12:22	24.8	13:12:22	24.8	14:12:22	25.3	15:12:22	25.3
16:12:22	25.3	17:12:22	25.3	18:12:22	25.3	19:12:22	26.3
20:12:22	27.3	21:12:22	27.3	22:12:22	27.8	23:12:22	27.8
05/21/98							
00:12:22	27.3	01:12:22	26.8	02:12:22	26.8	03:12:22	26.8
04:12:22	26.3	05:12:22	26.3	06:12:22	26.3	07:12:22	25.8
08:12:22	25.3	09:12:22	24.8	10:12:22	24.3	11:12:22	24.3
12:12:22	24.3	13:12:22	24.3	14:12:22	24.3	15:12:22	24.8
16:12:22	24.8	17:12:22	24.3	18:12:22	24.3	19:12:22	24.8
20:12:22	25.3	21:12:22	25.3	22:12:22	25.3	23:12:22	24.8
05/22/98							
00:12:22	24.8	01:12:22	24.3	02:12:22	24.3	03:12:22	23.8
04:12:22	23.8	05:12:22	23.8	06:12:22	23.8	07:12:22	23.3
08:12:22	23.3	09:12:22	23.3	10:12:22	23.3	11:12:22	22.8
12:12:22	22.8	13:12:22	22.8	14:12:22	22.8	15:12:22	22.8
16:12:22	22.8	17:12:22	22.8	18:12:22	23.3	19:12:22	24.3
20:12:22	24.8	21:12:22	25.3	22:12:22	25.3	23:12:22	25.3
05/23/98							
00:12:22	24.8	01:12:22	24.3	02:12:22	23.8	03:12:22	23.3
04:12:22	22.8	05:12:22	22.3	06:12:22	21.8	07:12:22	21.8
08:12:22	22.8	09:12:22	23.3	10:12:22	23.8	11:12:22	24.3
12:12:22	24.8	13:12:22	24.8	14:12:22	24.8	15:12:22	24.8
16:12:22	24.8	17:12:22	24.3	18:12:22	24.3	19:12:22	23.8
20:12:22	23.8	21:12:22	23.8	22:12:22	24.3	23:12:22	24.3
05/24/98							
00:12:22	23.8	01:12:22	23.8	02:12:22	23.8	03:12:22	23.3
04:12:22	23.3	05:12:22	22.8	06:12:22	22.8	07:12:22	22.8
08:12:22	23.3	09:12:22	23.8	10:12:22	24.3	11:12:22	24.8
12:12:22	24.8	13:12:22	24.8	14:12:22	24.8	15:12:22	25.3
16:12:22	25.3	17:12:22	24.8	18:12:22	24.3	19:12:22	24.3
20:12:22	23.8	21:12:22	23.8	22:12:22	24.3	23:12:22	24.3
05/25/98							
00:12:22	24.3	01:12:22	24.8	02:12:22	24.8	03:12:22	25.3
04:12:22	25.3	05:12:22	25.3	06:12:22	25.3	07:12:22	25.3
08:12:22	24.8	09:12:22	24.8	10:12:22	24.3	11:12:22	23.8
12:12:22	23.8	13:12:22	23.8	14:12:22	23.3	15:12:22	23.8
16:12:22	23.3	17:12:22	23.3	18:12:22	23.8	19:12:22	24.8
20:12:22	25.8	21:12:22	26.8	22:12:22	27.3	23:12:22	27.3
05/26/98							
00:12:22	26.8	01:12:22	26.8	02:12:22	26.8	03:12:22	26.8
04:12:22	26.3	05:12:22	26.3	06:12:22	25.8	07:12:22	25.8
08:12:22	25.3	09:12:22	24.3	10:12:22	24.3	11:12:22	24.3
12:12:22	24.3	13:12:22	24.3	14:12:22	24.8	15:12:22	24.8
16:12:22	24.8	17:12:22	24.8	18:12:22	25.3	19:12:22	26.3
20:12:22	26.8	21:12:22	27.3	22:12:22	27.8	23:12:22	27.3

Recorder ID: 7004062 Deployment #: 40 Interval: 1 hour Samples: 623
Start: 05/13/98 14:12:22 Recover: 06/08/98 13:40:00 Min/Max Window: -39/ 87C
Description: Job #98-164 E. foetida 15 day LC50 test and SRT

Note: Deployed

Date/Time	Temp C	Date/Time	Temp C	Date/Time	Temp C	Date/Time	Temp C
05/27/98							
00:12:22	27.3	01:12:22	26.8	02:12:22	26.8	03:12:22	26.8
04:12:22	26.3	05:12:22	26.3	06:12:22	26.3	07:12:22	25.8
08:12:22	25.3	09:12:22	24.8	10:12:22	24.3	11:12:22	24.3
12:12:22	24.3	13:12:22	24.3	14:12:22	23.3	15:12:22	23.8
16:12:22	23.8	17:12:22	23.3	18:12:22	23.8	19:12:22	25.8
20:12:22	26.8	21:12:22	27.3	22:12:22	27.3	23:12:22	26.8
05/28/98							
00:12:22	26.3	01:12:22	26.3	02:12:22	25.8	03:12:22	25.8
04:12:22	25.8	05:12:22	25.3	06:12:22	25.3	07:12:22	23.8
08:12:22	22.8	09:12:22	22.8	10:12:22	22.3	11:12:22	22.3
12:12:22	22.8	13:12:22	22.3	14:12:22	22.8	15:12:22	23.3
16:12:22	22.8	17:12:22	21.8	18:12:22	22.3	19:12:22	24.8
20:12:22	26.3	21:12:22	26.8	22:12:22	27.3	23:12:22	26.8
05/29/98							
00:12:22	26.3	01:12:22	26.3	02:12:22	26.3	03:12:22	25.8
04:12:22	25.8	05:12:22	25.8	06:12:22	25.8	07:12:22	24.3
08:12:22	23.8	09:12:22	22.8	10:12:22	22.3	11:12:22	22.8
12:12:22	23.3	13:12:22	23.3	14:12:22	23.8	15:12:22	24.3
16:12:22	23.8	17:12:22	23.3	18:12:22	23.8	19:12:22	26.3
20:12:22	26.8	21:12:22	27.3	22:12:22	27.3	23:12:22	26.8
30/98							
.12:22	24.8	01:12:22	23.8	02:12:22	23.3	03:12:22	22.8
04:12:22	22.8	05:12:22	22.8	06:12:22	22.3	07:12:22	22.3
08:12:22	22.8	09:12:22	23.8	10:12:22	23.8	11:12:22	22.8
12:12:22	23.3	13:12:22	22.8	14:12:22	22.3	15:12:22	22.3
16:12:22	22.3	17:12:22	21.8	18:12:22	21.8	19:12:22	20.8
20;12:22	20.8	21:12:22	20.8	22:12:22	21.3	23:12:22	21.8
05/31/98							
00:12:22	21.8	01:12:22	21.8	02:12:22	22.3	03:12:22	22.3
04:12:22	21.8	05:12:22	21.8	06:12:22	22.3	07:12:22	22.3
08:12:22	22.3	09:12:22	22.8	10:12:22	23.8	11:12:22	23.3
12:12:22	23.8	13:12:22	22.3	14:12:22	21.8	15:12:22	21.8
16:12:22	21.3	17:12:22	20.8	18:12:22	20.8	19:12:22	20.3
20:12:22	20.3	21:12:22	20.8	22:12:22	21.8	23:12:22	21.8
06/01/98							
00:12:22	22.8	01:12:22	23.8	02:12:22	24.8	03:12:22	24.8
04:12:22	25.3	05:12:22	25.3	06:12:22	25.3	07:12:22	24.3
08:12:22	23.3	09:12:22	22.8	10:12:22	22.3	11:12:22	21.8
12:12:22	21.8	13:12:22	21.8	14:12:22	22.3	15:12:22	22.3
16:12:22	22.3	17:12:22	21.8	18:12:22	22.3	19:12:22	23.3
20:12:22	24.3	21:12:22	24.3	22:12:22	24.8	23:12:22	25.3
06/02/98							
[illegible]12:22	25.3	01:12:22	24.8	02:12:22	24.8	03:12:22	24.3
12:22	24.3	05:12:22	24.3	06:12:22	23.8	07:12:22	23.3
08:12:22	22.8	09:12:22	22.3	10:12:22	21.8	11:12:22	22.3

Recorder ID: 7004062 Deployment #: 40 Interval: 1 hour Samples: 623
Start: 05/13/98 14:12:22 Recover: 06/08/98 13:40:00 Min/Max Window: -39/ 87C
Description: Job #98-164 E. foetida 15 day LC50 test and SRT

State: Deployed

Date/Time	Temp C	Date/Time	Temp C	Date/Time	Temp C	Date/Time	Temp C
12:12:22	21.8	13:12:22	21.8	14:12:22	22.3	15:12:22	22.3
16:12:22	22.8	17:12:22	22.8	18:12:22	22.8	19:12:22	24.3
20:12:22	25.3	21:12:22	25.8	22:12:22	26.3	23:12:22	26.3
06/03/98							
00:12:22	25.8	01:12:22	25.8	02:12:22	25.8	03:12:22	25.8
04:12:22	25.8	05:12:22	25.3	06:12:22	25.3	07:12:22	24.3
08:12:22	22.8	09:12:22	22.3	10:12:22	21.8	11:12:22	21.8
12:12:22	21.8	13:12:22	21.8	14:12:22	21.3	15:12:22	21.3
16:12:22	21.8	17:12:22	21.8	18:12:22	22.3	19:12:22	23.8
20:12:22	24.8	21:12:22	25.3	22:12:22	25.8	23:12:22	25.8
06/04/98							
00:12:22	25.8	01:12:22	25.3	02:12:22	25.3	03:12:22	24.8
04:12:22	24.3	05:12:22	24.3	06:12:22	23.8	07:12:22	23.8
08:12:22	23.3	09:12:22	22.8	10:12:22	21.8	11:12:22	21.3
12:12:22	21.3	13:12:22	21.3	14:12:22	20.8	15:12:22	21.8
16:12:22	21.3	17:12:22	21.8	18:12:22	23.3	19:12:22	24.8
20:12:22	25.3	21:12:22	25.8	22:12:22	25.8	23:12:22	25.8
06/05/98							
00:12:22	25.3	01:12:22	24.8	02:12:22	24.8	03:12:22	24.3
04:12:22	24.3	05:12:22	23.8	06:12:22	23.8	07:12:22	23.3
08:12:22	22.3	09:12:22	22.3	10:12:22	22.3	11:12:22	23.3
12:12:22	22.3	13:12:22	22.8	14:12:22	22.8	15:12:22	21.8
16:12:22	22.3	17:12:22	22.3	18:12:22	24.3	19:12:22	25.8
20:12:22	26.8	21:12:22	27.3	22:12:22	27.8	23:12:22	27.3
06/06/98							
00:12:22	24.8	01:12:22	23.8	02:12:22	23.3	03:12:22	23.8
04:12:22	23.8	05:12:22	23.8	06:12:22	23.8	07:12:22	22.8
08:12:22	23.3	09:12:22	23.8	10:12:22	23.8	11:12:22	24.3
12:12:22	23.8	13:12:22	23.8	14:12:22	24.8	15:12:22	23.8
16:12:22	23.8	17:12:22	23.3	18:12:22	23.8	19:12:22	23.3
20:12:22	23.3	21:12:22	23.3	22:12:22	23.8	23:12:22	23.3
06/07/98							
00:12:22	23.8	01:12:22	23.3	02:12:22	23.3	03:12:22	23.8
04:12:22	23.8	05:12:22	23.3	06:12:22	23.3	07:12:22	23.3
08:12:22	23.3	09:12:22	23.3	10:12:22	23.8	11:12:22	24.3
12:12:22	23.8	13:12:22	23.3	14:12:22	22.8	15:12:22	22.8
16:12:22	22.8	17:12:22	22.3	18:12:22	22.8	19:12:22	22.8
20:12:22	23.3	21:12:22	23.3	22:12:22	23.8	23:12:22	24.3
06/08/98							
00:12:22	23.8	01:12:22	23.8	02:12:22	23.8	03:12:22	23.8
04:12:22	23.3	05:12:22	23.3	06:12:22	23.3	07:12:22	23.3
08:12:22	23.3	09:12:22	22.8	10:12:22	21.8	11:12:22	21.8
12:12:22	21.8	13:12:22	21.8				

AQUA SURVEY, INC.

CULTURE LAB DISTRIBUTION FORM

DATE: 5/13/98

TEST JOB#: 98-164 CLIENT: MKC

TEST LOCATION: IN-LAB [X] FIELD [ ]

TEST SPECIES: E. foetida

TOTAL NUMBER ORGANISMS TRANSFERRED: 1300+

AQUA SURVEY, INC. CULTURE LAB INVESTIGATORS: CD

A. ORGANISMS

1. ASI CULTURE/HOLDING UNIT: Worm Ranch
2. RECEIVING LOG #: 98-0020 Carolina Bio Supply
3. CULTURE LOG #: 98-0262
4. AGE/SIZE INFORMATION: adults

B. HOLDING [X] CULTURE [ ] WATER PARAMETERS

1. TEMPERATURE: 14.5°C
2. SALINITY: *
3. WATER SOURCE: *

C. TRANSFER CUSTODY & TRANSFER

1. LIVESTOCK RELINQUISHMENT DATE: 5/13/98
   TIME: 1430 hrs
   BY: CD

2. LIVESTOCK RECEIVING DATE: 5/13/98
   TIME: 1430 hrs
   BY: YT

3. CULTURE SUPERVISOR OR SENIOR TECH. INITIALS: CD

REMARKS: * Held in moist silica sand / kaolinite clay / Sphagnum moss mixture

AQUA SURVEY, INC.

CULTURE LAB DISTRIBUTION FORM

DATE: 5/13/98

TEST JOB#: SRT CLIENT: In house

TEST LOCATION: IN-LAB [X] FIELD [ ]

TEST SPECIES: E. foetida

TOTAL NUMBER ORGANISMS TRANSFERRED: 180+

AQUA SURVEY, INC. CULTURE LAB INVESTIGATORS: CD

A. ORGANISMS

1. ASI CULTURE/HOLDING UNIT: Worm Ranch
2. RECEIVING LOG #: 98-0020 Carolina Bio Supply
3. CULTURE LOG #: 98-0263
4. AGE/SIZE INFORMATION: adults

B. HOLDING [X] CULTURE [ ] WATER PARAMETERS

1. TEMPERATURE: 19.5 °C
2. SALINITY: *
3. WATER SOURCE: *

C. TRANSFER CUSTODY & TRANSFER

1. LIVESTOCK RELINQUISHMENT DATE: 5/13/98
   TIME: 1430 hrs
   BY: CD

2. LIVESTOCK RECEIVING DATE: 5/13/98
   TIME: 1430 hrs
   BY: [illegible]

3. CULTURE SUPERVISOR OR SENIOR TECH. INITIALS: CD

REMARKS: * Held in moist silica sand / kaolinite clay / sphagnum moss mixture

AQUA SURVEY, INC.
CULTURE LABORATORY

15 Day - General Species Status Log

Species: E. fetida

Dates: 5/8/98 →

Receiving [ ] Culture [ ] Log #: 98-0020 Initial Stock @: 1800+

Test Job #: 98-164 Client: MKC Food Type: Mag. Worm Fo.

Date	Day Number	Temp/DO	NH_3/NO_2	pH	Sal/Hardness	Alkalinity	Mortality	Remarks/Initials
5/8	1	22.0°C/*	*	*	*	*	—	Set up in worm Ranch. Fed CD
5/9	2							
5/10	3			No	Data	Recorded		
5/11	4	19.5°C/*	*	*	*	*	—	Soil moistened. Fed CD
5/12	5	19.0°C/*	*	*	*	*	—	Soil moistened lightly. CD
5/13	6	19.5°C/*	*	*	*	*	—	Soil moistened. 1300+ to Test
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							

* No water Quality parameters measured. Worms are ① ~~mined~~ maintained in a mixture of Sphagnum moss, clay, and silica sa

① Mistake CD

AQUA SURVEY, INC.

CULTURE LABORATORY RECEIVING FORM

RECEIVING LOG #: 98-0020 DATE: 5/8/98

SHIPPING CARRIER: Airborne CARRIER LOG #: N/A

SPECIES: E. foetida NUMBER SHIPPED: 18004

LIVESTOCK SOURCE/SHIPPER: Carolina Biological Supply

SHIPPER INVOICE #: 935827 PACKER'S NAME: N/A

ASI ORDER REF. DATE: 5/7/98 ASI REF. INITIALS: CD

AGE/CHARACTERISTICS: adults

TAXONOMIC VERIFICATION LOG #: N/A DATE: N/A

RECEIVING/WATER QUALITY PARAMETERS

D.O: * TEMP: 22.0°C NH_3/NO_2: *

SALINITY/HARDNESS: * ALK: * pH:

WATER - CLEAR/CLOUDY CONTAINER SIZE/NUMBER: 500 ml/c-p/18

OF BLUE ICE#: Ø TYPE OF PACKING: box

OBSERVATION/CONDITION OF LIVESTOCK: Appear healthy

RECEIVING TECH. INIT.: CD SUPERVISORS'S INIT.: CD

Date	05/07/98
Time	12:00
Page	1

PACKING LIST

FROM: CAROLINA BIOLOGICAL SUPPLY COMPANY
2700 YORK ROAD
BURLINGTON, NC 27215-3398

Tel: 800-334-5551
Fax: 336-584-3399

BILL TO: 7099886

ACCOUNTS PAYABLE
AQUA SURVEY
499 POINT BREEZE RD
FLEMINGTON NJ 08822

SHIP TO: 8

CHRIS DOYLE
AQUA SURVEY INC
499 POINT BREEZE RD
FLEMINGTON NJ 08822

Dept 3767

Quote No.	Pick List No.	Requested Delivery Date	Ship Date	Ship Method	Our Order No.	Customer Purchase Order No.
	10		05/07/98	APP	935827	

Line	Cto No.	Ordered	Shipped	B/O	Catalog No.	Description	Unit	Price	Extension
1		18	18		DB 1409	REDWORMS Adults	EACH		

00066

00100

FedEx USA Airbill 8008118247 65 0200 Fax Retrieval Copy

1 From

5/11/98 Sender's FedEx Account Number 1768-6278-5

KIM DAWSON Phone (812) 854-6741

MORRISON KNUDSEN CORP.

NSWC CTR12 300 HWY 361 Dept./Floor/Suite/Room

CRANE State IN ZIP 47522

2 Your Internal Billing Reference Information

3 To

Recipient's Name JAMES TODD Phone 908 788-8700

Company AQUA SURVEY, INC

Address 499 POINT BREEZE ROAD Dept./Floor/Suite/Room

Check here if residence

FLEMINGTON State NJ ZIP 08822

For HOLD at FedEx Location check here

Hold Weekday Hold Saturday

For Saturday Delivery check here

4a Express Package Service

4b Express Freight Service

5 Packaging

6 Special Handling

Does this shipment contain dangerous goods?

7 Payment

Bill to: Sender Recipient Third Party Credit Card Cash/Check

Total Packages 1 Total Weight 32 LB Total Charges

Credit Card Auth.

8 Release Signature

287

L

8 0 0 8 1 1 8 2 4 7 6 5

003196427 2

AQUA SURVEY, INC.

CULTURE LAB DISTRIBUTION FORM

DATE: 5/22/98

TEST JOB#: 98-164 CLIENT: MKC

TEST LOCATION: IN-LAB [X] FIELD [ ]

TEST SPECIES: E. foetida

TOTAL NUMBER ORGANISMS TRANSFERRED: 200+

AQUA SURVEY, INC. CULTURE LAB INVESTIGATORS: CD

A. ORGANISMS

1. ASI CULTURE/HOLDING UNIT: Worm Ranch
2. RECEIVING LOG #: 98-0020 Carolina Bio
3. CULTURE LOG #: 98-0279
4. AGE/SIZE INFORMATION: adults

B. HOLDING [X] CULTURE [ ] WATER PARAMETERS

1. TEMPERATURE: 19.0°C
2. SALINITY: *
3. WATER SOURCE: *

C. TRANSFER CUSTODY & TRANSFER

1. LIVESTOCK RELINQUISHMENT DATE: 5/22/98
   TIME: 1430hrs
   BY: CD

2. LIVESTOCK RECEIVING DATE: 5/22/98
   TIME: 1430hrs
   BY: YT

3. CULTURE SUPERVISOR OR SENIOR TECH. INITIALS: CD

REMARKS: * worms held in a sphagnum moss, kaolinite clay, and silica sand mixture.

AQUA SURVEY, INC.
CULTURE LABORATORY

15 Day - General Species Status Log

Species: E. foetida

Dates: 5/8/98 →

Receiving [ ] Culture [ ] Log #: 98-0020

Initial Stock @: 1800+

Test Job #: 98-164

Client: MKC

Food Type: Mg. E. worm Fo.

Date	Day Number	Temp/DO	NH_3-NO_3	pH	Sal/Hardness	Alkalinity	Mortality	Remarks/Initials
5/8	1	22.0°C/*	*	*	*	*	—	Set up in worm Ranch. Fed CD
5/9	2							
5/10	3			No	Data	Recorded		
5/11	4	19.5°C/*	*	*	*	*	—	Soil moistened Fed CD
5/12	5	19.0°C/*	*	*	*	*	—	Soil moistened lightly. C
5/13	6	19.5°C/*	*	*	*	*	—	Soil moistene 1300+ to
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							

* No water Quality parameters measured. worms are maintained in a mixture of Sphagnum moss, clay, and silica

Mistake CD

AQUA SURVEY, INC.

CULTURE LABORATORY RECEIVING FORM

RECEIVING LOG #: 98-0020 DATE: 5/8/98

SHIPPING CARRIER: Airborne CARRIER LOG #: N/A

SPECIES: E. foetida NUMBER SHIPPED: 18000+

LIVESTOCK SOURCE/SHIPPER: Carolina Biological Supply

SHIPPER INVOICE #: 935827 PACKER'S NAME: N/A

ASI ORDER REF. DATE: 5/7/98 ASI REF. INITIALS: CD

AGE/CHARACTERISTICS: adults

TAXONOMIC VERIFICATION LOG #: N/A DATE: N/A

RECEIVING/WATER QUALITY PARAMETERS

D.O: * TEMP: 22.0°C NH_3/NO_2: *

SALINITY/HARDNESS: * ALK: * pH:

WATER - CLEAR/CLOUDY CONTAINER SIZE/NUMBER: 500ml/c-p/18

OF BLUE ICE#: Ø TYPE OF PACKING: box

OBSERVATION/CONDITION OF LIVESTOCK: Appear healthy

RECEIVING TECH. INIT.: CD SUPERVISORS'S INIT.: CD

Date	05/07/98
Time	12:00
Page	1

PACKING LIST

FROM: CAROLINA BIOLOGICAL SUPPLY COMPANY
2700 YORK ROAD
BURLINGTON, NC 27215-3398

Tel: 800-334-5551
Fax: 336-584-3399

BILL TO: 7099886

ACCOUNTS PAYABLE
AQUA SURVEY
499 POINT BREEZE RD
FLEMINGTON NJ 08822

SHIP TO: 8

CHRIS DOYLE
AQUA SURVEY INC
499 POINT BREEZE RD
FLEMINGTON NJ 08822

Dept 3767

Quote No.	Pick List No.	Requested Delivery Date	Ship Date	Ship Method	Our Order No.	Customer Purchase Order No.
	10		05/07/98	APP	935827	

Line	Cin No.	Ordered	Shipped	B/O	Catalog No.	Description	Unit	Price	Extension
1		18	18		D8 1409	REDWORMS Adults	EACH		

SAMPLE ID: 98-164, Sample 80885 7 day

CONCENTRATION	NUMBER EXPOSED	NUMBER AFFECTED	PERCENT AFFECTED	BINOMIAL PROBABILITY (%)
100.0000	30	30	100.0000000	0.0000001
50.0000	30	27	90.0000000	0.0004215
25.0000	30	1	3.3333340	0.0000029
12.5000	30	2	6.6666670	0.0000434
6.2500	30	0	0.0000000	0.0000001

---------- RESULTS ----------

METHOD	SPAN	G	EC50	95 PERCENT CONFIDENCE LIMITS
BINOMIAL			36.881410	25.000000 - 50.000000
MOVING AVERAGE	4	0.032585	34.089830	28.832060 - 41.157350
PROBIT	(.....NOT VALID.....)			

INTERPRETATION OF STATISTICS

The order of preference of results is:
BEST: Probit Method
BETTER: Moving Average
GOOD: Binomial
GOOD: Graphic Interpolation (Graph drawn by hand)
assuming all are statistically valid.

To Determine if a method has given valid results:
GRAPHICAL: Always valid
BINOMIAL: The program will tell you if this is not valid.
MOVING AVERAGE: The number of spans needs to be no less than one lower than the number of concentrations tested (excluding control).
PROBIT: The program will tell you if this is not valid

SAMPLE ID: 98-164 Sample 80885 14 day

CONCENTRATION	NUMBER EXPOSED	NUMBER AFFECTED	PERCENT AFFECTED	BINOMIAL PROBABILITY (%)
100.0000	30	30	100.0000000	0.0000001
50.0000	30	30	100.0000000	0.0000001
25.0000	30	1	3.3333340	0.0000029
12.5000	30	3	10.0000000	0.0004215
6.2500	30	0	0.0000000	0.0000001

---------- RESULTS ----------

METHOD	SPAN	G	EC50	95 PERCENT CONFIDENCE LIMITS
BINOMIAL			34.130110	25.000000 - 50.000000
MOVING AVERAGE	4	0.032585	29.253130	24.790450 - 34.886490
PROBIT	(.....NOT VALID.....)			

INTERPRETATION OF STATISTICS

The order of preference of results is:
BEST: Probit Method
BETTER: Moving Average
GOOD: Binomial
GOOD: Graphic Interpolation (Graph drawn by hand)
assuming all are statistically valid.

To Determine if a method has given valid results:
GRAPHICAL: Always valid
BINOMIAL: The program will tell you if this is not valid.
MOVING AVERAGE: The number of spans needs to be no less than one lower than the number of concentrations tested (excluding control).
PROBIT: The program will tell you if this is not valid

SAMPLE ID: 98-164 Sample 80886 7 day

CONCENTRATION	NUMBER EXPOSED	NUMBER AFFECTED	PERCENT AFFECTED	BINOMIAL PROBABILITY (%)
100.0000	30	30	100.0000000	0.0000001
50.0000	30	1	3.3333340	0.0000029
25.0000	30	0	0.0000000	0.0000001
12.5000	30	0	0.0000000	0.0000001
6.2500	30	0	0.0000000	0.0000001

---------- RESULTS ----------

METHOD	SPAN	G	EC50	95 PERCENT CONFIDENCE LIMITS
BINOMIAL			68.260230	50.000000 - 100.000000
MOVING AVERAGE	(.....NOT VALID.....)			
PROBIT	(.....NOT VALID.....)			

INTERPRETATION OF STATISTICS

The order of preference of results is:
BEST: Probit Method
BETTER: Moving Average
GOOD: Binomial
GOOD: Graphic Interpolation (Graph drawn by hand)
assuming all are statistically valid.

To Determine if a method has given valid results:
GRAPHICAL: Always valid
BINOMIAL: The program will tell you if this is not valid.
MOVING AVERAGE: The number of spans needs to be no less than one lower than the number of concentrations tested (excluding control).
PROBIT: The program will tell you if this is not valid

SAMPLE ID: 98-164 Sample 80886 14 day

CONCENTRATION	NUMBER EXPOSED	NUMBER AFFECTED	PERCENT AFFECTED	BINOMIAL PROBABILITY (%)
100.0000	30	30	100.0000000	0.0000001
50.0000	30	6	20.0000000	0.0715453
25.0000	30	0	0.0000000	0.0000001
12.5000	30	0	0.0000000	0.0000001
6.2500	30	0	0.0000000	0.0000001

---------- RESULTS ----------

METHOD	SPAN	G	EC50	95 PERCENT CONFIDENCE LIMITS
BINOMIAL			61.918950	50.000000 - 100.000000
MOVING AVERAGE	(.....NOT VALID.....)			
PROBIT	(.....NOT VALID.....)			

INTERPRETATION OF STATISTICS

The order of preference of results is:
BEST: Probit Method
BETTER: Moving Average
GOOD: Binomial
GOOD: Graphic Interpolation (Graph drawn by hand)
assuming all are statistically valid.

To Determine if a method has given valid results:
GRAPHICAL: Always valid
BINOMIAL: The program will tell you if this is not valid.
MOVING AVERAGE: The number of spans needs to be no less than one lower than the number of concentrations tested (excluding control).
PROBIT: The program will tell you if this is not valid

SAMPLE ID: 98-164 sample 80887 7 day

CONCENTRATION	NUMBER EXPOSED	NUMBER AFFECTED	PERCENT AFFECTED	BINOMIAL PROBABILITY (%)
100.0000	30	30	100.0000000	0.0000001
50.0000	30	20	66.6666700	4.9368570
25.0000	30	3	10.0000000	0.0004215
12.5000	30	3	10.0000000	0.0004215
6.2500	30	1	3.3333340	0.0000029

---------- RESULTS ----------

METHOD	SPAN	G	EC50	95 PERCENT CONFIDENCE LIMITS
BINOMIAL			41.456090	25.000000 - 100.000000
MOVING AVERAGE	3	0.048576	38.815970	32.693020 - 46.527250
PROBIT		0.909646		
PROBIT	(.....NOT VALID.....)			

INTERPRETATION OF STATISTICS

The order of preference of results is:
BEST: Probit Method
BETTER: Moving Average
GOOD: Binomial
GOOD: Graphic Interpolation (Graph drawn by hand)
assuming all are statistically valid.

To Determine if a method has given valid results:
GRAPHICAL: Always valid
BINOMIAL: The program will tell you if this is not valid.
MOVING AVERAGE: The number of spans needs to be no less than one lower than the number of concentrations tested (excluding control).
PROBIT: The program will tell you if this is not valid

SAMPLE ID: 98-164 E. foetida sample 80887 14 day

CONCENTRATION	NUMBER EXPOSED	NUMBER AFFECTED	PERCENT AFFECTED	BINOMIAL PROBABILITY (%)
100.0000	30	30	100.0000000	0.0000001
50.0000	30	20	66.6666700	4.9368570
25.0000	30	3	10.0000000	0.0004215
12.5000	30	4	13.3333300	0.0029738
6.2500	30	3	10.0000000	0.0004215

---------- RESULTS ----------

METHOD	SPAN	G	EC50	95 PERCENT CONFIDENCE LIMITS
BINOMIAL			41.456090	25.000000 - 100.000000
MOVING AVERAGE	4	0.048576	34.909110	28.463980 - 44.298410
PROBIT		1.271655		
PROBIT	(.....NOT VALID.....)			

INTERPRETATION OF STATISTICS

The order of preference of results is:
BEST: Probit Method
BETTER: Moving Average
GOOD: Binomial
GOOD: Graphic Interpolation (Graph drawn by hand)
assuming all are statistically valid.

To Determine if a method has given valid results:
GRAPHICAL: Always valid
BINOMIAL: The program will tell you if this is not valid.
MOVING AVERAGE: The number of spans needs to be no less than one lower than the number of concentrations tested (excluding control).
PROBIT: The program will tell you if this is not valid

SAMPLE ID: 98-164 Sample 80888 7 day

CONCENTRATION	NUMBER EXPOSED	NUMBER AFFECTED	PERCENT AFFECTED	BINOMIAL PROBABILITY (%)
100.0000	30	30	100.0000000	0.0000001
50.0000	30	30	100.0000000	0.0000001
25.0000	30	1	3.3333340	0.0000029
12.5000	30	4	13.3333300	0.0029738
6.2500	30	0	0.0000000	0.0000001

---------- RESULTS ----------

METHOD	SPAN	G	EC50	95 PERCENT CONFIDENCE LIMITS
BINOMIAL			34.130110	25.000000 - 50.000000
MOVING AVERAGE	4	0.032585	28.554670	24.196160 - 34.001450
PROBIT		2.501768		
PROBIT	(.....NOT VALID.....)			

INTERPRETATION OF STATISTICS

The order of preference of results is:
BEST: Probit Method
BETTER: Moving Average
GOOD: Binomial
GOOD: Graphic Interpolation (Graph drawn by hand)
assuming all are statistically valid.

To Determine if a method has given valid results:
GRAPHICAL: Always valid
BINOMIAL: The program will tell you if this is not valid.
MOVING AVERAGE: The number of spans needs to be no less than one lower than the number of concentrations tested (excluding control).
PROBIT: The program will tell you if this is not valid

SAMPLE ID: 98-164 Sample 80888 14 day

CONCENTRATION	NUMBER EXPOSED	NUMBER AFFECTED	PERCENT AFFECTED	BINOMIAL PROBABILITY (%)
100.0000	30	30	100.0000000	0.0000001
50.0000	30	30	100.0000000	0.0000001
25.0000	30	1	3.3333340	0.0000029
12.5000	30	5	16.6666700	0.0162457
6.2500	30	1	3.3333340	0.0000029

---------- RESULTS ----------

METHOD	SPAN	G	EC50	95 PERCENT CONFIDENCE LIMITS
BINOMIAL			34.130110	25.000000 - 50.000000
MOVING AVERAGE	4	0.039555	27.272520	22.703280 - 32.996980
PROBIT		2.199311		
PROBIT	(.....NOT VALID.....)			

INTERPRETATION OF STATISTICS

The order of preference of results is:
BEST: Probit Method
BETTER: Moving Average
GOOD: Binomial
GOOD: Graphic Interpolation (Graph drawn by hand)
assuming all are statistically valid.

To Determine if a method has given valid results:
GRAPHICAL: Always valid
BINOMIAL: The program will tell you if this is not valid.
MOVING AVERAGE: The number of spans needs to be no less than one lower than the number of concentrations tested (excluding control).
PROBIT: The program will tell you if this is not valid

SAMPLE ID: E. foetida 98-164 Sample 80889 7 day

CONCENTRATION	NUMBER EXPOSED	NUMBER AFFECTED	PERCENT AFFECTED	BINOMIAL PROBABILITY (%)
100.0000	30	30	100.0000000	0.0000001
50.0000	30	11	36.6666700	10.0244200
25.0000	30	24	80.0000000	0.0715453
12.5000	30	0	0.0000000	0.0000001
6.2500	30	30	100.0000000	0.0000001

---------------------------- RESULTS ------------------------------------

METHOD	SPAN	G	EC50	95 PERCENT CONFIDENCE LIMITS
BINOMIAL			11.507660	0.000000 - 100.000000
MOVING AVERAGE	3	0.032585	32.329250	27.931470 - 37.194580
PROBIT		171.381500		
PROBIT	(......................NOT VALID......................)			

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Öáááááááááááááááááááá INTERPRETATION OF STATISTICS áááááááááááááááááááá¢
•                                                                      •
•       The order of preference of results is:                         •
•           BEST:   Probit Method                                      •
•           BETTER: Moving Average                                     •
•           GOOD:   Binomial                                           •
•           GOOD:   Graphic Interpolation (Graph drawn by hand)        •
•       assuming all are statistically valid.                          •
•                                                                      •
•   To Determine if a method has given valid results:                  •
•   GRAPHICAL:       Always valid                                      •
•   BINOMIAL:        The program will tell you if this is not valid.   •
•   MOVING AVERAGE: The number of spans needs to be no less than one   •
•                    lower than the number of concentrations tested    •
•                    (excluding control).                              •
•   PROBIT:          The program will tell you if this is not valid    •
•                                                                      •
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SAMPLE ID: 98-164 Sample 80889

CONCENTRATION	NUMBER EXPOSED	NUMBER AFFECTED	PERCENT AFFECTED	BINOMIAL PROBABILITY (%)
100.0000	30	30	100.0000000	0.0000001
50.0000	30	13	43.3333300	29.2332400
25.0000	30	26	86.6666600	0.0029738
12.5000	30	0	0.0000000	0.0000001
6.2500	30	30	100.0000000	0.0000001

---------- RESULTS ----------

METHOD	SPAN	G	EC50	95 PERCENT CONFIDENCE LIMITS
BINOMIAL			11.507660	0.000000 - 100.000000
MOVING AVERAGE	3	0.032585	29.986700	25.782520 - 34.491630
PROBIT		118.308600		
PROBIT	(.....NOT VALID.....)			

INTERPRETATION OF STATISTICS

The order of preference of results is:
BEST: Probit Method
BETTER: Moving Average
GOOD: Binomial
GOOD: Graphic Interpolation (Graph drawn by hand)
assuming all are statistically valid.

To Determine if a method has given valid results:
GRAPHICAL: Always valid
BINOMIAL: The program will tell you if this is not valid.
MOVING AVERAGE: The number of spans needs to be no less than one lower than the number of concentrations tested (excluding control).
PROBIT: The program will tell you if this is not valid

SAMPLE ID: 98-164 7 day LC50 sample 81036

CONCENTRATION	NUMBER EXPOSED	NUMBER AFFECTED	PERCENT AFFECTED	BINOMIAL PROBABILITY (%)
100.0000	30	30	100.0000000	0.0000001
50.0000	30	30	100.0000000	0.0000001
25.0000	30	27	90.0000000	0.0004215
12.5000	30	6	20.0000000	0.0715453
6.2500	30	0	0.0000000	0.0000001

---------- RESULTS ----------

METHOD	SPAN	G	EC50	95 PERCENT CONFIDENCE LIMITS
BINOMIAL			16.625080	12.500000 - 25.000000
MOVING AVERAGE	3	0.032585	16.539470	14.306860 - 19.034960
PROBIT		0.116828	16.475690	14.422710 - 18.837060

INTERPRETATION OF STATISTICS

The order of preference of results is:
BEST: Probit Method
BETTER: Moving Average
GOOD: Binomial
GOOD: Graphic Interpolation (Graph drawn by hand)
assuming all are statistically valid.

To Determine if a method has given valid results:
GRAPHICAL: Always valid
BINOMIAL: The program will tell you if this is not valid.
MOVING AVERAGE: The number of spans needs to be no less than one lower than the number of concentrations tested (excluding control).
PROBIT: The program will tell you if this is not valid

SAMPLE ID: 98-164 14 day LC50 Sample 81036

CONCENTRATION	NUMBER EXPOSED	NUMBER AFFECTED	PERCENT AFFECTED	BINOMIAL PROBABILITY (%)
100.0000	30	30	100.0000000	0.0000001
50.0000	30	30	100.0000000	0.0000001
25.0000	30	27	90.0000000	0.0004215
12.5000	30	8	26.6666700	0.8062400
6.2500	30	1	3.3333340	0.0000029

---------- RESULTS ----------

METHOD	SPAN	G	EC50	95 PERCENT CONFIDENCE LIMITS
BINOMIAL			15.885830	12.500000 - 25.000000
MOVING AVERAGE	3	0.039555	15.213530	12.880190 - 17.748740
PROBIT		0.098253	15.236660	13.104290 - 17.704130

INTERPRETATION OF STATISTICS

The order of preference of results is:
BEST: Probit Method
BETTER: Moving Average
GOOD: Binomial
GOOD: Graphic Interpolation (Graph drawn by hand)
assuming all are statistically valid.

To Determine if a method has given valid results:
GRAPHICAL: Always valid
BINOMIAL: The program will tell you if this is not valid.
MOVING AVERAGE: The number of spans needs to be no less than one lower than the number of concentrations tested (excluding control).
PROBIT: The program will tell you if this is not valid

SAMPLE ID: SRT E. foetida 7day LC50

CONCENTRATION	NUMBER EXPOSED	NUMBER AFFECTED	PERCENT AFFECTED	BINOMIAL PROBABILITY (%)
%20000.0000	30	30	100.0000000	0.0000001
%10000.0000	30	30	100.0000000	0.0000001
5000.0000	30	1	3.3333340	0.0000029
2500.0000	30	0	0.0000000	0.0000001
1250.0000	30	0	0.0000000	0.0000001

---------- RESULTS ----------

METHOD	SPAN	G	EC50	95 PERCENT CONFIDENCE LIMITS
BINOMIAL			%6826.024000	%5000.000000 - %10000.0000
00				
MOVING AVERAGE	(.....NOT VALID.....)			
PROBIT	(.....NOT VALID.....)			

INTERPRETATION OF STATISTICS

The order of preference of results is:
BEST: Probit Method
BETTER: Moving Average
GOOD: Binomial
GOOD: Graphic Interpolation (Graph drawn by hand)
assuming all are statistically valid.

To Determine if a method has given valid results:
GRAPHICAL: Always valid
BINOMIAL: The program will tell you if this is not valid.
MOVING AVERAGE: The number of spans needs to be no less than one lower than the number of concentrations tested (excluding control).
PROBIT: The program will tell you if this is not valid

SAMPLE ID: SRT E. foetida 14 day LC50

CONCENTRATION	NUMBER EXPOSED	NUMBER AFFECTED	PERCENT AFFECTED	BINOMIAL PROBABILITY (%)
%20000.0000	30	30	100.0000000	0.0000001
%10000.0000	30	30	100.0000000	0.0000001
5000.0000	30	1	3.3333340	0.0000029
2500.0000	30	1	3.3333340	0.0000029
1250.0000	30	0	0.0000000	0.0000001

---------- RESULTS ----------

METHOD	SPAN	G	EC50	95 PERCENT CONFIDENCE LIMITS
BINOMIAL 00			%6826.024000	%5000.000000 - %10000.0000
MOVING AVERAGE	4	0.032585	6221.215000	5270.736000 - %7451.995000
PROBIT	(.....NOT VALID.....)			

INTERPRETATION OF STATISTICS

The order of preference of results is:
BEST: Probit Method
BETTER: Moving Average
GOOD: Binomial
GOOD: Graphic Interpolation (Graph drawn by hand)
assuming all are statistically valid.

To Determine if a method has given valid results:
GRAPHICAL: Always valid
BINOMIAL: The program will tell you if this is not valid.
MOVING AVERAGE: The number of spans needs to be no less than one lower than the number of concentrations tested (excluding control).
PROBIT: The program will tell you if this is not valid

Appendix Three

Raw Data: Pathogen Testing

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

BO-015

720 Park Blvd., PO Box 73
Boise, Idaho 83729
(208) 386-5000

Project No.: 1334-009-07-35

Project Name: NSWC Crane Bioreactor Facility

Samplers: (Signature) Ken Phillips

Sampler: (Print) KEN PHILLIPS

Analysis Required: Microtox, Cadmium TCLP, Arsenic

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	Microtox	Cadmium TCLP	Arsenic	Remarks
Compost	Column 3	5/11/98	1006	BO-12/14-S001-3		✓	✓	✓	✓	Soil Toxicity
	5		1026	BO-12/14-S001-5		✓	✓	✓	✓	
	7		0945	BO-12/14-S001-7		✓	✓	✓	✓	
	9		0936	BO-12/14-S001-9		✓	✓	✓	✓	
	11		0919	BO-12/14-S001-11		✓	✓	✓	✓	
										~~Pathogen bpc~~ ~~40CFR 503.32~~
										AQUA Survey

Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company	Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company
Ken Phillips	5/11/98 1530	York [illegible] 5/11/98			
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Received for Laboratory By: (Signature) / Company:	Date/Time	Total No. Samples This Shipping Container / Company:
Relinquished By: (Signature) / Comp	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

BIO - 22

720 Park Blvd, PO Box 73
Boise, Idaho 83729
(208) 386 5000

Project No.: 4324-0009-01-35

Project Name: NSWC Crane Bioreactor Facility

Samplers: (Signature)

Sampler: (Print) Mike Maddox

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	Microtox	Earthworm Tox.	Remarks
Compost	Control Pile, 25% Dry Lost (26)	5/20/98	1245	B10-12/14-Control		-	✓	✓	
									AQUA Survey

Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
	5/20/98 1530	York Tuell 5/21			
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Received for Laboratory By: (Signature) / Company:	Date/Time	Total No. Samples This Shipping Container / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:

Bill #: [illegible]

00066
00100

FedEx. *USA Airbill* 8008118247 65

9N-21

0200 FedEx Retrieval Copy

1 From

Date 5/11/98 Sender's FedEx Account Number 1768-6278-5

Sender's Name RITA DAWSON Phone (812) 854-6941

Company MORRISON KNUDSEN CORP

Address NSWC CTR12 300 HWY 361 Dept./Floor/Suite/Room

City CRANE State IN ZIP 47522

2 Your Internal Billing Reference Information

3 To

Recipient's Name JAMES TODD Phone 908) 788-8700

Company AQUA SURVEY, INC

Address 499 POINT BREEZE ROAD Dept./Floor/Suite/Room

(To HOLD at FedEx location, print FedEx address here)

☐ Check here if residence

City FLEMINGTON State NJ ZIP 08822

For HOLD at FedEx Location check here

1 ☐ Hold Weekday (Not available with FedEx First Overnight)

3 ☐ Hold Saturday (Not available at all locations) (Available for FedEx Priority Overnight and FedEx 2Day only)

For Saturday Delivery check here

3 ☐ (Extra Charge Not available at all locations) (Available for FedEx Priority Overnight and FedEx 2Day only)

L

8008118247 65

4a Express Package Service Packages under 150 lbs. Delivery commitment may be later in some areas

1 [X] FedEx Priority Overnight (Next business morning)

5 [ ] FedEx Standard Overnight (Next business afternoon)

3 [ ] FedEx 2Day* (Second business day)

20 [ ] FedEx Express Saver* (Third business day)

6 [ ] FedEx First Overnight (Earliest next business morning delivery to select locations) (Higher rates apply)

*FedEx Letter Rate not available. Minimum charge: One pound rate

4b Express Freight Service Packages over 150 lbs. Delivery commitment may be later in some areas

7 [ ] FedEx Overnight Freight (Next business day)

8 [ ] FedEx 2Day Freight (Second business day)

83 [ ] FedEx Express Saver Freight (Up to 3 business days)

(Call for delivery schedule. See back for detailed descriptions of freight services.)

5 Packaging 6 [ ] FedEx Letter 2 [ ] FedEx Pak (Declared value limit $500) 3 [ ] FedEx Box 4 [ ] FedEx Tube 1 [X] Other Pkg

6 Special Handling

Does this shipment contain dangerous goods? 4 [ ] Yes (Shipper's Declaration not required) [ ] Yes (Shipper's Declaration required)

6 [ ] Dry Ice (Dry Ice ____ lbs.) (Dangerous Goods Shipper's Declaration not required)

CA [ ] Cargo Aircraft Only

7 Payment [ ] Obtain Recipient FedEx Account No.

Bill to: 1 [X] Sender (Recipient to receive bill if left blank) 2 [ ] Recipient 3 [ ] Third Party 4 [ ] Credit Card 5 [ ] Cash/Check

(Enter FedEx account no. or Credit Card no. below)

FedEx Account No.

Credit Card No. Exp. Date

Total Packages 1 Total Weight 32 Lb [redacted] Total Charges $

When declaring a value higher than $100 per shipment you pay an additional charge. See SERVICE CONDITIONS, DECLARED VALUE, AND LIMIT OF LIABILITY section for further information.

Credit Card Auth.

8 Release Signature

Your signature authorizes Federal Express to deliver this shipment without obtaining a signature and agrees to indemnify and hold harmless Federal Express from any resulting claims.

287

003196427 2

ASI, INC.
SAMPLE RECEIVING FORM

Client: Marisa Knudson Comp

Shipped Via: Fed Ex | # of Shipping Containers: 1

Type of Shipping Container: Cooler | Custody Seal: Present ✓ Absent _ Broken _ | Condition of Shipping Containers: Acceptable ✓ Unacceptable _

	ASI # 98-164	Sample ID	Type of Container	Number of Containers	Condition of Sample	Temp. °C	Ice -	Type of Sample
1.	80885	Column 3	Jar/Can	2	A	6	T	S
2.	80886	" 5	↓	↓	↓	↓	↓	↓
3.	80887	" 7						
4.	80888	" 9						
5.	80889	" 11						
6.								
7.								
8.								
9.								
10.								

Notes: (Discrepancies Between Sample Labels and COC Record)

Opened/Received by: [illegible] | Date/Time: 5/10/98 1300

S - Soil
Sa - Sediment
Sl - Sludge
W - Water
E - Effluent

A - Acceptable
U - Unacceptable or Contaminated

I - Ice
D - Dry Ice
B - Blue Ice
N - None

7/96

ASI, INC.
SAMPLE RECEIVING FORM

Client: Morrison Knudsen Corp.

Shipper Via: FedEx | # of Shipping Containers: 1

Type of Shipping Container: Cooler | Custody Seal: Present ✓ Absent ___ Broken ___ | Condition of Shipping Container: Acceptable ✓ Unacceptable ___

	ASI #	Sample ID	Type of Container	Number of Containers	Condition of Sample	Temp. °C	Ice	Type of Sample
1.	81036	BD-W/14 Control	Glass Jar / Tyvek Bag	2	A	12.5	I	S
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								

Notes: (Discrepancies Between Sample Labels and COC Record)

Opened/Received by: [signature] | Date/Time:

S - Soil
Se - Sediment
Sl - Sludge
W - Water
E - Effluent

A - Acceptable
U - Unacceptable or Compromised

I - Ice
D - Dry Ice
B - Blue Ice
N - None

7/96

PURE EARTH ENVIRONMENTAL LAB., INC.

7184 North Park Drive
Pennsauken. NJ 08110
Phone: (609) 486-1177
FAX: (609) 486-0005

T.J. Passon JR., PH.D.
LABORATORY DIRECTOR

LABORATORY REPORT

Aqua Survey
499 POINT BREEZE ROAD
FLEMINGTON NJ 08822

(908) 788-8700

Re: Accession No.: 194717
Date Collected: 05/11/98
Date Received: 05/13/98
Aqua Survey
NSWC BIOFACILITY
COLUMN 3
BIO-12/14-50013

SALMONELLA SP

SALMONELLA SP	<3	MPN

40 CFR PART 503
18TH ED
STANDARD METHODS
PART 9260D.1
CLASS A NOT TO EXCEED
3 MPN PER 4 GRAMS
TOTAL SOLIDS (DRY WEIGHT)

TOTAL SOLIDS

TOTAL SOLID % DRY WEIGHT	76.6	%

FECAL COLI/BIOSOLIDS

FECAL COLIFORM PER GRAM TOTAL SOLIDS	<1.000	MPN

****
DILUTIONS REQUIRED
DEP #04624
40 CFR PART 503
18 ED STANDARD METHODS
9221E.1
****
ALLOWABLE LIMITS
<1.000 MPN/gram
Total solids

Report Date/Time 05/18/98 16:46:43

PURE EARTH ENVIRONMENTAL LAB., INC.

7184 North Park Drive
Pennsauken. NJ 08110
Phone: (609) 486-1177
FAX: (609) 486-0005

T.J. Passon JR., PH.D.
LABORATORY DIRECTOR

LABORATORY REPORT

Aqua Survey
499 POINT BREEZE ROAD
FLEMINGTON NJ 08822

(908) 788-8700

Re: Accession No.: 194719
Date Collected: 05/11/98
Date Received: 05/13/98
Aqua Survey
NSWC BIOFACILITY
COLUMN 5
BIO-12/14-50015

SALMONELLA SP

SALMONELLA SP	<3	MPN

40 CFR PART 503
18TH ED
STANDARD METHODS
PART 9260D.1
CLASS A NOT TO EXCEED
3 MPN PER 4 GRAMS
TOTAL SOLIDS (DRY WEIGHT)

TOTAL SOLIDS

TOTAL SOLID % DRY WEIGHT	78.3	%

FECAL COLI/BIOSOLIDS

FECAL COLIFORM PER GRAM TOTAL SOLIDS	<1,000	MPN

****
DILUTIONS REQUIRED
DEP #04624
40 CFR PART 503
18 ED STANDARD METHODS
9221E.1
****
ALLOWABLE LIMITS
<1,000 MPN/gram
Total solids

Report Date/Time 05/18/98 16:46:

PURE EARTH ENVIRONMENTAL LAB., INC.

7184 North Park Drive
Pennsauken, NJ 08110
Phone: (609) 486-1177
FAX: (609) 486-0005

T.J. Passon JR., PH.D.
LABORATORY DIRECTOR

LABORATORY REPORT

Aqua Survey
499 POINT BREEZE ROAD
FLEMINGTON NJ 08822

(908) 788-8700

Re: Accession No.: 194720
Date Collected: 05/11/98
Date Received: 05/13/98
Aqua Survey
NSWC BIOFACILITY
COLUMN 7
BIO-12/14-50017

SALMONELLA SP

SALMONELLA SP	<3	MPN

40 CFR PART 503
18TH ED
STANDARD METHODS
PART 9260D.1
CLASS A NOT TO EXCEED
3 MPN PER 4 GRAMS
TOTAL SOLIDS (DRY WEIGHT)

TOTAL SOLIDS

TOTAL SOLID % DRY WEIGHT	76.2	%

FECAL COLI/BIOSOLIDS

FECAL COLIFORM PER GRAM TOTAL SOLIDS	<1,000	MPN

****
DILUTIONS REQUIRED
DEP #04624
40 CFR PART 503
18 ED STANDARD METHODS
9221E.1
****
ALLOWABLE LIMITS
<1,000 MPN/gram
Total solids

Report Date/Time 05/18/98 16:46:4

PURE EARTH ENVIRONMENTAL LAB., INC.

7184 North Park Drive
Pennsauken, NJ 08110
Phone: (609) 486-1177
FAX: (609) 486-0005

T.J. Passon JR., PH.D.
LABORATORY DIRECTOR

LABORATORY REPORT

Aqua Survey
499 POINT BREEZE ROAD
FLEMINGTON NJ 08822

(908) 788-8700

Re: Accession No.: 194721
Date Collected: 05/11/98
Date Received: 05/13/98
Aqua Survey
NSWC BIOFACILITY
COLUMN 9
BIO-12/14-50019

TOTAL SOLIDS

TOTAL SOLID		
% DRY WEIGHT	73.9	%

FECAL COLI/BIOSOLIDS

FECAL COLIFORM	<1,000	MPN
PER GRAM TOTAL SOLIDS		

****

DILUTIONS REQUIRED
DEP #04624
40 CFR PART 503
18 ED STANDARD METHODS
9221E.1

****

ALLOWABLE LIMITS
<1,000 MPN/gram
Total solids

SALMONELLA SP

SALMONELLA SP	<3	MPN

40 CFR PART 503
18TH ED
STANDARD METHODS
PART 9260D.1
CLASS A NOT TO EXCEED
3 MPN PER 4 GRAMS
TOTAL SOLIDS (DRY WEIGHT)

Report Date/Time 05/18/98 16:46:

PURE EARTH ENVIRONMENTAL LAB., INC.

7184 North Park Drive
Pennsauken, NJ 08110
Phone: (609) 486-1177
FAX: (609) 486-0005

T.J. Passon JR., PH.D.
LABORATORY DIRECTOR

LABORATORY REPORT

Aqua Survey
499 POINT BREEZE ROAD
FLEMINGTON NJ 08822

(908) 788-8700

Re: Accession No.: 194722
Date Collected: 05/11/98
Date Received: 05/13/98
Aqua Survey
NSWC BIOFACILITY
COLUMN 11
BIO12/14-500111

SALMONELLA SP

SALMONELLA SP	<3	MPN

40 CFR PART 503
18TH ED
STANDARD METHODS
PART 9260D.1
CLASS A NOT TO EXCEED
3 MPN PER 4 GRAMS
TOTAL SOLIDS (DRY WEIGHT)

TOTAL SOLIDS

TOTAL SOLID % DRY WEIGHT	73.9	%

FECAL COLI/BIOSOLIDS

FECAL COLIFORM PER GRAM TOTAL SOLIDS	<1,000	MPN

****
DILUTIONS REQUIRED
DEP #04624
40 CFR PART 503
18 ED STANDARD METHODS
9221E.1
****
ALLOWABLE LIMITS
<1.000 MPN/gram
Total solids

Report Date/Time 05/18/98 16:46:

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 386-5000

BU-016

Project No.: 1324-019-07-35
Project Name: NSWC Crane BioFacility
Samplers: (Signature) Ken Phillips
Sampler: (Print) KEN PHILLIPS

Analysis Required: Radionuclides 40 CFR 503.33

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	Remarks
Composite	column 3	5/11/98	1026	BU-12/14-SC01-3		✓	Soil Toxicity
	5		1026	BU-12/14-SC01-5		✓	
	7		0915	BU-12/14-SC01-7		✓	
	9		0933	BU-12/14-SC01-9		✓	
	11		0922	BU-12/14-SC01-11		✓	
-	blank	5/11/98	~~1530~~ 1006	BU-12/21-SC01-Blank		✓	

Remarks: Pure Earth Environmental

Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company	Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company
Ken Phillips	5/11/98 1530	R Rivera / Pure Earth		5/14/98 9:30am	
Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company	Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company
Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company	Received for Laboratory By: (Signature) / Company	Date/Time	Total No. Samples This Shipping Container / Company
Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company	Relinquished By: (Signature) / Company	Date/Time	Received By: (Signature) / Company

C. Ields 2-11 2-12

PURE EARTH ENVIRONMENTAL LAB.. INC.

7184 North Park Drive
Pennsauken. NJ 08110
Phone: (609) 486-1177
FAX: (609) 486-0005

T.J. Passon JR.. PH.D.
LABORATORY DIRECTOR

LABORATORY REPORT

Aqua Survey
499 POINT BREEZE ROAD
FLEMINGTON NJ 08822

(908) 788-8700

Re: Accession No.: 194920
Date Collected: 05/20/98
Date Received: 05/21/98
Aqua Survey
NSWC CROME BIOFACILI
CONTROL PILE 25%
COMPOST

TOTAL SOLIDS

TOTAL SOLID		
% DRY WEIGHT	81.3	%

SALMONELLA SP

SALMONELLA SP	<3	MPN

40 CFR PART 503
18TH ED
STANDARD METHODS
PART 9260D.1
CLASS A NOT TO EXCEED
3 MPN PER 4 GRAMS
TOTAL SOLIDS (DRY WEIGHT)

FECAL COLI/BIOSOLIDS

FECAL COLIFORM	1.968	MPN

PER GRAM TOTAL SOLIDS
****
DILUTIONS REQUIRED
DEP #04624
40 CFR PART 503
18 ED STANDARD METHODS
9221E.1
****
ALLOWABLE LIMITS
<1.000 MPN/gram
Total solids

Report Date/Time 06/01/98 11:09:1

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 368-5000

Aqua Survey

BIO-23

Project No.: 4324-0009-07-35

Project Name: NSWC Crane Biofacility

Samplers: (Signature)

Sampler: (Print) Mike Maddox

Analysis Required: Refinery Bio 40 CFR 503.32

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	Remarks
Compost	Control Pile, 25% Hay Last (26)	5/26/98	1245	BIO-12/4-Control		✓	
—	Blank	5/26/98		BIO-12/4-Control		✓	
							Rare Earth Env.

Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
[signature]	5/27/98 1530	P. McBride / RABL			
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Received for Laboratory By: (Signature) / Company:	Date/Time	Total No. Samples This Shipping Container / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:

APPENDIX B

EXPLOSIVE LEACHABILITY ANALYSIS

TABLE OF CONTENTS

DESCRIPTION **PAGES**

Explosive Leachability Analysis . . . . . 57 pages

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-3

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33925

Matrix: (soil/water) SOIL Lab Sample ID: 33925.01

Sample Amt: 2g % Moisture 19.71 Date Received: 05/12/98

Extraction Volume: 10ml Date Extracted: 05/13/98

Extraction Method: SONC Date Analyzed: 06/06/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
2691-41-0	HMX	2200	U
121-82-4	RDX	2240	
99-35-4	TNB	250	U
99-65-0	DNB	250	U
479-45-8	TETRYL	650	U
98-95-3	NB	260	U
118-96-7	TNT	652	P
1946-51-0	4ADNT	250	U
35572-78-2	2ADNT	250	U
606-20-2	26DNT	260	U
121-14-2	24DNT	250	U
88-72-2	2NT	250	U
99-99-0	4NT	250	U
99-08-1	3NT	250	U

SURROGATE AMOUNT SPIKED (ug/kg dry wt.) 2000
3,4-DNT

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-3

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33925

Matrix: (soil/water) SOIL Lab Sample ID: 33925.01

Sample Amt: 2g % Moisture 19.71 Date Received: 05/12/98

Extraction Volume: 10ml Date Extracted: 05/13/98

Extraction Method: SONC Date Analyzed: 05/18/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
75-11-5	PETN----------	250	U

FORM I

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-5

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33925

Matrix: (soil/water) SOIL Lab Sample ID: 33925.02

Sample Amt: 2g % Moisture 21.84 Date Received: 05/12/98

Extraction Volume: 10ml Date Extracted: 05/13/98

Extraction Method: SONC Date Analyzed: 06/06/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
2691-41-0	HMX	2200	U
121-82-4	RDX	1000	U
99-35-4	TNB	250	U
99-65-0	DNB	250	U
479-45-8	TETRYL	650	U
98-95-3	NB	260	U
118-96-7	TNT	250	U
1946-51-0	4ADNT	250	U
35572-78-2	2ADNT	250	U
606-20-2	26DNT	260	U
121-14-2	24DNT	250	U
88-72-2	2NT	250	U
99-99-0	4NT	250	U
99-08-1	3NT	250	U

SURROGATE AMOUNT SPIKED (ug/kg dry wt.) 2000
3,4-DNT

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-5

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33925

Matrix: (soil/water) SOIL Lab Sample ID: 33925.02

Sample Amt: 2g % Moisture 21.84 Date Received: 05/12/98

Extraction Volume: 10ml Date Extracted: 05/13/98

Extraction Method: SONC Date Analyzed: 05/18/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
75-11-5	PETN	250	U

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-7

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33925

Matrix: (soil/water) SOIL Lab Sample ID: 33925.03

Sample Amt: 2g % Moisture 24.72 Date Received: 05/12/98

Extraction Volume: 10ml Date Extracted: 05/13/98

Extraction Method: SONC Date Analyzed: 06/06/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
2691-41-0	HMX	2200	U
121-82-4	RDX	1000	U
99-35-4	TNB	250	U
99-65-0	DNB	250	U
479-45-8	TETRYL	650	U
98-95-3	NB	260	U
118-96-7	TNT	196	J
1946-51-0	4ADNT	250	U
35572-78-2	2ADNT	250	U
606-20-2	26DNT	260	U
121-14-2	24DNT	250	U
88-72-2	2NT	250	U
99-99-0	4NT	250	U
99-08-1	3NT	250	U

SURROGATE AMOUNT SPIKED (ug/kg dry wt.) 2000
3,4-DNT

FORM I

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-7

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33925

Matrix: (soil/water) SOIL Lab Sample ID: 33925.03

Sample Amt: 2g % Moisture 24.72 Date Received: 05/12/98

Extraction Volume: 10ml Date Extracted: 05/13/98

Extraction Method: SONC Date Analyzed: 05/18/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
75-11-5	PETN----------	250	U

FORM I

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-9

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33925

Matrix: (soil/water) SOIL Lab Sample ID: 33925.04

Sample Amt: 2g % Moisture 25.02 Date Received: 05/12/98

Extraction Volume: 10ml Date Extracted: 05/13/98

Extraction Method: SONC Date Analyzed: 06/06/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
2691-41-0	HMX	2200	U
121-82-4	RDX	1000	U
99-35-4	TNB	250	U
99-65-0	DNB	250	U
479-45-8	TETRYL	650	U
98-95-3	NB	260	U
118-96-7	TNT	250	U
1946-51-0	4ADNT	250	U
35572-78-2	2ADNT	250	U
606-20-2	26DNT	260	U
121-14-2	24DNT	250	U
88-72-2	2NT	250	U
99-99-0	4NT	250	U
99-08-1	3NT	250	U

SURROGATE AMOUNT SPIKED (ug/kg dry wt.) 2000
3,4-DNT

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-9

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33925

Matrix: (soil/water) SOIL Lab Sample ID: 33925.04

Sample Amt: 2g % Moisture 25.02 Date Received: 05/12/98

Extraction Volume: 10ml Date Extracted: 05/13/98

Extraction Method: SONC Date Analyzed: 05/18/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
75-11-5	PETN----------	250	U

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-11

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33925

Matrix: (soil/water) SOIL Lab Sample ID: 33925.05

Sample Amt: 2g % Moisture 21.41 Date Received: 05/12/98

Extraction Volume: 10ml Date Extracted: 05/13/98

Extraction Method: SONC Date Analyzed: 06/06/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
2691-41-0	HMX	6660	P
121-82-4	RDX	52900	E
99-35-4	TNB	250	U
99-65-0	DNB	250	U
479-45-8	TETRYL	650	U
98-95-3	NB	260	U
118-96-7	TNT	22700	E
1946-51-0	4ADNT	250	U
35572-78-2	2ADNT	250	U
606-20-2	26DNT	260	U
121-14-2	24DNT	250	U
88-72-2	2NT	250	U
99-99-0	4NT	250	U
99-08-1	3NT	250	U

SURROGATE AMOUNT SPIKED (ug/kg dry wt.) 2000
3,4-DNT

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-11 5X

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33925

Matrix: (soil/water) SOIL Lab Sample ID: 33925.05DL

Sample Amt: 2g % Moisture 21.41 Date Received: 05/12/98

Extraction Volume: 20ml Date Extracted: 05/13/98

Extraction Method: SONC Date Analyzed: 06/06/98

GPC Cleanup: (Y/N) N Dilution Factor: 5.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
2691-41-0	HMX	6840	DP
121-82-4	RDX	53000	D
99-35-4	TNB	625	U
99-65-0	DNB	625	U
479-45-8	TETRYL	1620	U
98-95-3	NB	650	U
118-96-7	TNT	23600	D
1946-51-0	4ADNT	625	U
35572-78-2	2ADNT	625	U
606-20-2	26DNT	650	U
121-14-2	24DNT	625	U
88-72-2	2NT	625	U
99-99-0	4NT	625	U
99-08-1	3NT	625	U

SURROGATE AMOUNT SPIKED (ug/kg dry wt.) 2000
3,4-DNT

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-11

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33925

Matrix: (soil/water) SOIL Lab Sample ID: 33925.05

Sample Amt: 2g % Moisture 21.41 Date Received: 05/12/98

Extraction Volume: 10ml Date Extracted: 05/13/98

Extraction Method: SONC Date Analyzed: 05/18/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
75-11-5	PETN----------	250	U

FORM I

2E

EXPLOSIVE SURROGATE RECOVERY FORM

Lab Name: SWL-TULSA Contract:

b Code: SWOK Case No: MKF-OH SDG No:33925

	SAMPLE NUMBER	S1 #	OTHER
1	BIO-12/14-S001-3	108	0
2	BIO-12/14-S001-5	100	0
3	BIO-12/14-S001-7	99.3	0
4	BIO-12/14-S001-9	99.3	0
5	BIO-12/14-S001-11	79.4	0
6	BIO-12/14-S001-11 5X	67.5D	0
7	BL0513SD	104	0
8	LC0513SD	84.1	0
9	LD0513SD	90.3	0
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			

S1 = 3,4-DNT (60-140)

Column to be used to flag recovery values
* Values outside of QC limits
D Surrogates diluted out

FORM II

C 4

SOIL EXPLOSIVE CONTROL SPIKE RECOVERY FORM

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No: MKF-OH SDG No:33925

Client Sample No: LC0513SD

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	LCS CONCENTRATION (ug/Kg)	LCS % REC #	QC LIMITS REC.
HMX	9500		11200	118	57-137
RDX	9500		10600	112	77-113
TNB	9500		10100	106	64-125
DNB	9500		10600	112	82-118
TETRYL	9500		5320	56	23-124
NB	9500		10600	112	69-143
TNT	9500		8440	89	75-118
4ADNT	9500		11700	123	60-140
2ADNT	9500		10800	114	60-140
26DNT	9500		10300	108	78-117
24DNT	9500		11600	122	74-126
2NT	9500		10400	109	78-123
4NT	9500		10300	108	79-125
3NT	9500		9480	100	78-121

# of Analyte recoveries out of QC Advisory Limits = 0

SOIL EXPLOSIVE CONTROL SPIKE RECOVERY FORM

Name: SWL-TULSA Contract:

Lab Code: SWOK Case No: MKF-OH SDG No:33925

Client Sample No: LC0513SE

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	LCS CONCENTRATION (ug/Kg)	LCS % REC #	QC LIMITS REC.
PETN	3000		3140	105	70-130

No of Analyte recoveries out of QC Advisory Limits = 0

SOIL EXPLOSIVE CONTROL SPIKE RECOVERY FORM

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No: MKF-OH SDG No:33925

Client Sample No: LD0513SD

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	LCSD CONCENTRATION (ug/Kg)	LCSD % REC #	QC LIMITS REC.
HMX	9500		11200	118	57-137
RDX	9500		10400	109	77-113
TNB	9500		10800	114	64-125
DNB	9500		10700	113	82-118
TETRYL	9500		8460	89	23-124
NB	9500		10500	110	69-143
TNT	9500		8830	93	75-118
4ADNT	9500		11200	118	60-140
2ADNT	9500		10900	115	60-140
26DNT	9500		10400	109	78-117
24DNT	9500		11700	123	74-126
2NT	9500		10700	113	78-123
4NT	9500		10400	109	79-125
3NT	9500		9640	101	78-121

# of Analyte recoveries out of QC Advisory Limits = 0

SOIL EXPLOSIVE CONTROL SPIKE RECOVERY FORM

Name: SWL-TULSA Contract:

Lab Code: SWOK Case No: MKF-OH SDG No:33925

Client Sample No: LD0513SE

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	LCSD CONCENTRATION (ug/Kg)	LCSD % REC #	QC LIMITS REC.
PETN	3000		3100	103	70-130

No of Analyte recoveries out of QC Advisory Limits = 0

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-3 TCLP

Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33924

Matrix: (soil/water) WATER Lab Sample ID: 33924.01

Sample Amt: 1ml % Moisture 20.81 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/15/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
2691-41-0	HMX	13.0	U
121-82-4	RDX	14.0	U
99-35-4	TNB	7.30	U
99-65-0	DNB	4.00	U
479-45-8	TETRYL	10.0	U
98-95-3	NB	7.00	U
118-96-7	TNT	6.40	U
1946-51-0	4ADNT	7.00	U
35572-78-2	2ADNT	12.0	U
606-20-2	26DNT	9.40	U
121-14-2	24DNT	5.70	U
88-72-2	2NT	12.0	U
99-99-0	4NT	8.00	U
99-08-1	3NT	7.90	U

SURROGATE AMOUNT SPIKED (ug/L) 200
3,4-DNT

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-3 TCLP

Name: SWL-TULSA Contract:

Code: SWOK Case No:MKF-OH SDG No: 33924

trix: (soil/water) WATER Lab Sample ID: 33924.01

mple Amt: 1ml % Moisture 20.81 Date Received: 05/12/98

traction Volume: 1ml Date Extracted: DIRECT INJ

traction Method: DIRECT Date Analyzed: 05/26/98

C Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg)	ug/L	Q
75-11-5	PETN		20.0	U

FORM I

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-5
TCLP

b Name: SWL-TULSA Contract:

b Code: SWOK Case No:MKF-OH SDG No: 33924

trix: (soil/water) WATER Lab Sample ID: 33924.02

mple Amt: 1ml % Moisture 21.49 Date Received: 05/12/98

xtraction Volume: 1ml Date Extracted: DIRECT INJ

xtraction Method: DIRECT Date Analyzed: 05/15/98

PC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q.
2691-41-0	HMX	13.0	U
121-82-4	RDX	14.0	U
99-35-4	TNB	7.30	U
99-65-0	DNB	4.00	U
479-45-8	TETRYL	10.0	U
98-95-3	NB	7.00	U
118-96-7	TNT	6.40	U
1946-51-0	4ADNT	7.00	U
572-78-2	2ADNT	12.0	U
-20-2	26DNT	9.40	U
121-14-2	24DNT	5.70	U
88-72-2	2NT	12.0	U
99-99-0	4NT	8.00	U
99-08-1	3NT	7.90	U

SURROGATE AMOUNT SPIKED (ug/L) 200
3,4-DNT

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-5 TCLP

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33924

Matrix: (soil/water) WATER Lab Sample ID: 33924.02

Sample Amt: 1ml % Moisture 21.49 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/26/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
75-11-5	PETN----------	20.0	U

FORM I

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-7
TCLP

me: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33924

Matrix: (soil/water) WATER Lab Sample ID: 33924.03

Sample Amt: 1ml % Moisture 22.57 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/15/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
2691-41-0	HMX	13.0	U
121-82-4	RDX	14.0	U
99-35-4	TNB	7.30	U
99-65-0	DNB	4.00	U
479-45-8	TETRYL	10.0	U
98-95-3	NB	7.00	U
118-96-7	TNT	6.40	U
1946-51-0	4ADNT	7.00	U
35572-78-2	2ADNT	12.0	U
606-20-2	26DNT	9.40	U
121-14-2	24DNT	5.70	U
88-72-2	2NT	12.0	U
99-99-0	4NT	8.00	U
99-08-1	3NT	7.90	U

SURROGATE AMOUNT SPIKED (ug/L) 200
3,4-DNT

FORM I

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-7 TCLP

ɔ Name: SWL-TULSA Contract:

b Code: SWOK Case No:MKF-OH SDG No: 33924

trix: (soil/water) WATER Lab Sample ID: 33924.03

mple Amt: 1ml % Moisture 22.57 Date Received: 05/12/98

:traction Volume: 1ml Date Extracted: DIRECT INJ

ɛtraction Method: DIRECT Date Analyzed: 05/26/98

PC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
75-11-5	PETN----------	20.0	U

FORM I

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-9 TCLP

SWL-TULSA Contract:

Code: SWOK Case No:MKF-OH SDG No: 33924

ix: (soil/water) WATER Lab Sample ID: 33924.04

ple Amt: 1ml % Moisture 25.28 Date Received: 05/12/98

raction Volume: 1ml Date Extracted: DIRECT INJ

raction Method: DIRECT Date Analyzed: 05/15/98

Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
691-41-0	HMX	13.0	U
21-82-4	RDX	14.0	U
9-35-4	TNB	7.30	U
9-65-0	DNB	4.00	U
479-45-8	TETRYL	10.0	U
98-95-3	NB	7.00	U
118-96-7	TNT	6.40	U
1946-51-0	4ADNT	7.00	U
3[illegible]-78-2	2ADNT	12.0	U
606-20-2	26DNT	9.40	U
121-14-2	24DNT	5.70	U
88-72-2	2NT	12.0	U
99-99-0	4NT	8.00	U
99-08-1	3NT	7.90	U

URROGATE AMOUNT SPIKED (ug/L) 200
,4-DNT

FORM I

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-9 TCLP

› Name: SWL-TULSA Contract:

› Code: SWOK Case No:MKF-OH SDG No: 33924

:rix: (soil/water) WATER Lab Sample ID: 33924.04

nple Amt: 1ml % Moisture 25.28 Date Received: 05/12/98

:raction Volume: 1ml Date Extracted: DIRECT INJ

traction Method: DIRECT Date Analyzed: 05/26/98

: Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg)	ug/L	Q
75-11-5	PETN		20.0	U

FORM I

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-11 TCLP

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33924

Matrix: (soil/water) WATER Lab Sample ID: 33924.05

Sample Amt: 1ml % Moisture 21.88 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/15/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
2691-41-0	HMX	13.0	U
121-82-4	RDX	14.0	U
99-35-4	TNB	7.30	U
99-65-0	DNB	4.00	U
479-45-8	TETRYL	10.0	U
98-95-3	NB	7.00	U
118-96-7	TNT	6.40	U
1946-51-0	4ADNT	7.00	U
35572-78-2	2ADNT	12.0	U
606-20-2	26DNT	9.40	U
121-14-2	24DNT	5.70	U
88-72-2	2NT	12.0	U
99-99-0	4NT	8.00	U
99-08-1	3NT	7.90	U

SURROGATE AMOUNT SPIKED (ug/L) 200
3,4-DNT

FORM I

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

b Name: SWL-TULSA Contract:

BIO-12/14-S001-11 TCLP

Lab Code: SWOK Case No:MKF-OH SDG No: 33924

Matrix: (soil/water) WATER Lab Sample ID: 33924.05

Sample Amt: 1ml % Moisture 21.88 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/26/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
75-11-5	PETN----------	20.0	U

FORM I

2E

EXPLOSIVE SURROGATE RECOVERY FORM

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No:33924

	SAMPLE NUMBER	S1 #	OTHER
1	BIO-12/14-S001-3	0	0
2	BIO-12/14-S001-3RE	100	0
3	BIO-12/14-S001-5	124	0
4	BIO-12/14-S001-7	123	0
5	BIO-12/14-S001-7 MS	111	0
6	BIO-12/14-S001-7 MSD	122	0
7	BIO-12/14-S001-9	117	0
8	BIO-12/14-S001-11	114	0
9	BB0513WE	114	0
10	BL0520WE	105	0
11	TB051298C1	120	0
12	TB051298B	120	0
13	TC0513WE	146	0
14	LC0520WE	97.2	0
15	TD0513WE	118	0
16	LD0520WE	95.0	0
17			
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S1 = 3,4DNT (60-140)

Column to be used to flag recovery values

* Values outside of QC limits

D Surrogates diluted out

3F

EXPLOSIVE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY FORM

-TULSA Contract:

OK Case No: MKF-OH SDG No:33924

e No: BIO-12/14-S001-7 MSD

	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
	400		348	87	44-154
	150		132	38	66-139
	225		206	92	56-129
	125		122	98	76-122
	413		326	79	76-120
	213		195	92	82-111
	188		239	127	76-137
	313		272	87	60-140
	313		270	86	60-140
	288		247	86	80-118
	175		156	89	72-123
	363		318	88	74-130
	250		232	93	78-116
	238		277	116	72-126

te recoveries out of QC Advisory Limits = 0

	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD#	QC LIMITS RPD	REC.
	400	329	82	6	15	44-154
	150	118	79	11	12	66-139
	225	202	90	2	10	56-129
	125	120	96	2	15	76-122
	413	329	80	1	14	76-120
	213	201	94	3	13	82-111
	188	241	128	1	15	76-137
	313	280	89	3	40	60-140
	313	273	87	1	40	60-140
	288	241	84	2	13	80-118
	175	155	89	1	14	72-123
	363	318	88	0	15	74-130
	250	224	90	4	14	78-116
	238	268	113	3	15	72-126

yte recoveries out of QC Advisory Limits = 0
's out of QC Limits 0

3F

WATER EXPLOSIVE MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY FORM

SWL-TULSA Contract:

Code: SWOK Case No: MKF-OH SDG No:33924

nt Sample No: BIO-12/14-S001-7

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC #	QC LIMITS REC.
ETN	1200		1380	115	70-130

of Analyte recoveries out of QC Advisory Limits = 0

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC #	% RPD#	QC LIMITS RPD	REC.
ETN	1200	1390	116	1	30	70-130

of Analyte recoveries out of QC Advisory Limits = 0
of RPD's out of QC Limits 0

WATER EXPLOSIVE CONTROL SPIKE RECOVERY FORM

Name: SWL-TULSA Contract:

Code: SWOK Case No: MKF-OH SDG No:33924

ent Sample No: LC0520WE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC #	QC LIMITS REC.
MX	400		369	92	46-151
DX	150		154	103	72-129
NB	225		225	100	74-118
NB	125		124	99	79-132
ETRYL	413		329	80	58-120
B	213		226	106	68-135
NT	188		265	141	61-145
ADNT	313		241	77	60-140
2ADNT	313		267	85	60-140
26DNT	288		253	88	77-125
24DNT	175		162	93	70-134
2NT	363		333	92	73-131
4NT	250		237	95	73-116
3NT	238		289	121	71- 127

f Analyte recoveries out of QC Advisory Limits = 0

3G

EXPLOSIVES WATER LABORATORY CONTROL SPIKE RECOVERY

Name: SWL-TULSA Contract:

: SWOK Case No: MKF-OH SDG No: 33924

ent Sample ID: TC0513WF

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC #	QC LIMITS REC.
ETN	1200	0.0	1380	115	70-130

of analyte recoveries out of QC Limits = 0

FORM III

3G

WATER EXPLOSIVE CONTROL SPIKE RECOVERY FORM

TULSA Contract:

Case No: MKF-OH SDG No:33924

No: LC0520WF

	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC #	QC LIMITS REC.
	1200		1240	103	70-130

recoveries out of QC Advisory Limits = 0

3G

WATER EXPLOSIVE CONTROL SPIKE RECOVERY FORM

me: SWL-TULSA Contract:

ab Code: SWOK Case No: MKF-OH SDG No:33924

lient Sample No: LD0520WE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	LCSD CONCENTRATION (ug/L)	LCSD % REC #	QC LIMITS REC.
HMX	400		373	93	46-151
RDX	150		159	106	72-129
TNB	225		228	101	74-118
DNB	125		121	97	79-132
TETRYL	413		302	73	58-120
NB	213		232	109	68-135
TNT	188		280	149*	61-145
4ADNT	313		268	86	60-140
2ADNT	313		275	88	60-140
26DNT	288		251	87	77-125
24DNT	175		164	94	70-134
2NT	363		325	90	73-131
4NT	250		228	91	73-116
3NT	238		286	120	71- 127

N . Analyte recoveries out of QC Advisory Limits = 1

3G

EXPLOSIVES WATER LABORATORY CONTROL SPIKE RECOVERY

ame: SWL-TULSA Contract:

ode: SWOK Case No: MKF-OH SDG No: 33924

.t Sample ID: TD0513WF

OMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC #	QC LIMITS REC.
TN	1200	0.0	1350	113	70-130

of analyte recoveries out of QC Limits = 0

FORM III

3G

WATER EXPLOSIVE CONTROL SPIKE RECOVERY FORM

e L-TULSA Contract:

ie: SWOK Case No: MKF-OH SDG No:33924

Sample No: LD0520WF

POUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	LCSD CONCENTRATION (ug/L)	LCSD % REC #	QC LIMITS REC.
	1200		1240	103	70-130

Analyte recoveries out of QC Advisory Limits = 0

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-3
SPLP

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33926

Matrix: (soil/water) WATER Lab Sample ID: 33926.01

Sample Amt: 1ml % Moisture 20.41 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/15/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
2691-41-0	HMX	13.0	U
121-82-4	RDX	14.0	U
99-35-4	TNB	7.30	U
99-65-0	DNB	4.00	U
479-45-8	TETRYL	10.0	U
98-95-3	NB	7.00	U
118-96-7	TNT	6.40	U
1946-51-0	4ADNT	7.00	U
35572-78-2	2ADNT	12.0	U
606-20-2	26DNT	9.40	U
121-14-2	24DNT	5.70	U
88-72-2	2NT	12.0	U
99-99-0	4NT	8.00	U
99-08-1	3NT	7.90	U

SURROGATE AMOUNT SPIKED (ug/L) 200
3,4-DNT

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-3 SPLP

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33926

Matrix: (soil/water) WATER Lab Sample ID: 33926.01

Sample Amt: 1ml % Moisture 20.41 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/26/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
75-11-5	PETN----------	20.0	U

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-5 SPLP

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33926

Matrix: (soil/water) WATER Lab Sample ID: 33926.02

Sample Amt: 1ml % Moisture 18.78 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/15/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
2691-41-0	HMX	13.0	U
121-82-4	RDX	14.0	U
99-35-4	TNB	7.30	U
99-65-0	DNB	4.00	U
479-45-8	TETRYL	10.0	U
98-95-3	NB	7.00	U
118-96-7	TNT	6.40	U
1946-51-0	4ADNT	7.00	U
35572-78-2	2ADNT	12.0	U
606-20-2	26DNT	9.40	U
121-14-2	24DNT	5.70	U
88-72-2	2NT	12.0	U
99-99-0	4NT	8.00	U
99-08-1	3NT	7.90	U

SURROGATE AMOUNT SPIKED (ug/L) 200
3,4-DNT

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-5 SPLP

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33926

Matrix: (soil/water) WATER Lab Sample ID: 33926.02

Sample Amt: 1ml % Moisture 18.78 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/26/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
75-11-5	PETN----------	20.0	U

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-7 SPLP

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33926

Matrix: (soil/water) WATER Lab Sample ID: 33926.03

Sample Amt: 1ml % Moisture 22.85 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/15/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
2691-41-0	HMX	13.0	U
121-82-4	RDX	14.0	U
99-35-4	TNB	7.30	U
99-65-0	DNB	4.00	U
479-45-8	TETRYL	10.0	U
98-95-3	NB	7.00	U
118-96-7	TNT	6.40	U
1946-51-0	4ADNT	7.00	U
35572-78-2	2ADNT	12.0	U
606-20-2	26DNT	9.40	U
121-14-2	24DNT	5.70	U
88-72-2	2NT	12.0	U
99-99-0	4NT	8.00	U
99-08-1	3NT	7.90	U

SURROGATE AMOUNT SPIKED (ug/L) 200
3,4-DNT

FORM I

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-7 SPLP

ıb Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33926

Matrix: (soil/water) WATER Lab Sample ID: 33926.03

Sample Amt: 1ml % Moisture 22.85 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/26/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
75-11-5	PETN----------	20.0	U

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-9 SPLP

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33926

Matrix: (soil/water) WATER Lab Sample ID: 33926.04

Sample Amt: 1ml % Moisture 25.07 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/15/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
2691-41-0	HMX	13.0	U
121-82-4	RDX	14.0	U
99-35-4	TNB	7.30	U
99-65-0	DNB	4.00	U
479-45-8	TETRYL	10.0	U
98-95-3	NB	7.00	U
118-96-7	TNT	6.40	U
1946-51-0	4ADNT	7.00	U
35572-78-2	2ADNT	12.0	U
606-20-2	26DNT	9.40	U
121-14-2	24DNT	5.70	U
88-72-2	2NT	12.0	U
99-99-0	4NT	8.00	U
99-08-1	3NT	7.90	U

SURROGATE AMOUNT SPIKED (ug/L) 200
3,4-DNT

FORM I

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-9 SPLP

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33926

Matrix: (soil/water) WATER Lab Sample ID: 33926.04

Sample Amt.: 1ml % Moisture 25.07 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/26/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
75-11-5	PETN----------	20.0	U

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-11 SPLP

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33926

Matrix: (soil/water) WATER Lab Sample ID: 33926.05

Sample Amt: 1ml % Moisture 22.87 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/15/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
2691-41-0	HMX	13.0	U
121-82-4	RDX	14.0	U
99-35-4	TNB	7.30	U
99-65-0	DNB	4.00	U
479-45-8	TETRYL	10.0	U
98-95-3	NB	7.00	U
118-96-7	TNT	6.40	U
1946-51-0	4ADNT	7.00	U
35572-78-2	2ADNT	12.0	U
606-20-2	26DNT	9.40	U
121-14-2	24DNT	5.70	U
88-72-2	2NT	12.0	U
99-99-0	4NT	8.00	U
99-08-1	3NT	7.90	U

SURROGATE AMOUNT SPIKED (ug/L) 200
3,4-DNT

FORM I

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-S001-11 SPLP

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33926

Matrix: (soil/water) WATER Lab Sample ID: 33926.05

Sample Amt: 1ml % Moisture 22.87 Date Received: 05/12/98

Extraction Volume: 1ml Date Extracted: DIRECT INJ

Extraction Method: DIRECT Date Analyzed: 05/26/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/L	Q
75-11-5	PETN----------	20.0	U

FORM I

2E

EXPLOSIVE SURROGATE RECOVERY FORM

Lab Name: SWL-TULSA Contract:

Code: SWOK Case No: MKF-OH SDG No:33926

	SAMPLE NUMBER	S1 #	OTHER
1	BIO-12/14-S001-3	113	0
2	BIO-12/14-S001-5	117	0
3	BIO-12/14-S001-7	107	0
4	BIO-12/14-S001-9	110	0
5	BIO-12/14-S001-11	112	0
6	BB0513WE	114	0
7	TB051298B	121	0
8	TB051298C1	120	0
9	TC0513WE	146*	0
10	TD0513WE	118	0
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
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26			
27			
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29			
30			

S1 = 3,4-DNT (60-140)

Column to be used to flag recovery values
* Values outside of QC limits
D Surrogates diluted out

page _ 1

FORM II

WATER EXPLOSIVE CONTROL SPIKE RECOVERY FORM

Lab Name: SWL-TULSA Contract:

Code: SWOK Case No: MKF-OH SDG No:33926

Client Sample No: TC0513WE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC #	QC LIMITS REC.
HMX	400		390	98	46-151
RDX	150		129	86	72-129
TNB	225		203	90	74-118
DNB	125		120	96	79-132
TETRYL	413		215	52*	58-120
NB	213		224	105	68-135
TNT	188		246	131	61-145
4ADNT	313		310	99	60-140
2ADNT	313		293	94	60-140
26DNT	288		266	92	77-125
24DNT	175		160	91	70-134
2NT	363		322	89	73-131
4NT	250		228	91	73-116
3NT	238		269	113	71- 127

f Analyte recoveries out of QC Advisory Limits = 1

3G

WATER EXPLOSIVE CONTROL SPIKE RECOVERY FORM

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No: MKF-OH SDG No:33926

Client Sample No: TD0513WE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	LCSD CONCENTRATION (ug/L)	LCSD % REC #	QC LIMITS REC.
HMX	400		380	95	46-151
RDX	150		132	88	72-129
TNB	225		208	92	74-118
DNB	125		119	95	79-132
TETRYL	413		340	82	58-120
NB	213		195	92	68-135
TNT	188		245	130	61-145
4ADNT	313		293	94	60-140
2ADNT	313		273	87	60-140
26DNT	288		268	93	77-125
24DNT	175		152	87	70-134
2NT	363		322	89	73-131
4NT	250		228	91	73-116
3NT	238		272	114	71- 127

# of Analyte recoveries out of QC Advisory Limits = 0

WATER EXPLOSIVE CONTROL SPIKE RECOVERY FORM

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No: MKF-OH SDG No:33926

Client Sample No: TC0513WF

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC #	QC LIMITS REC.
PETN	1200		1380	115	70-130

No of Analyte recoveries out of QC Advisory Limits = 0

WATER EXPLOSIVE CONTROL SPIKE RECOVERY FORM

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No: MKF-OH SDG No:33926

Client Sample No: TD0513WF

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	LCSD CONCENTRATION (ug/L)	LCSD % REC #	QC LIMITS REC.
PETN	1200		1350	112	70-130

No of Analyte recoveries out of QC Advisory Limits = 0

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-~~CONTR~~ ~~OL~~ CONTROL

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 34070

Matrix: (soil/water) SOIL Lab Sample ID: 34070.01

Sample Amt: 2g % Moisture 19.15 Date Received: 05/21/98

Extraction Volume: 10ml Date Extracted: 05/22/98

Extraction Method: SONC Date Analyzed: 05/24/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
2691-41-0	HMX	2200	U
121-82-4	RDX	1200	P
99-35-4	TNB	250	U
99-65-0	DNB	250	U
479-45-8	TETRYL	650	U
98-95-3	NB	260	U
118-96-7	TNT	250	U
1946-51-0	4ADNT	250	U
35572-78-2	2ADNT	250	U
606-20-2	26DNT	260	U
121-14-2	24DNT	250	U
88-72-2	2NT	250	U
99-99-0	4NT	250	U
99-08-1	3NT	250	U

SURROGATE AMOUNT SPIKED (ug/kg dry wt.) 2000
3,4-DNT

FORM I

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-12/14-~~CONTR~~ ~~OL~~ CONTROL

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 34070

Matrix: (soil/water) SOIL Lab Sample ID: 34070.01

Sample Amt: 2g % Moisture 19.15 Date Received: 05/21/98

Extraction Volume: 10ml Date Extracted: 05/22/98

Extraction Method: SONC Date Analyzed: 05/29/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
75-11-5	PETN----------	250	U

FORM I

2E

EXPLOSIVE SURROGATE RECOVERY FORM

Lab Name: SWL-TULSA Contract:

Code: SWOK Case No: MKF-OH SDG No:34070

	SAMPLE NUMBER	S1 #	OTHER
1	BIO-12/14-CONTROL	104	0
2	BL0522SC	97.9	0
3	LC0522SC	114	0
4	LD0522SC	114	0
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
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29			
30			

S1 = 3,4-DNT (60-140)

Column to be used to flag recovery values
* Values outside of QC limits
D Surrogates diluted out

page _ 1

FORM II

3G

SOIL EXPLOSIVE CONTROL SPIKE RECOVERY FORM

Name: SWL-TULSA Contract:

Lab Code: SWOK Case No: MKF-OH SDG No:34070

Client Sample No: LC0522SC

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	LCS CONCENTRATION (ug/Kg)	LCS % REC #	QC LIMITS REC.
HMX	9500		10100	106	57-137
RDX	9500		8950	94	77-113
TNB	9500		9480	100	64-125
DNB	9500		9260	98	82-118
TETRYL	9500		5740	60	23-124
NB	9500		9480	100	69-143
TNT	9500		7450	78	75-118
4ADNT	9500		10900	115	60-140
2ADNT	9500		9170	97	60-140
26DNT	9500		8850	93	78-117
24DNT	9500		10100	106	74-126
2NT	9500		9820	103	78-123
4NT	9500		9350	98	79-125
3NT	9500		8820	93	78-121

No of Analyte recoveries out of QC Advisory Limits = 0

3G

SOIL EXPLOSIVE CONTROL SPIKE RECOVERY FORM

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No: MKF-OH SDG No:34070

Client Sample No: LC0522SD

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	LCS CONCENTRATION (ug/Kg)	LCS % REC #	QC LIMITS REC.
PETN	3000		2680	89	70-130

No of Analyte recoveries out of QC Advisory Limits = 0

3G

SOIL EXPLOSIVE CONTROL SPIKE RECOVERY FORM

Name: SWL-TULSA Contract:

Lab Code: SWOK Case No: MKF-OH SDG No:34070

Client Sample No: LD0522SC

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	LCSD CONCENTRATION (ug/Kg)	LCSD % REC #	QC LIMITS REC.
HMX	9500		10100	106	57-137
RDX	9500		8910	94	77-113
TNB	9500		9540	100	64-125
DNB	9500		9190	97	82-118
TETRYL	9500		6580	69	23-124
NB	9500		9260	98	69-143
TNT	9500		7510	79	75-118
4ADNT	9500		11000	116	60-140
2ADNT	9500		9160	96	60-140
26DNT	9500		8810	93	78-117
24DNT	9500		10100	106	74-126
2NT	9500		9730	102	78-123
4NT	9500		9260	98	79-125
3NT	9500		8670	91	78-121

No of Analyte recoveries out of QC Advisory Limits = 0

3G

SOIL EXPLOSIVE CONTROL SPIKE RECOVERY FORM

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No: MKF-OH SDG No:34070

Client Sample No: LD0522SD

COMPOUND	SPIKE ADDED (ug/Kg)	SAMPLE CONCENTRATION (ug/Kg)	LCSD CONCENTRATION (ug/Kg)	LCSD % REC #	QC LIMITS REC.
PETN	3000		2630	88	70-130

No of Analyte recoveries out of QC Advisory Limits = 0

APPENDIX C

ANALYTICAL RESULTS OF BORROW SOURCE

TABLE OF CONTENTS

DESCRIPTION **PAGES**

Borrow Source Analytical Data . . . . . 8 pages

1D
EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-33/00-BORRO W

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33672

Matrix: (soil/water) SOIL Lab Sample ID: 33672.01

Sample Amt: 2g % Moisture 16.13 Date Received: 04/21/98

Extraction Volume: 10ml Date Extracted: 04/21/98

Extraction Method: SONC Date Analyzed: 04/26/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
2691-41-0	HMX	2200	U
121-82-4	RDX	1000	U
99-35-4	TNB	250	U
99-65-0	DNB	250	U
479-45-8	TETRYL	650	U
98-95-3	NB	260	U
118-96-7	TNT	250	U
1946-51-0	4ADNT	250	U
35572-78-2	2ADNT	250	U
606-20-2	26DNT	260	U
121-14-2	24DNT	250	U
88-72-2	2NT	250	U
99-99-0	4NT	250	U
99-08-1	3NT	250	U

SURROGATE AMOUNT SPIKED (ug/kg dry wt.) 2000
3,4-DNT

FORM I

1D

EXPLOSIVE ANALYSIS DATA SHEET

EPA SAMPLE NO:

BIO-33/00-BORRO W

Lab Name: SWL-TULSA Contract:

Lab Code: SWOK Case No:MKF-OH SDG No: 33672

Matrix: (soil/water) SOIL Lab Sample ID: 33672.01

Sample Amt: 2g % Moisture 16.13 Date Received: 04/21/98

Extraction Volume: 10ml Date Extracted: 04/21/98

Extraction Method: Date Analyzed: 04/23/98

GPC Cleanup: (Y/N) N Dilution Factor: 2.00

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/kg) ug/kg	Q
75-11-5	PETN----------	250	U

FORM I

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

IO3300BORROW

Lab Name: SWL-TULSA Contract: NSWC CRANE

Lab Code: SWOK Case No.: MKF-OH SAS No.: SDG No.: 33672

Matrix: (soil/water) SOIL Lab Sample ID: 33672.01

Sample wt/vol: 5.0 (g/mL) G Lab File ID: C26138.D

Level: (low/med) LOW Date Received: 04/21/98

% Moisture: not dec. 16 Date Analyzed: 04/22/98

Column: (pack/cap) CAP Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
75-01-4	VINYL CHLORIDE	6	U
75-00-3	CHLOROETHANE	6	U
75-09-2	METHYLENE CHLORIDE	6	U
67-64-1	ACETONE	6	U
75-35-4	1 1-DICHLOROETHENE	6	U
75-34-3	1 1-DICHLOROETHANE	6	U
540-59-0	1,2-Dichloroethene (total)	6	U
67-66-3	CHLOROFORM	6	U
107-06-2	1 2-DICHLOROETHANE	6	U
78-93-3	2-BUTANONE	6	U
71-55-6	1 1 1-TRICHLOROETHANE	6	U
79-01-6	TRICHLOROETHENE	6	U
79-00-5	1 1 2-TRICHLOROETHANE	6	U
10061-02-6	trans-1,3-Dichloropropene	6	U
108-10-1	4-METHYL-2-PENTANONE	6	U
127-18-4	TETRACHLOROETHENE	6	U
108-88-3	TOLUENE	6	U
79-34-5	1 1 2 2-TETRACHLOROETHANE	6	U
1330-20-7	Xylenes (total)	6	U

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

3300BORROW

Lab Name: SWL-TULSA Contract: NSWC CRANE

Lab Code: SWOK Case No.: MKF-OH SAS No.: SDG No.: 33672

Matrix: (soil/water) SOIL Lab Sample ID: 33672.01

Sample wt/vol: 30.2 (g/mL) G Lab File ID: P15924.D

Level: (low/med) LOW Date Received: 04/21/98

% Moisture: not dec. 16 dec. Date Extracted: 04/21/98

Extraction: (SepF/Cont/Sonc) SONC Date Analyzed: 04/22/98

Concentrated Extract Volume: 1000(uL)

GPC Cleanup: (Y/N) N pH: 6.3 Dilution Factor: 1.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
100-02-7	4-Nitrophenol	1900	U
86-30-6	N-Nitrosodiphenylamine (1)	390	U
85-01-8	Phenanthrene	390	U
84-74-2	Di-n-butylphthalate	390	U
206-44-0	Fluoranthene	390	U
129-00-0	Pyrene	390	U
56-55-3	Benzo(a)anthracene	390	U
218-01-9	Chrysene	390	U
117-81-7	bis(2-Ethylhexyl)phthalate	86	J
205-99-2	Benzo(b)fluoranthene	390	U

(1) - Cannot be separated from Diphenylamine

FORM I SV-1

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

BIO-33/00-BORROW

ıb Name: SWL-TULSA

Lab Code: SWOK Case No.: MKF-O SDG No.: 33672

Matrix: (soil/water) SOIL Lab Sample ID: 33672.01

Sample wt/vol: 30.7 (g/mL) G Lab File ID:_____

% Moisture: 16 decanted: (Y/N) N Date Received: 04/21/98

Extraction: (SepF/Cont/Sonc) SONC Date Extracted: 04/21/98

Concentrated Extract Volume: 5000(uL) Date Analyzed: 04/24/98

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) Y pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
319-84-6	alpha-BHC	1.5	U
319-85-7	beta-BHC	1.5	U
319-86-8	delta-BHC	1.5	U
58-89-9	gamma-BHC (Lindane)	1.5	U
76-44-8	Heptachlor	1.5	U
309-00-2	Aldrin	1.5	U
1024-57-3	Heptachlor epoxide	1.5	U
959-98-8	Endosulfan I	1.5	U
60-57-1	Dieldrin	2.9	U
72-55-9	4,4'-DDE	2.9	U
72-20-8	Endrin	2.9	U
33213-65-9	Endosulfan II	2.9	U
72-54-8	4,4'-DDD	2.9	U
1031-07-8	Endosulfan sulfate	2.9	U
50-29-3	4,4'-DDT	2.9	U
72-43-5	Methoxychlor	15	U
53494-70-5	Endrin ketone	2.9	U
7421-93-4	Endrin aldehyde	2.9	U
5103-71-9	alpha-Chlordane	1.5	U
5103-74-2	gamma-Chlordane	1.5	U
8001-35-2	Toxaphene	97	U
12674-11-2	Aroclor-1016	38	U
11104-28-2	Aroclor-1221	38	U
11141-16-5	Aroclor-1232	38	U
53469-21-9	Aroclor-1242	38	U
12672-29-6	Aroclor-1248	38	U
11097-69-1	Aroclor-1254	78	U
11096-82-5	Aroclor-1260	78	U
Surrogate amount spiked		15.52	

1D
HERBICIDE ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

BIO-33/00-BORROW

ab Name: SWL-TULSA

Lab Code: SWOK Case No.: MKF-OH SDG No.: 33672

Matrix: (soil/water) SOIL Lab Sample ID: 33672.01

Sample wt/vol: 30.2 (g/mL) G Lab File ID:_____

% Moisture: 16 decanted: (Y/N) N Date Received: 04/21/98

Extraction: (SepF/Cont/Sonc) OTHER Date Extracted:04/21/98

Concentrated Extract Volume: 10000(uL) Date Analyzed: 04/22/98

Injection Volume: 1.0(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 6.3 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
75-99-0	Dalapon	240	U
1918-00-9	Dicamba	24	U
93-65-2	MCPP	5900	U
94-74-6	MCPA	4700	U
120-36-5	Dichloroprop	59	U
94-75-7	2,4-D	83	U
93-72-1	2,4,5-TP(Silvex)	12	U
93-76-5	2,4,5-T	12	U
94-82-6	2,4-DB	120	U
88-85-7	Dinoseb	24	U
Surrogate amount spiked		295.84	

INORGANIC ANALYSES DATA SHEET

CLIENT SAMPLE ID

BORRO

Lab Name: SOUTHWEST_LAB_OF_OK Contract:MKF-OH
Lab Code: SWOK Case No.: 33672 SAS No.: SDG No.: 33672
Matrix (soil/water): SOIL Lab Sample ID: 33672.01
Level (low/med): LOW Date Received: 04/21/98
% Solids: 83.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-39-3	Barium	103			P
7440-43-9	Cadmium	0.21	B		P
7440-47-3	Chromium	18.2			P
7439-92-1	Lead	18.2			P

Color Before: BROWN Clarity Before: Texture: MEDIUM
Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:
CLIENT_ID_=_BOP-33/00-BORRO

MORRISON KNUDSEN CORPORATION

CHAIN OF CUSTODY RECORD

B10-005

720 Park Blvd., P.O. Box 73
Boise, Idaho 83729
(208) 386-5000

Project No.: 4324-009-07-3S

Project Name: NSWC Crane Bioreactor Facility

Samplers: (Signature)

Sampler: (Print) Peter Chevalier

Sample Type	Sampling Point Description	Sample Date	Time	Sample I.D. Number	Split Samples Yes	Split Samples No	8330 Explosives	8240 VOC	8080 Pest.	6010 Metals	8270 SVOC	8141 herbs.	Remarks
Soil	borrow for Control	4/20/98	1500	B10-33/00-borrow		✓	✓	—	—	—	—	—	72 hr.
liquid		4/20/98	1530	B10-33/00-TB042098		✓		✓					TAT
													Southwest Labs

Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
	4/20/98 1530				
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Received for Laboratory By: (Signature) / Company:	Date/Time 4/21/98 0930	Total No. Samples This Shipping Container: / Company:
Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:	Relinquished By: (Signature) / Company:	Date/Time	Received By: (Signature) / Company:

Seal #s 2144, 2145

5

APPENDIX D

CONTROL WINDROW PROCESS DATA

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Windrow Average Daily Temperature Graph	1 page
Windrow Average Daily Temperature Report	1 page
Windrow Average Daily WHC Graph	1 page
Windrow Average Daily WHC Report	1 page
Windrow Average Daily Oxygen Graph	1 page
Windrow Average Daily Oxygen Report	1 page
Windrow Average Daily pH Report	1 page

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 4/25/98

Age 0

Relative Humidity: 68.0%

Inspected By: PAC

Windrow Height: 5

Ambient Temperature: 13

Performed By: MAM MAM

Windrow Length: 20

Windrow Width: 20

Texture: COARSE

Time Turned: 9:30

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	7:21	7:28
Post-Turn:	9:40	9:47

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	C	1	25	26	16	2			
		2	25	26	10	1			
		3	29	28	3	5			
POST		1	30	32	12	8			
		2	29	29	14	4			
		3	26	31	14	2			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 4/26/98

Age 1

Relative Humidity: 75.0%

Inspected By: PAC

Windrow Height: 5

Ambient Temperature: 16

Performed By: MAM / MAM

Windrow Length: 25

Windrow Width: 20

Texture: COARSE

Time Turned: 10:17

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	7:24	7:31
Post-Turn:	10:27	10:32

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	C	1	43	38	10	4			
		2	38	31	18	0			
		3	45	42	10	1			
POST		1	40	41	15	5			
		2	30	38	7	3			
		3	41	42	10	10			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 4/27/98

Age 2

Relative Humidity: 60.0%

Inspected By:

Windrow Height: 5

Ambient Temperature: 12

Performed By: MAM / MAM

Windrow Length: 20

Windrow Width: 25

Texture: COARSE

Time Turned: 11:10

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	10:28	10:35
Post-Turn:	11:20	11:26

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	C	1	57	52	6	1			
		2	46	50	9	12		42.7	
		3	51	49	9	1			
POST		1	38	40	9	13			
		2	30	40	10	6			
		3	42	42	11	14			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 4/29/98

Age 4

Relative Humidity: 7.0%

Inspected By: KAP

Windrow Height: 5

Ambient Temperature: 8

Performed By: RAE RAE

Windrow Length: 10

Windrow Width: 6

Texture: COARSE

Time Turned: 1:00

Moisture Added: 50

	Start Time	Finish Time
Pre-Turn:	9:00	9:08
Post-Turn:	1:10	1:25

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	67	61	0	0			
		2	62	63	1	1			8.7
		3	51	56	1	0			
POST		1	40	38	14	16			
		2	40	39	16	16		41.2	
		3	41	50	8	9			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 4/30/98

Age 5

Relative Humidity: 100.0%

Inspected By: MAM

ndrow Height: 6

Ambient Temperature: 19

Performed By: RAE RAE

Windrow Length: 7

Windrow Width: 8

Texture: COARSE

Time Turned: 14:40

Moisture Added: 75

	Start Time	Finish Time
Pre-Turn:	8:18	8:22
Post-Turn:	14:50	14:54

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	60	58	0	0			
		2	57	58	3	8			
		3	64	67	8	3			
POST		1	50	54	10	10			
		2	48	51	15	10		41	
		3	49	50	14	10			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/1/98

Age 6

Relative Humidity: 97.0%

Inspected By: RAE

Windrow Height: 4

Ambient Temperature: 12

Performed By: KAP KAP

Windrow Length: 20

Windrow Width: 10

Texture: COARSE

Time Turned: 12:30

Moisture Added: 75

	Start Time	Finish Time
Pre-Turn:	8:06	8:12
Post-Turn:	12:40	12:50

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	67	64	10	2			
		2	66	67	0	1			
		3	69	65	1	0			
POST		1	57	68	12	8			
		2	69	70	10	9			
		3	68	70	6	7			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/2/98

Age 7

Relative Humidity: 97.0%

Inspected By: RAE

ndrow Height: 4.5

Ambient Temperature: 19

Performed By: JAD JAD

Windrow Length: 18

Windrow Width: 12

Texture: COARSE

Time Turned: 8:27

Moisture Added: 75

	Start Time	Finish Time
Pre-Turn:	7:59	8:02
Post-Turn:	8:30	8:33

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	68	66	2	2			
		2	70	69	12	4			
		3	65	68	3	2			
POST		1	51	51	10	11			
		2	52	54	10	10		51.6	
		3	51	53	12	11			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/3/98

Age 8

Relative Humidity: 66.0%

Inspected By: RAE

Windrow Height: 5

Ambient Temperature: 18

Performed By: JAD JAD

Windrow Length: 20

Windrow Width: 12

Texture: COARSE

Time Turned: 10:01

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	6:38	6:40
Post-Turn:	10:14	10:20

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	66	64	4	4			
		2	61	60	19	3			
		3	56	64	17	4			
POST		1	45	44	18	18			
		2	35	34	19	19		51.6	
		3	46	42	18	20			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/4/98

Age 9

Relative Humidity: 100.0%

Inspected By: RAE

ndrow Height: 4

Ambient Temperature: 11

Performed By: KAP KAP

Windrow Length: 20

Windrow Width: 10

Texture: COARSE

Time Turned: 8:50

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	7:27	7:34
Post-Turn:	9:00	9:05

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	59	59	5	5			
		2	63	60	3	1			
		3	64	59	0	0			
POST		1	53	47	12	14			
		2	43	42	13	14			
		3	49	50	11	14			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/5/98

Age 10

Relative Humidity: 100.0%

Inspected By: PAC

Windrow Height: 4

Ambient Temperature: 12

Performed By: KAP MAC

Windrow Length: 10

Windrow Width: 10

Texture: COARSE

Time Turned: 10:50

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	8:12	8:16
Post-Turn:	10:53	10:55

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	59	59	3	2			
		2	60	56	2	9			
		3	56	55	7	5			
POST		1	54	56	8	7			
		2	63	64	7	3			
		3	65	66	5	2			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/6/98

Age 11

Relative Humidity: 90.0%

Inspected By: PAC

ndrow Height: 5

Ambient Temperature: 12

Performed By: KAP KAP

Windrow Length: 10

Windrow Width: 12

Texture: COARSE

Time Turned: 1:40

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	6:50	6:55
Post-Turn:	1:46	1:55

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	62	65	11	4			
		2	68	68	6	3		53.3	8.7
		3	66	63	0	0			
POST		1	53	62	9	3			
		2	56	63	12	9			
		3	62	67	8	2			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/7/98

Age 12

Relative Humidity: 98.0%

Inspected By: KAP

Windrow Height: 5

Ambient Temperature: 15

Performed By: RAE RAE

Windrow Length: 8

Windrow Width: 9

Texture: COARSE

Time Turned: 2:50

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	7:59	8:02
Post-Turn:	3:03	3:07

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	63	71	16	10			
		2	67	65	12	13		43.4	
		3	45	50	19	18			
POST		1	58	67	18	10			
		2	66	68	14	15			
		3	69	66	14	15			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/8/98

Age 13

Relative Humidity: 100.0%

Inspected By: KAP

ndrow Height: 4

Ambient Temperature: 16

Performed By: RAE RAE

Windrow Length: 18

Windrow Width: 16

Texture: MEDIUM

Time Turned: 11:35

Moisture Added: 75

	Start Time	Finish Time
Pre-Turn:	8:30	8:36
Post-Turn:	11:49	11:55

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	68	71	12	9			
		2	53	64	16	15			
		3	67	66	8	11			
POST		1	44	43	12	17			
		2	42	45	16	15		50	
		3	38	38	16	17			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/9/98

Age 14

Relative Humidity: 95.0%

Inspected By: PAC

Windrow Height: 5

Ambient Temperature: 17

Performed By: KAP KAP

Windrow Length: 15

Windrow Width: 12

Texture: COARSE

Time Turned: 9:40

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	8:29	8:31
Post-Turn:	9:45	9:53

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	53	53	0	0			
		2	52	51	0	0			
		3	49	47	0	0			
POST		1	47	43	13	10			
		2	56	49	18	18			
		3	50	49	17	9			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/10/98

Age 15

Relative Humidity: 82.0%

Inspected By: PAC

ndrow Height: 4

Ambient Temperature: 18

Performed By: KAP KAP

Windrow Length: 15

Windrow Width: 10

Texture: COARSE

Time Turned: 8:47

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	7:51	7:55
Post-Turn:	8:49	8:52

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	52	48	11	3			
		2	51	50	2	1			
		3	48	49	3	1			
POST		1	37	44	17	12			
		2	44	44	9	10			
		3	43	44	8	9			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/11/98

Age 16

Relative Humidity: 81.0%

Inspected By: MAM

Windrow Height: 5.5

Ambient Temperature: 16

Performed By: KAP KAP

Windrow Length: 20

Windrow Width: 18

Texture: COARSE

Time Turned: 13:00

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	8:14	8:17
Post-Turn:	13:10	13:15

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	62	63	5	12			
		2	63	64	14	13		48.3	
		3	63	62	11	6			
POST		1	44	54	4	2			
		2	39	36	9	9			
		3	41	53	15	8			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/12/98

Age 17

Relative Humidity: 87.0%

Inspected By: PAC

ndrow Height: 5.5

Ambient Temperature: 14

Performed By: MAM MAM

Windrow Length: 20

Windrow Width: 20

Texture: MEDIUM

Time Turned: 8:15

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	7:28	7:35
Post-Turn:	8:25	8:30

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	54	54	7	3			
		2	55	54	5	2			
		3	50	57	14	9			
POST		1	50	51	14	6			
		2	49	50	14	13			
		3	52	50	12	12			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/13/98

Age 18

Relative Humidity: 75.0%

Inspected By: PAC

Windrow Height: 3

Ambient Temperature: 19

Performed By: RAE RAE

Windrow Length: 15

Windrow Width: 10

Texture: COARSE

Time Turned: 9:02

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	8:10	8:18
Post-Turn:	9:10	9:15

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	59	55	11	5			
		2	57	61	5	5		48.4	8.4
		3	57	60	14	11			
POST		1	47	42	19	18			
		2	36	33	20	18			
		3	48	46	13	18			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/14/98

Age 19

Relative Humidity: 81.0%

Inspected By: PAC

ndrow Height: 4

Ambient Temperature: 19

Performed By: KAP KAP

Windrow Length: 13

Windrow Width: 10

Texture: COARSE

Time Turned: 8:05

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	7:30	7:33
Post-Turn:	8:10	8:13

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	66	65	6	2			
		2	61	58	1	0			
		3	55	54	1	2			
POST		1	42	42	12	11			
		2	48	48	7	5			
		3	51	50	7	4			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/15/98

Age 20

Relative Humidity: 79.0%

Inspected By: MAM

Windrow Height: 4

Ambient Temperature: 19

Performed By: KAP KAP

Windrow Length: 12

Windrow Width: 9

Texture: COARSE

Time Turned: 8:30

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	7:56	7:58
Post-Turn:	8:35	8:40

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	53	51	0	0			
		2	54	53	0	0		50	
		3	62	55	3	0			
POST		1	49	52	17	15			
		2	50	48	14	15			
		3	50	48	20	19			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/16/98

Age 21

Relative Humidity: 91.0%

Inspected By: PAC

ndrow Height: 5

Ambient Temperature: 22

Performed By: MAM MAM

vvindrow Length: 18

Windrow Width: 18

Texture: MEDIUM

Time Turned: 7:30

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	6:35	6:40
Post-Turn:	7:40	7:45

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	52	51	3	0			
		2	65	61	8	0			
		3	46	46	10	1			
POST		1	48	47	10	7			
		2	49	49	13	10			
		3	47	46	10	8			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/17/98

Age 22

Relative Humidity: 54.0%

Inspected By: PAC

Windrow Height: 4.5

Ambient Temperature: 21

Performed By: MAM MAM

Windrow Length: 19

Windrow Width: 18.5

Texture: MEDIUM

Time Turned: 9:35

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	8:45	8:49
Post-Turn:	9:45	9:50

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	56	53	1	1			
		2	57	59	10	2			
		3	50	49	10	11			
POST		1	49	55	15	8			
		2	45	54	17	10			
		3	47	51	16	11			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/18/98

Age 23

Relative Humidity: 66.0%

Inspected By: RAE

ndrow Height: 4

Ambient Temperature: 18

Performed By: KAP KAP

Windrow Length: 8

Windrow Width: 5

Texture: COARSE

Time Turned: 12:58

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	7:47	7:50
Post-Turn:	12:59	1:05

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	59	58	1	1			
		2	54	52	1	1			
		3	51	51	1	1			
POST		1	49	48	16	16			
		2	41	37	18	20			
		3	36	32	20	20			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/19/98

Age 24

Relative Humidity: 60.0%

Inspected By: MAM

Windrow Height: 4

Ambient Temperature: 20

Performed By: RAE RAE

Windrow Length: 10

Windrow Width: 12

Texture: COARSE

Time Turned: 7:15

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	6:40	6:45
Post-Turn:	7:18	7:20

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	50	49	0	1			
		2	47	49	1	0			
		3	55	53	0	0			
POST		1	41	41	14	15			
		2	36	34	18	18			
		3	36	37	13	15			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: N-CONT

Date Monitored: 5/20/98

Age 25

Relative Humidity: 60.0%

Inspected By: PAC

ndrow Height: 5

Ambient Temperature: 28

Performed By: MAM MAM

Windrow Length: 12

Windrow Width: 10

Texture: MEDIUM

Time Turned: 13:10

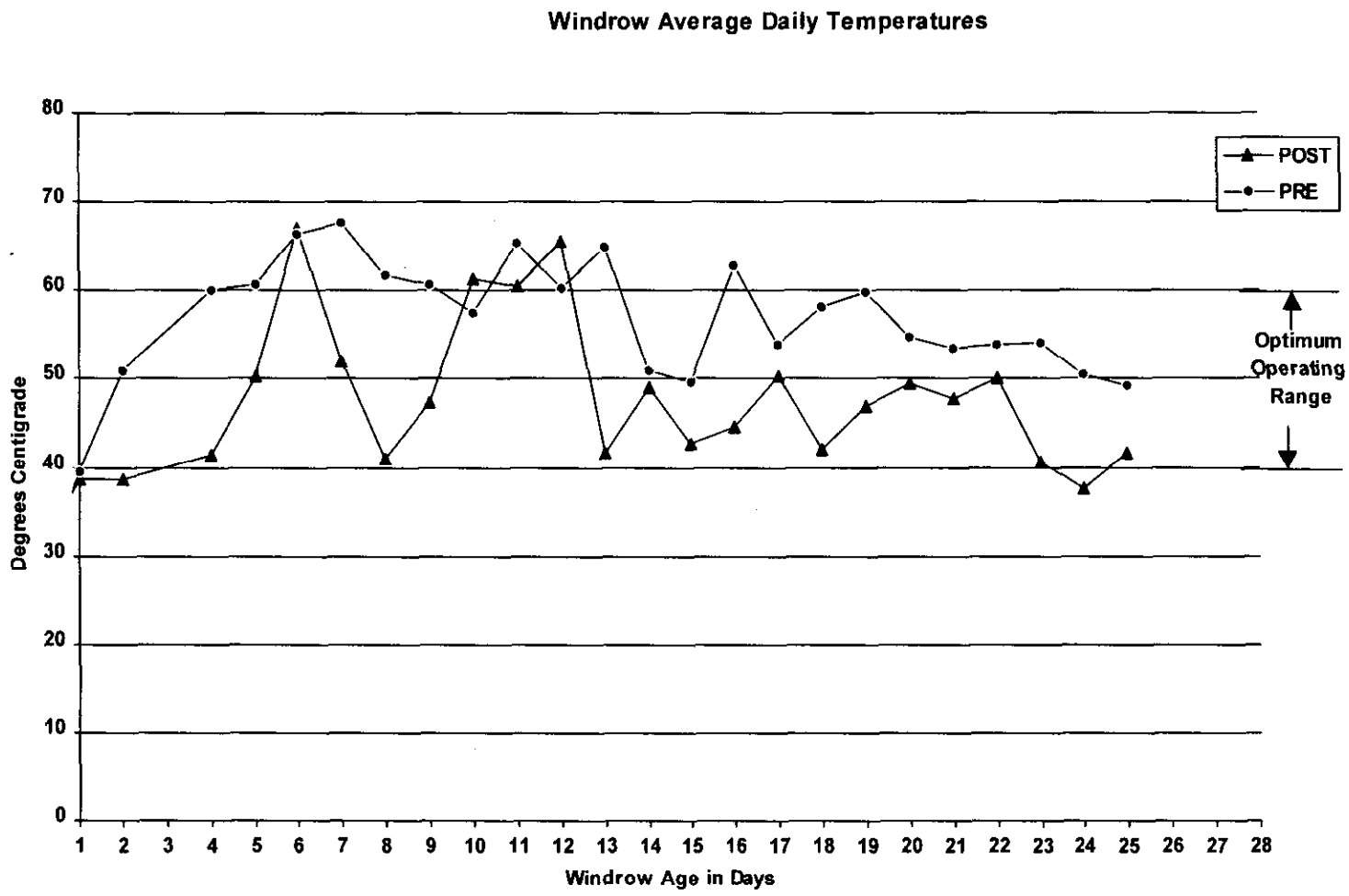
Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	13:00	13:05
Post-Turn:	13:11	13:15

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	52	51	6	1			
		2	50	49	5	2			
		3	48	45	3	1			
POST		1	41	42	10	8			
		2	43	41	11	9			
		3	40	42	10	8			

NSWC Crane BioFacility Full Scale Windrow N-Control

Constructed April 25, 1998



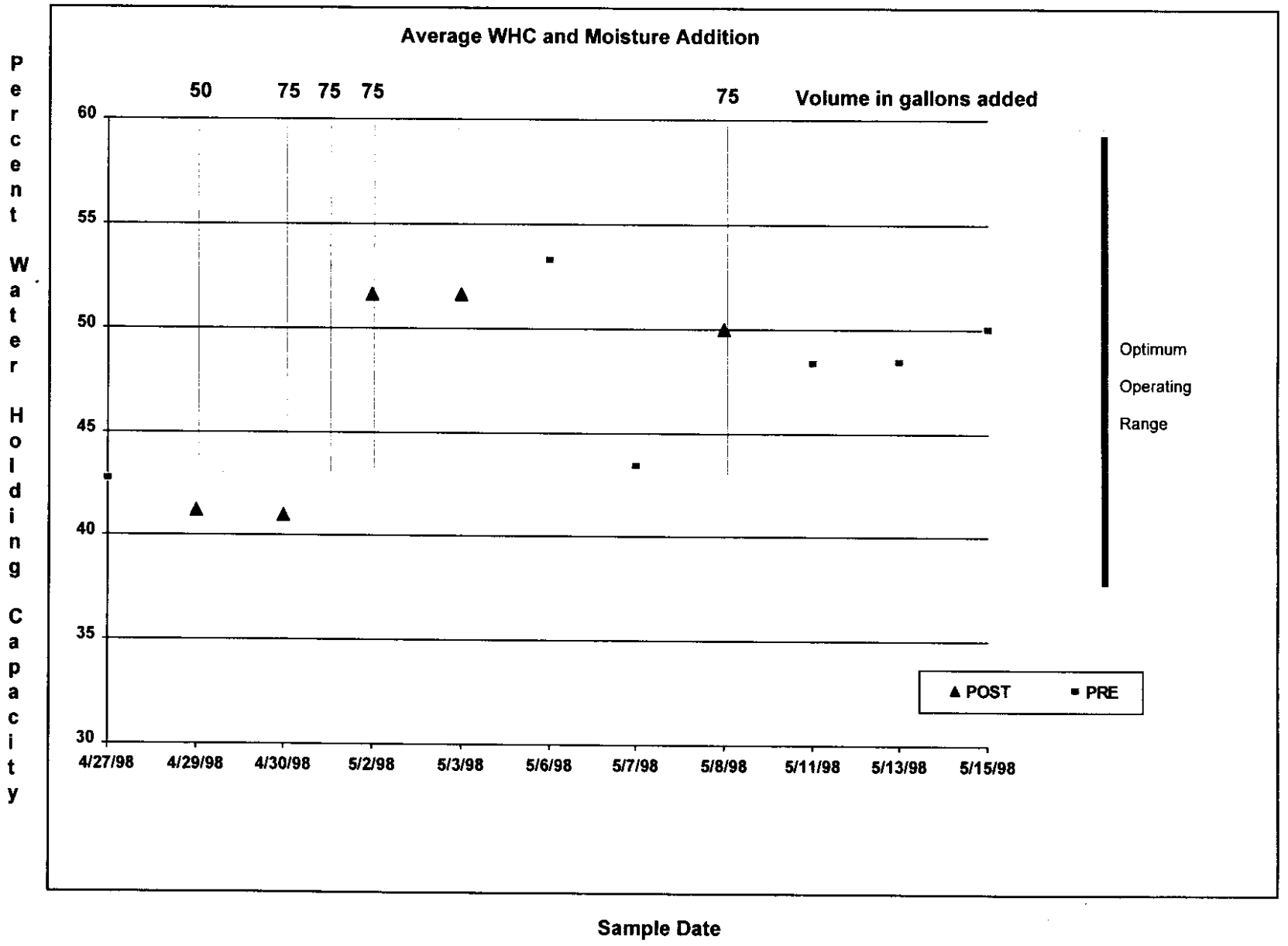
Morrison Knudsen Corporation

Average Daily Windrow Temperature Summary Report

Windrow Number	*Construction Date*	*Date Monitored*	*Age (Days)*	*PRE-Turn (Deg C)*	*POST-Turn (Deg C)*
N-CONTROL	4/25/98	4/25/98	0	26.50	29.50
		4/26/98	1	39.50	38.67
		4/27/98	2	50.83	38.67
		4/29/98	4	60.00	41.33
		4/30/98	5	60.67	50.33
		5/1/98	6	66.33	67.00
		5/2/98	7	67.67	52.00
		5/3/98	8	61.83	41:00
		5/4/98	9	60.67	47.33
		5/5/98	10	57.50	61.33
		5/6/98	11	65.33	60.50
		5/7/98	12	60.17	65.67
		5/8/98	13	64.83	41.67
		5/9/98	14	50.83	49.00
		5/10/98	15	49.67	42.67
		5/11/98	16	62.83	44.50
		5/12/98	17	54.00	50.33
		5/13/98	18	58.17	42.00
		5/14/98	19	59.83	46.83
		5/15/98	20	54.67	49.50
		5/16/98	21	53.50	47.67
		5/17/98	22	54.00	50.17
		5/18/98	23	54.17	40.50
		5/19/98	24	50.50	37.50
		5/20/98	25	49.17	41.50

All average temperatures are in degrees centigrade

NSWC Crane BioFacility Full Scale Windrow Monitoring Activity Windrow N-Control



Average Daily Windrow WHC Summary Report

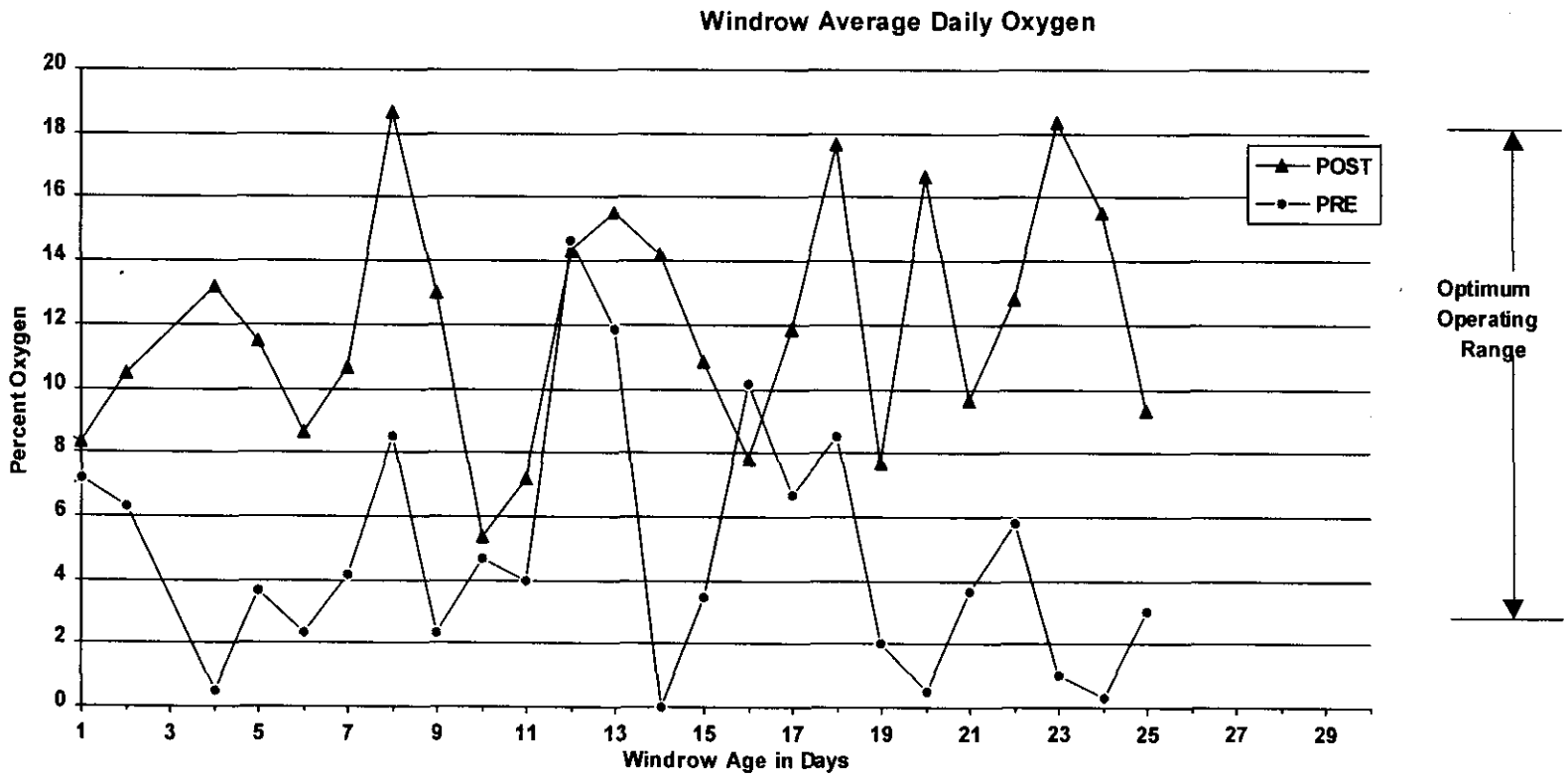
Windrow Number	*Construction Date*	*Date Monitored*	*Age (Days)*	*PRE-Turn (%)*	*POST-Turn (%)*
N-CONTROL	4/24/98	4/27/98	3	42.70	
		4/29/98	5		41.20
		4/30/98	6		41.00
		5/2/98	8		51.60
		5/3/98	9		51.60
		5/6/98	12	53.30	
		5/7/98	13	43.40	
		5/8/98	14		50.00
		5/11/98	17	48.30	
		5/13/98	19	48.40	
		5/15/98	21	50.00	

All average MWHC values are expressed in percent

Generated: *12-Feb-99*

NSWC Crane BioFacility Full Scale Windrow N-Control

Constructed April 25, 1998



Morrison Knudsen Corporation

Average Daily Windrow Oxygen Summary Report

Windrow Number	*Construction Date*	*Date Monitored*	*Age (Days)*	*PRE-Turn (%)*	*POST-Turn (%)*
N-CONTROL	4/25/98	4/25/98	0	6.17	9.00
		4/26/98	1	7.17	8.33
		4/27/98	2	6.33	10.50
		4/29/98	4	0.50	13.17
		4/30/98	5	3.67	11.50
		5/1/98	6	2.33	8.67
		5/2/98	7	4.17	10.67
		5/3/98	8	8.50	18.67
		5/4/98	9	2.33	13.00
		5/5/98	10	4.67	5.33
		5/6/98	11	4.00	7.17
		5/7/98	12	14.67	14.33
		5/8/98	13	11.83	15.50
		5/9/98	14	0.00	14.17
		5/10/98	15	3.50	10.83
		5/11/98	16	10.17	7.83
		5/12/98	17	6.67	11.83
		5/13/98	18	8.50	17.67
		5/14/98	19	2.00	7.67
		5/15/98	20	0.50	16.67
		5/16/98	21	3.67	9.67
		5/17/98	22	5.83	12.83
		5/18/98	23	1.00	18.33
		5/19/98	24	0.33	15.50
		5/20/98	25	3.00	9.33

All average Oxygen values are expressed as a percent

Generated: *10-Feb-99*

Average Daily Windrow PH Summary Report

Windrow Number	*Construction Date*	*Date Monitored*	*Age (Days)*	*PRE-Turn (STD Units)*
N-CONTROL	4/24/98	4/29/98	5	8.70
		5/6/98	12	8.70
		5/13/98	19	8.40

All average PH values are expressed in standard units

February 10, 1998

APPENDIX E

WINDROW S-001 PROCESS DATA

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Windrow Average Daily Oxygen Report	1 page
Windrow Average Daily pH Report	1 page

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001

Date Monitored: 4/15/98

Age 0

Relative Humidity: 98.0%

Inspected By: KAP

ndrow Height: 6.5

Ambient Temperature: 12

Performed By: RAE RAE

vVindrow Length: 250

Windrow Width: 19

Texture: COARSE

Time Turned: 11:50

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:		
Post-Turn:	12:00	12:18

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
POST	A	1	17	22	20	20			
		2	28	33	15	13		47.7	8.5
		3	34	35	15	16			
	B	1	35	35	15	15			
		2	34	37	15	15		51.7	8.6
		3	29	27	17	17			
	C	1	26	28	15	15			
		2	30	31	16	16		54.5	8.4
		3	23	22	18	19			
	D	1	43	42	15	14			
		2	42	45	15	15		55.4	8.4
		3	37	35	15	16			
	E	1	39	40	16	16			
		2	41	46	15	16		50	8.6
		3	34	36	17	18			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 4/16/98

Age 1 **Relative Humidity:** 98.0% **Inspected By:** PAC

Windrow Height: 6.5 **Ambient Temperature:** 12 **Performed By:** MAM MAM

Windrow Length: 250

Windrow Width: 19

Texture: COARSE

	Start Time	Finish Time
Time Turned: 11:10	**Pre-Turn:** 8:11	8:37
Moisture Added: 0	**Post-Turn:** 11:20	11:37

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	51	52	2	1			
		2	54	58	14	13			
		3	58	56	18	3			
	B	1	47	46	10	3			
		2	48	59	12	4			
		3	42	41	13	3			
	C	1	46	44	7	4			
		2	51	49	17	7			
		3	41	36	11	0			
	D	1	48	51	1	0			
		2	44	54	19	13			
		3	46	44	4	2			
	E	1	54	53	2	1			
		2	45	51	15	17			
		3	39	49	13	6			
POST	A	1	43	44	17	11			
		2	41	46	15	10			
		3	41	46	18	14			
	B	1	41	43	14	10			
		2	41	44	17	12			
		3	39	43	18	11			
	C	1	39	39	13	12			
		2	40	44	16	11			
		3	33	36	14	11			
	D	1	44	48	11	9			
		2	48	52	16	10			
		3	36	42	16	11			
	E	1	43	47	10	8			
		2	47	52	17	12			
		3	44	46	17	14			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 4/17/98

Age 2 **Relative Humidity:** 95.0% **Inspected By:** KAP

ndrow Height: 6 **Ambient Temperature:** 4 **Performed By:** RAE RAE

Windrow Length: 225

Windrow Width: 17

Texture: COARSE

Time Turned: 9:10

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	7:50	8:15
Post-Turn:	9:20	9:40

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	50	54	17	15			
		2	42	49	18	18		48.2	
		3	48	54	15	17			
	B	1	60	56	2	0			
		2	67	70	15	12		46.7	
		3	66	60	2	2			
	C	1	66	61	3	3			
		2	63	63	12	13		50	
		3	65	65	10	6			
	D	1	64	64	16	9			
		2	64	60	16	16		50	
		3	64	69	11	9			
	E	1	65	58	6	1			
		2	49	52	1	16		45.5	
		3	61	68	12	14			
POST	A	1	53	51	6	3			
		2	51	52	13	14			
		3	43	49	16	15			
	B	1	52	51	9	7			
		2	46	49	17	16			
		3	51	51	12	10			
	C	1	49	50	8	7			
		2	49	50	13	12			
		3	46	49	15	12			
	D	1	54	55	7	9			
		2	46	52	16	15			
		3	51	52	15	16			
	E	1	48	51	12	10			
		2	46	48	15	15			
		3	48	48	16	16			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 4/18/98

Age 3 **Relative Humidity:** 68.0% **Inspected By:** PAC

Windrow Height: 7 **Ambient Temperature:** 7 **Performed By:** PAC PAC

Windrow Length: 275

Windrow Width: 18

Texture: COARSE

	Start Time	Finish Time
Time Turned: 9:25		
Pre-Turn:	8:35	8:57
Moisture Added: 0		
Post-Turn:	9:32	10:03

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	67	60	2	1			
		2	53	66	17	17			
		3	43	59	20	18			
	B	1	67	60	3	1			
		2	58	66	18	17			
		3	60	71	18	14			
	C	1	63	59	2	1			
		2	59	67	18	17			
		3	61	67	16	16			
	D	1	68	62	3	1			
		2	54	63	18	18			
		3	60	68	17	16			
	E	1	65	61	5	1			
		2	53	64	18	17			
		3	56	56	19	18			
POST	A	1	55	57	16	14			
		2	50	51	18	18			
		3	41	48	20	19			
	B	1	54	55	11	9			
		2	45	52	19	18			
		3	50	54	18	13			
	C	1	53	54	15	13			
		2	52	54	19	17			
		3	50	53	18	17			
	D	1	57	59	10	10			
		2	49	50	18	15			
		3	46	50	19	17			
	E	1	56	56	14	13			
		2	48	57	19	16			
		3	44	50	20	19			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001

Date Monitored: 4/19/98

Age 4

Relative Humidity: 84.0%

Inspected By:

ndrow Height: 6

Ambient Temperature: 8

Performed By: PAC PAC

vVindrow Length: 275

Windrow Width: 18

Texture: COARSE

Time Turned: 10:35

Moisture Added: 2000

	Start Time	Finish Time
Pre-Turn:	8:31	8:50
Post-Turn:	10:46	11:10

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	69	64	4	1			
		2	61	69	17	15			
		3	48	59	20	18			
	B	1	68	67	6	3			
		2	51	61	19	18			
		3	60	73	18	10			
	C	1	66	60	1	1			
		2	54	67	18	16			
		3	66	73	14	12			
	D	1	55	61	12	3			
		2	57	66	18	17			
		3	65	72	13	12			
	E	1	69	66	5	2			
		2	44	62	20	16			
		3	57	59	17	18			
POST	A	1	53	57	17	13			
		2	45	50	19	18		49	
		3	44	49	19	18			
	B	1	52	55	17	14			
		2	48	48	18	18		54.6	
		3	50	55	16	15			
	C	1	55	55	17	13			
		2	47	51	19	17		47.8	
		3	49	54	18	16			
	D	1	51	56	17	14			
		2	42	48	19	17		54.3	
		3	52	57	17	15			
	E	1	52	56	16	15			
		2	51	53	18	17		46.7	
		3	44	47	18	17			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 4/20/98

Age 5 **Relative Humidity:** 73.0% **Inspected By:** KAP

Windrow Height: 5 **Ambient Temperature:** 9 **Performed By:** MAM MAM

Windrow Length: 250

Windrow Width: 20

Texture: COARSE

	Start Time	Finish Time
Pre-Turn:	8:30	9:02
Post-Turn:	10:00	10:28

Time Turned: 9:50

Moisture Added: 0

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	70	65	10	1			
		2	50	64	19	15			
		3	20	63	20	16			
	B	1	67	64	8	1			
		2	53	65	18	17			
		3	52	70	19	14			
	C	1	52	58	19	1			
		2	45	60	20	18			
		3	57	71	18	14			
	D	1	45	56	20	1			
		2	52	65	19	18			
		3	51	70	18	15			
	E	1	54	59	17	2			
		2	43	61	20	18			
		3	39	64	18	17			
POST	A	1	55	59	15	13			
		2	40	50	20	17			
		3	36	44	20	19			
	B	1	55	57	16	13			
		2	49	49	18	17			
		3	46	54	19	14			
	C	1	57	58	13	11			
		2	49	53	18	15			
		3	52	56	19	16			
	D	1	58	57	13	12			
		2	46	52	20	18			
		3	52	57	19	14			
	E	1	58	60	12	10			
		2	45	51	20	17			
		3	43	48	20	18			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 4/21/98

Age 6 **Relative Humidity:** 96.0% **Inspected By:** MAM

ndrow Height: 5.5 **Ambient Temperature:** 9 **Performed By:** KAP KAP

Windrow Length: 250

Windrow Width: 19.5

Texture: COARSE

	Start Time	Finish Time
Pre-Turn:	8:22	8:45
Post-Turn:	9:48	10:15

Time Turned: 9:35

Moisture Added: 0

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	69	63	1	1			
		2	69	74	19	10		45.7	
		3	64	70	15	14			
	B	1	72	70	4	3			
		2	64	69	16	14		48.4	
		3	70	74	13	14			
	C	1	65	63	2	1			
		2	68	73	14	8		48.6	
		3	67	74	12	9			
	D	1	69	64	1	1			
		2	66	72	15	11		47.2	
		3	69	73	16	15			
	E	1	65	68	2	3			
		2	47	67	19	19		49.5	
		3	64	69	16	10			
POST	A	1	59	59	11	10			
		2	59	62	14	8			
		3	54	60	15	15			
	B	1	61	60	11	10			
		2	56	59	16	11			
		3	58	62	15	14			
	C	1	60	58	11	10			
		2	56	60	11	12			
		3	59	62	15	15			
	D	1	61	61	7	5			
		2	55	58	16	15			
		3	54	57	10	8			
	E	1	59	60	9	6			
		2	57	59	9	9			
		3	55	58	10	10			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 4/22/98

Age 7 **Relative Humidity:** 97.0% **Inspected By:**

Windrow Height: 5.5 **Ambient Temperature:** 9 **Performed By:** MAM MAM

Windrow Length: 250

Windrow Width: 19.5

Texture: COARSE

	Start Time	Finish Time
Pre-Turn:	8:41	9:15
Post-Turn:	9:56	10:25

Time Turned: 9:46

Moisture Added: 0

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	41	67	20	2			
		2	56	69	18	16			
		3	62	70	15	15			
	B	1	53	63	15	1			
		2	56	71	19	14			
		3	64	71	14	14			
	C	1	63	68	13	1			
		2	49	68	20	15			
		3	51	69	19	17			
	D	1	40	62	20	1			
		2	52	66	13	11			
		3	52	70	20	12			
	E	1	54	64	15	1			
		2	37	54	14	14			
		3	53	67	19	15			
POST	A	1	57	60	15	12			
		2	37	50	20	18			
		3	51	56	19	16			
	B	1	58	60	13	10			
		2	48	51	19	16			
		3	50	55	18	16			
	C	1	57	60	10	8			
		2	51	59	19	14			
		3	51	54	18	14			
	D	1	57	59	9	7			
		2	49	57	19	15			
		3	50	57	19	14			
	E	1	53	58	8	6			
		2	44	45	20	17			
		3	50	55	19	15			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001

Date Monitored: 4/23/98

Age 8

Relative Humidity: 100.0%

Inspected By: PAC

Windrow Height: 6

Ambient Temperature: 7

Performed By: RAE RAE

Windrow Length: 250

Windrow Width: 16

Texture: MEDIUM

Time Turned: 11:10

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	8:45	9:05
Post-Turn:	11:20	11:45

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	71	67	1	1			
		2	60	69	14	16		47.6	8.3
		3	64	72	18	14			
	B	1	70	66	6	2			
		2	64	69	10	16		50.8	8.4
		3	70	74	15	13			
	C	1	70	67	6	1			
		2	62	69	18	17		45.5	8.5
		3	65	69	10	15			
	D	1	69	67	1	1			
		2	68	69	17	16		45.9	8.5
		3	68	72	16	11			
	E	1	66	67	2	3			
		2	57	62	18	19		52.2	8.5
		3	61	67	16	16			
POST	A	1	62	63	17	14			
		2	57	59	17	17			
		3	60	61	16	15			
	B	1	62	64	13	12			
		2	60	60	18	17			
		3	58	61	16	16			
	C	1	64	64	12	13			
		2	57	63	18	17			
		3	61	60	16	15			
	D	1	64	65	13	4			
		2	61	56	18	18			
		3	60	63	16	15			
	E	1	64	65	13	12			
		2	51	58	19	18			
		3	60	59	17	16			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 4/24/98

Age 9 **Relative Humidity:** 69.0% **Inspected By:** PAC

Windrow Height: 5 **Ambient Temperature:** 12 **Performed By:** KAP KAP

Windrow Length: 250

Windrow Width: 18

Texture: COARSE

	Start Time	Finish Time
Pre-Turn:	8:33	8:59
Post-Turn:	11:04	11:35

Time Turned: 11:14

Moisture Added: 0

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	69	68	0	0			
		2	73	73	11	2			
		3	68	75	17	7			
	B	1	72	68	4	0			
		2	71	75	15	7			
		3	74	74	11	2			
	C	1	66	67	17	1			
		2	70	75	12	5			
		3	71	74	14	4			
	D	1	68	69	15	1			
		2	71	75	14	4			
		3	73	72	9	1			
	E	1	71	70	16	2			
		2	71	75	14	6			
		3	69	74	14	8			
POST	A	1	61	61	9	8			
		2	61	61	12	11			
		3	57	61	14	12			
	B	1	61	62	10	9			
		2	58	61	15	14			
		3	58	69	14	13			
	C	1	62	62	9	7			
		2	60	62	13	13			
		3	61	62	14	13			
	D	1	61	63	9	7			
		2	59	61	16	15			
		3	62	64	13	10			
	E	1	61	63	10	7			
		2	64	66	15	14			
		3	57	64	15	12			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001

Date Monitored: 4/25/98

Age 10

Relative Humidity: 62.0%

Inspected By: PAC

Windrow Height: 5

Ambient Temperature: 14

Performed By: MAM MAM

Windrow Length: 250

Windrow Width: 19.5

Texture: MEDIUM

Time Turned: 13:33

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	9:07	9:34
Post-Turn:	13:43	14:05

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	67	64	14	0			
		2	53	72	17	7			
		3	57	71	18	12			
	B	1	59	63	18	0			
		2	57	72	18	13			
		3	67	75	16	7			
	C	1	70	64	5	0			
		2	60	73	18	10			
		3	62	75	18	10			
	D	1	69	65	6	0			
		2	55	70	19	11			
		3	46	73	19	9			
	E	1	45	62	20	0			
		2	45	68	20	15			
		3	54	72	20	15			
POST	A	1	59	61	16	7			
		2	57	58	16	12			
		3	56	60	17	13			
	B	1	60	63	9	7			
		2	60	61	18	13			
		3	55	60	16	14			
	C	1	60	63	12	7			
		2	53	58	17	14			
		3	56	58	17	13			
	D	1	62	63	11	8			
		2	59	60	17	14			
		3	58	62	18	15			
	E	1	60	63	13	10			
		2	59	63	17	16			
		3	57	60	18	15			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 4/26/98

Age 11 **Relative Humidity:** 71.0% **Inspected By:** PAC

Windrow Height: 5 **Ambient Temperature:** 17 **Performed By:** MAM MAM

Windrow Length: 250

Windrow Width: 19

Texture: MEDIUM

	Start Time	Finish Time
Pre-Turn:	8:41	9:04
Post-Turn:	10:38	10:56

Time Turned: 10:28

Moisture Added: 0

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	54	65	18	1			
		2	60	73	17	9		48.8	
		3	55	71	18	6			
	B	1	57	64	19	1			
		2	64	73	17	12		51.4	
		3	62	74	17	10			
	C	1	55	64	18	1			
		2	62	74	18	6		40	
		3	59	72	18	9			
	D	1	52	62	18	1			
		2	54	71	18	12		47.7	
		3	62	73	17	7			
	E	1	69	67	11	1			
		2	59	70	19	14		53.2	
		3	61	73	17	11			
POST	A	1	56	59	12	6			
		2	54	57	16	13			
		3	52	49	16	15			
	B	1	57	60	17	6			
		2	53	57	18	14			
		3	50	58	18	15			
	C	1	58	60	19	6			
		2	56	59	18	10			
		3	53	56	18	14			
	D	1	57	61	16	6			
		2	53	58	17	14			
		3	53	58	19	12			
	E	1	54	59	17	6			
		2	55	58	17	12			
		3	55	58	18	13			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 4/27/98

Age 12 **Relative Humidity:** 61.0% **Inspected By:**

ndrow Height: 5 **Ambient Temperature:** 7 **Performed By:** MAM MAM

vindrow Length: 250

Windrow Width: 19

Texture: MEDIUM

	Start Time	Finish Time
Pre-Turn:	8:24	8:45
Post-Turn:	9:36	9:55

Time Turned: 9:26

Moisture Added: 0

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	49	65	12	7			
		2	50	72	11	8			
		3	60	68	7	16			
	B	1	52	61	14	11			
		2	64	72	14	16			
		3	61	70	12	15			
	C	1	58	66	9	10			
		2	58	68	10	17			
		3	57	68	13	15			
	D	1	48	56	13	10			
		2	63	69	11	17			
		3	56	69	16	17			
	E	1	45	63	10	11			
		2	61	68	13	18			
		3	53	64	13	19			
POST	A	1	55	57	11	7			
		2	45	56	19	17			
		3	55	61	17	16			
	B	1	58	62	10	13			
		2	53	59	17	17			
		3	56	63	18	16			
	C	1	59	61	7	11			
		2	55	61	18	17			
		3	54	61	18	16			
	D	1	59	61	6	5			
		2	53	56	18	19			
		3	53	59	19	17			
	E	1	54	58	12	11			
		2	54	58	15	17			
		3	54	58	17	17			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 4/28/98

Age 13 **Relative Humidity:** 65.0% **Inspected By:** MAM

Windrow Height: 5 **Ambient Temperature:** 6 **Performed By:** KAP KAP

Windrow Length: 250

Windrow Width: 18

Texture: COARSE

	Start Time	Finish Time
Pre-Turn:	7:43	8:17
Post-Turn:	12:50	1:01

Time Turned: 12:40

Moisture Added: 0

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	68	68	10	3			
		2	70	74	11	10			
		3	72	74	16	15			
	B	1	61	69	12	19			
		2	72	74	12	3			
		3	70	73	14	13			
	C	1	58	67	20	4			
		2	73	74	16	8			
		3	68	72	15	15			
	D	1	67	66	12	10			
		2	69	74	17	14			
		3	70	74	15	10			
	E	1	68	66	1	5			
		2	72	74	14	15			
		3	69	74	13	12			
POST	A	1	57	58	12	11			
		2	56	60	16	15			
		3	54	51	16	18			
	B	1	57	62	12	10			
		2	59	63	15	17			
		3	60	60	17	16			
	C	1	59	63	10	8			
		2	63	64	14	17			
		3	61	60	17	16			
	D	1	60	61	9	11			
		2	61	60	15	17			
		3	57	61	17	16			
	E	1	62	63	9	8			
		2	61	59	8	17			
		3	57	66	17	15			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 4/29/98

Age 14 **Relative Humidity:** 68.0% **Inspected By:** RAE

Windrow Height: 4.5 **Ambient Temperature:** 13 **Performed By:** KAP KAP

Windrow Length: 250

Windrow Width: 18

Texture: MEDIUM

Time Turned: 2:00

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	9:11	9:21
Post-Turn:	2:10	2:30

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	67	63	0	0			
		2	72	73	4	1		42.3	8.6
		3	58	74	12	2			
	B	1	67	65	3	0			
		2	68	74	5	6		50	8.6
		3	73	72	6	6			
	C	1	65	65	0	0			
		2	70	72	5	6		40.9	8.4
		3	71	71	9	3			
	D	1	69	66	0	0			
		2	68	72	6	8		44.6	8.5
		3	74	70	7	1			
	E	1	70	70	2	7			
		2	69	73	13	13		59.2	8.7
		3	73	74	12	4			
POST	A	1	63	64	12	11			
		2	63	63	15	14			
		3	57	62	17	15			
	B	1	62	64	12	10			
		2	63	65	15	15			
		3	62	62	15	14			
	C	1	63	65	17	10			
		2	64	65	15	14			
		3	62	62	15	14			
	D	1	63	65	13	11			
		2	62	62	15	15			
		3	61	62	14	14			
	E	1	62	65	10	9			
		2	63	61	14	15			
		3	63	65	13	12			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 4/30/98

Age 15 **Relative Humidity:** 89.0% **Inspected By:** MAM

Windrow Height: 4.5 **Ambient Temperature:** 16 **Performed By:** RAE RAE

Windrow Length: 250

Windrow Width: 12

Texture: MEDIUM

	Start Time	Finish Time
Time Turned: 12:07		
Pre-Turn:	9:25	9:40
Moisture Added: 0		
Post-Turn:	12:17	12:35

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	72	70	1	2			
		2	63	73	14	8		45.9	
		3	74	74	4	5			
	B	1	68	67	3	5			
		2	74	73	6	4		39.8	
		3	73	72	3	3			
	C	1	67	68	0	0			
		2	74	75	7	8		48.1	
		3	72	72	5	5			
	D	1	70	68	4	3			
		2	74	76	11	9		46.2	
		3	72	75	5	3			
	E	1	71	70	13	7			
		2	73	75	11	13		44.3	
		3	73	75	11	9			
POST	A	1	60	63	14	14			
		2	42	58	17	17			
		3	63	64	14	15			
	B	1	64	66	12	9			
		2	64	66	14	13			
		3	61	64	15	13			
	C	1	65	65	10	9			
		2	63	65	16	14			
		3	63	67	9	10			
	D	1	65	67	8	6			
		2	65	66	12	12			
		3	64	65	12	11			
	E	1	65	67	8	6			
		2	64	66	15	12			
		3	64	64	12	13			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001

Date Monitored: 5/1/98

Age 16

Relative Humidity: 92.0%

Inspected By: RAE

ndrow Height: 5

Ambient Temperature: 15

Performed By: KAP KAP

Windrow Length: 250

Windrow Width: 18

Texture: MEDIUM

Time Turned: 9:45

Moisture Added: 1500

	Start Time	Finish Time
Pre-Turn:	8:40	8:55
Post-Turn:	9:55	10:01

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	68	66	1	0			
		2	70	72	4	3			
		3	73	71	2	1			
	B	1	68	67	1	1			
		2	71	71	5	2			
		3	69	69	1	0			
	C	1	68	67	0	0			
		2	73	70	3	1			
		3	71	69	1	1			
	D	1	67	67	1	0			
		2	73	71	6	3			
		3	73	72	6	4			
	E	1	71	67	3	2			
		2	73	74	4	7			
		3	76	73	6	3			
POST	A	1	63	64	13	13			
		2	63	62	15	16			
		3	56	60	16	14			
	B	1	61	63	13	13			
		2	62	62	15	16			
		3	60	59	16	15			
	C	1	55	60	13	12			
		2	61	62	13	15			
		3	60	60	15	15			
	D	1	56	61	14	13			
		2	60	60	15	17			
		3	56	61	17	16			
	E	1	57	61	15	14			
		2	60	61	17	17			
		3	60	60	17	16			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 5/2/98

Age 17 **Relative Humidity:** 95.0% **Inspected By:** RAE

Windrow Height: 4.5 **Ambient Temperature:** 17 **Performed By:** JAD JAD

Windrow Length: 270

Windrow Width: 18

Texture: COARSE

	Start Time	Finish Time
Pre-Turn:	8:56	9:11
Post-Turn:	10:36	10:48

Time Turned: 10:27

Moisture Added: 0

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	67	69	1	3			
		2	73	73	7	4			
		3	72	73	9	7			
	B	1	64	65	5	2			
		2	71	70	2	2			
		3	71	70	4	4			
	C	1	63	64	1	1			
		2	71	70	7	4			
		3	73	69	3	2			
	D	1	65	65	3	2			
		2	73	73	4	2			
		3	71	71	12	6			
	E	1	63	64	3	1			
		2	68	71	9	1			
		3	71	73	10	10			
POST	A	1	63	63	13	12			
		2	62	64	15	15			
		3	61	62	14	14			
	B	1	61	63	13	11			
		2	63	63	15	15			
		3	57	59	13	15			
	C	1	61	62	13	11			
		2	62	62	15	16			
		3	60	60	14	14			
	D	1	63	64	15	13			
		2	63	64	14	14			
		3	63	63	16	16			
	E	1	62	64	14	12			
		2	62	63	15	15			
		3	48	56	18	17			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001

Date Monitored: 5/3/98

Age 18

Relative Humidity: 99.0%

Inspected By: RAE

ndrow Height: 4

Ambient Temperature: 18

Performed By: JAD JAD

Windrow Length: 270

Windrow Width: 16

Texture: MEDIUM

Time Turned: 9:25

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	7:41	7:55
Post-Turn:	9:30	9:41

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	71	66	5	2			
		2	72	72	5	1			
		3	66	72	0	13			
	B	1	69	68	8	10			
		2	70	71	6	5			
		3	57	58	4	4			
	C	1	65	65	9	6			
		2	74	73	11	2			
		3	71	70	2	4			
	D	1	62	66	1	7			
		2	59	67	19	15			
		3	68	67	1	7			
	E	1	63	66	2	4			
		2	71	73	10	13			
		3	68	71	14	1			
POST	A	1	63	64	12	11			
		2	65	65	14	14			
		3	62	64	13	14			
	B	1	62	62	12	12			
		2	62	62	16	15			
		3	59	62	16	12			
	C	1	62	60	11	14			
		2	58	63	16	15			
		3	57	60	16	15			
	D	1	64	64	13	10			
		2	59	62	18	15			
		3	56	60	17	17			
	E	1	64	62	13	13			
		2	59	62	16	16			
		3	56	62	18	16			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 | **Date Monitored:** 5/4/98

Age 19 | **Relative Humidity:** 90.0% | **Inspected By:** RAE

Windrow Height: 5 | **Ambient Temperature:** 12 | **Performed By:** KAP KAP

Windrow Length: 250

Windrow Width: 17

Texture: MEDIUM

	Start Time	Finish Time
Pre-Turn:	8:55	9:10
Post-Turn:	10:28	10:40

Time Turned: 10:18

Moisture Added: 0

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	66	66	0	0			
		2	68	70	9	8		51.4	
		3	71	71	9	7			
	B	1	67	65	1	0			
		2	71	73	6	9		44.4	
		3	73	66	4	0			
	C	1	68	65	3	1			
		2	67	72	8	5		55.7	
		3	71	72	7	10			
	D	1	66	66	10	5			
		2	68	69	8	5		47.5	
		3	69	69	10	7			
	E	1	51	61	18	12			
		2	65	70	8	10		52.5	
		3	69	70	10	7			
POST	A	1	59	61	9	10			
		2	59	57	15	16			
		3	59	60	16	16			
	B	1	60	62	8	10			
		2	61	60	12	16			
		3	61	62	13	12			
	C	1	60	62	11	8			
		2	61	61	14	16			
		3	61	62	14	14			
	D	1	60	61	12	12			
		2	60	60	16	12			
		3	60	60	16	16			
	E	1	62	62	10	11			
		2	62	63	16	16			
		3	61	65	13	10			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001

Date Monitored: 5/5/98

Age 20

Relative Humidity: 88.0%

Inspected By: PAC

ıdrow Height: 5

Ambient Temperature: 16

Performed By: KAP KAP

Windrow Length: 250

Windrow Width: 17

Texture: MEDIUM

Time Turned: 9:25

Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	9:14	9:25
Post-Turn:	9:35	9:48

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	69	67	1	1			
		2	69	71	4	9			
		3	74	71	2	2			
	B	1	67	66	1	1			
		2	68	71	6	10			
		3	72	71	7	7			
	C	1	66	66	3	2			
		2	67	70	5	9			
		3	70	68	6	5			
	D	1	65	66	2	3			
		2	67	69	5	10			
		3	70	71	5	10			
	E	1	66	67	2	2			
		2	68	71	5	12			
		3	72	72	7	11			
POST	A	1	61	62	9	12			
		2	62	62	14	16			
		3	57	61	13	11			
	B	1	58	60	11	9			
		2	61	60	12	16			
		3	59	60	16	14			
	C	1	55	59	13	10			
		2	61	62	13	16			
		3	61	60	16	16			
	D	1	56	59	15	11			
		2	60	59	12	17			
		3	59	59	17	17			
	E	1	56	60	13	10			
		2	62	67	11	17			
		3	62	62	16	15			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 | **Date Monitored:** 5/6/98

Age 21 | **Relative Humidity:** 78.0% | **Inspected By:** PAC

Windrow Height: 5 | **Ambient Temperature:** 17 | **Performed By:** KAP KAP

Windrow Length: 250

Windrow Width: 18

Texture: MEDIUM

	Start Time	Finish Time
Pre-Turn:	7:58	8:12
Post-Turn:	1:31	1:43

Time Turned: 1:21

Moisture Added: 0

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	67	66	1	0			
		2	68	67	8	5			
		3	71	69	6	2			
	B	1	64	64	0	0			
		2	69	69	2	1			
		3	67	65	1	1			
	C	1	64	66	1	1			
		2	70	69	4	2			
		3	69	66	4	2			
	D	1	65	65	0	0			
		2	68	67	9	3			
		3	68	67	6	4			
	E	1	66	67	1	0			
		2	70	71	7	3			
		3	71	68	3	1			
POST	A	1	57	61	7	9			
		2	61	61	12	14			
		3	60	62	14	12			
	B	1	57	61	8	9			
		2	60	60	14	16			
		3	60	60	13	12			
	C	1	59	61	9	8			
		2	61	63	14	15			
		3	62	60	14	13			
	D	1	58	61	11	9			
		2	63	64	13	15			
		3	63	63	14	13			
	E	1	62	62	10	9			
		2	62	62	15	17			
		3	58	62	15	14			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 5/7/98

Age 22 **Relative Humidity:** 100.0% **Inspected By:** KAP

ndrow Height: 4 **Ambient Temperature:** 16 **Performed By:** RAE RAE

Windrow Length: 230

Windrow Width: 16

Texture: MEDIUM

	Start Time	Finish Time
Time Turned: 1:56		
Pre-Turn:	8:58	9:08
Moisture Added: 0		
Post-Turn:	2:08	2:20

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	64	64	0	0			
		2	68	69	1	2		41.5	
		3	69	70	8	4			
	B	1	66	67	0	0			
		2	69	71	3	0		40.3	
		3	68	65	1	1			
	C	1	65	66	0	0			
		2	69	70	2	5		44.1	
		3	64	63	0	0			
	D	1	68	67	0	0			
		2	69	70	6	8		37.4	
		3	66	69	7	6			
	E	1	67	66	0	0			
		2	71	72	5	2		47.4	
		3	66	67	3	5			
POST	A	1	61	63	9	8			
		2	62	62	10	12			
		3	55	59	10	9			
	B	1	57	59	8	10			
		2	61	63	8	9			
		3	61	61	9	10			
	C	1	58	61	10	9			
		2	61	61	11	14			
		3	59	59	11	11			
	D	1	57	60	9	10			
		2	60	58	12	16			
		3	58	60	12	11			
	E	1	58	61	9	10			
		2	61	61	11	15			
		3	62	63	9	10			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 5/8/98

Age 23 **Relative Humidity:** 100.0% **Inspected By:** KAP

Windrow Height: 4 **Ambient Temperature:** 16 **Performed By:** RAE RAE

Windrow Length: 230

Windrow Width: 17

Texture: MEDIUM

	Start Time	Finish Time
Pre-Turn:	8:10	8:26
Post-Turn:	9:55	10:08

Time Turned: 9:45

Moisture Added: 1500

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	65	66	1	5			
		2	69	70	2	2			8.6
		3	63	67	11	5			
	B	1	65	67	0	0			
		2	67	69	1	2			8.6
		3	65	64	1	1			
	C	1	62	62	6	10			
		2	67	69	1	5			8.6
		3	64	65	0	2			
	D	1	62	64	1	3			
		2	70	72	6	11			8.8
		3	62	64	0	2			
	E	1	68	68	0	1			
		2	64	69	17	12			8.7
		3	66	67	3	2			
POST	A	1	53	56	13	11			
		2	55	57	16	14		42.2	
		3	45	49	18	16			
	B	1	51	58	11	10			
		2	51	55	16	13		51.7	
		3	57	57	10	10			
	C	1	55	56	15	11			
		2	57	58	10	10		50.8	
		3	50	53	14	14			
	D	1	57	58	12	12			
		2	54	58	16	14		54.8	
		3	54	56	12	12			
	E	1	49	49	12	12			
		2	58	60	12	14		43.5	
		3	48	56	12	11			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 5/9/98

Age 24 **Relative Humidity:** 98.0% **Inspected By:** PAC

ndrow Height: 4 **Ambient Temperature:** 14 **Performed By:** KAP KAP

Windrow Length: 250

Windrow Width: 19

Texture: MEDIUM

	Start Time	Finish Time
Time Turned: 9:16		
Pre-Turn:	7:18	7:38
Moisture Added: 0		
Post-Turn:	9:26	9:34

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	62	71	7	1			
		2	54	55	13	12			
		3	55	67	19	19			
	B	1	70	69	0	2			
		2	65	66	4	2			
		3	73	65	0	0			
	C	1	70	72	4	0			
		2	69	67	0	0			
		3	71	67	3	2			
	D	1	68	68	0	0			
		2	69	68	4	5			
		3	68	70	4	0			
	E	1	67	72	4	1			
		2	72	69	5	4			
		3	66	68	4	5			
POST	A	1	47	51	16	15			
		2	53	55	14	13			
		3	56	57	13	14			
	B	1	54	54	15	15			
		2	54	54	14	14			
		3	52	50	16	16			
	C	1	49	53	14	13			
		2	57	54	13	13			
		3	53	51	15	14			
	D	1	51	59	14	14			
		2	55	56	13	13			
		3	55	54	13	15			
	E	1	53	56	13	12			
		2	56	56	13	14			
		3	55	56	11	10			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 5/10/98

Age 25 **Relative Humidity:** 83.0% **Inspected By:** PAC

Windrow Height: 4 **Ambient Temperature:** 16 **Performed By:** KAP KAP

Windrow Length: 250

Windrow Width: 18

Texture: MEDIUM

	Start Time	Finish Time
Pre-Turn:	7:19	7:33
Post-Turn:	8:14	8:22

Time Turned: 8:04

Moisture Added: 0

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	62	62	0	0			
		2	64	64	0	0			
		3	62	63	1	1			
	B	1	59	59	0	0			
		2	61	62	0	0			
		3	61	59	0	0			
	C	1	58	59	0	0			
		2	62	62	0	0			
		3	61	59	0	0			
	D	1	59	61	0	0			
		2	64	65	0	0			
		3	64	62	0	0			
	E	1	57	60	0	0			
		2	62	63	0	0			
		3	62	61	0	0			
POST	A	1	52	55	11	10			
		2	56	56	10	12			
		3	54	55	10	9			
	B	1	52	55	11	10			
		2	56	56	11	12			
		3	56	55	11	12			
	C	1	52	55	12	11			
		2	55	55	12	11			
		3	54	53	13	12			
	D	1	54	56	12	11			
		2	55	55	14	15			
		3	54	53	15	15			
	E	1	56	58	11	10			
		2	58	58	13	12			
		3	51	53	15	14			

NSWC CRANE
WINDROW PROCESS DATA - DAILY LOG

Windrow Number: S001 **Date Monitored:** 5/11/98

Age 26 **Relative Humidity:** 84.0% **Inspected By:** MAM

Windrow Height: 4 **Ambient Temperature:** 13 **Performed By:** KAP KAP

Windrow Length: 250

Windrow Width: 17

Texture: MEDIUM

Time Turned: 13:50

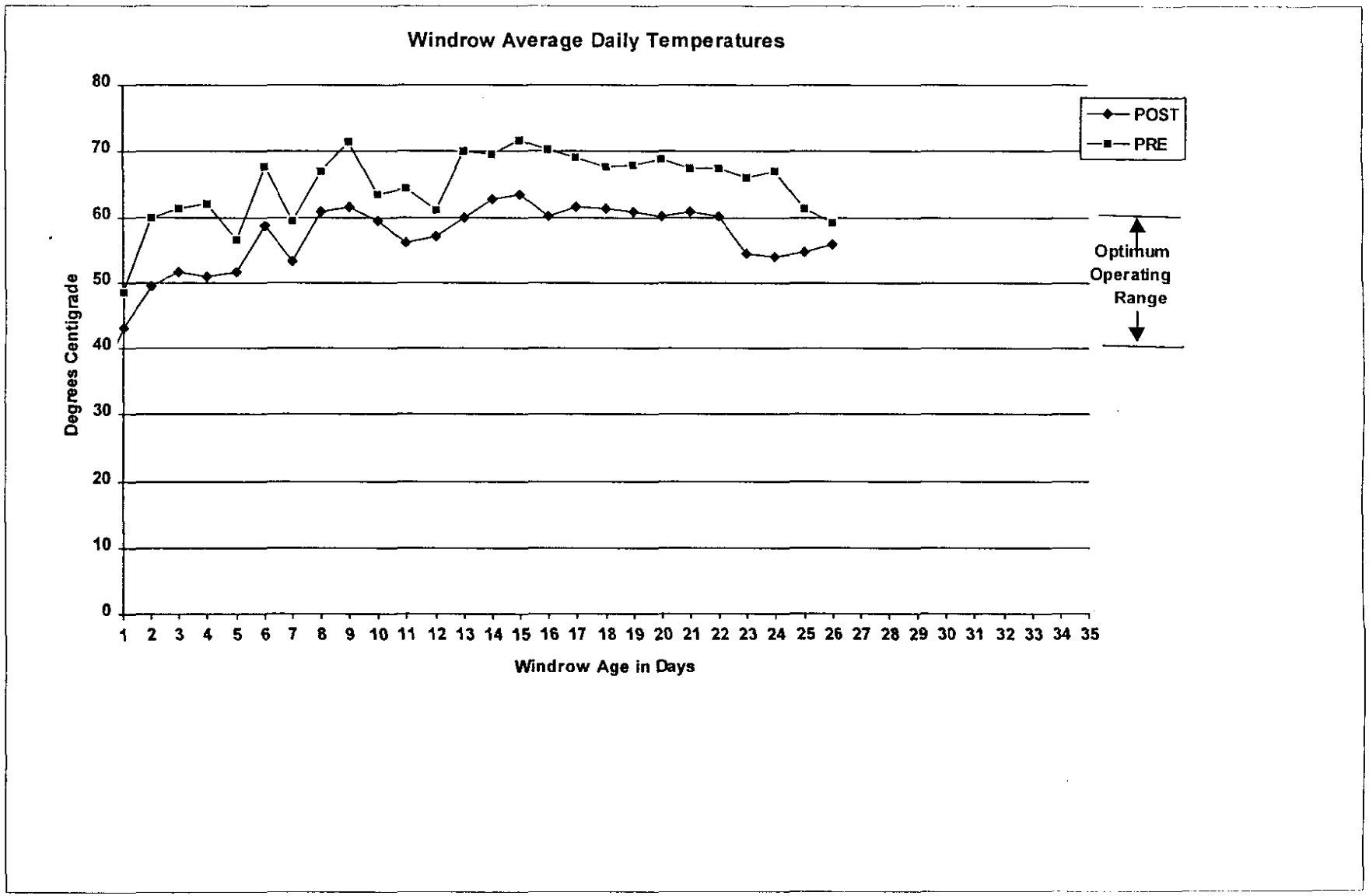
Moisture Added: 0

	Start Time	Finish Time
Pre-Turn:	7:49	7:59
Post-Turn:	14:00	14:16

Pre or Post	Cross Section	Location	Temperature (C) 1 Foot	Temperature (C) 2/3 Feet	Oxygen (%) 1 Foot	Oxygen (%) 2/3 Feet	MWHC (%) 1 Foot	MWHC (%) 2/3 Feet	pH
PRE	A	1	57	59	0	0			
		2	58	57	0	0			
		3	58	59	0	0			
	B	1	55	58	0	0			
		2	61	60	0	0			
		3	57	56	0	0			
	C	1	58	58	0	0			
		2	59	59	0	0			
		3	55	55	0	0			
	D	1	58	58	12	6			
		2	64	62	1	0			
		3	63	62	7	3			
	E	1	60	61	0	0			
		2	63	63	0	0			
		3	61	61	0	0			
POST	A	1	55	59	6	6			
		2	56	58	7	6			
		3	55	53	7	6			
	B	1	54	56	8	6			
		2	56	58	8	6			
		3	50	56	10	8			
	C	1	52	56	10	8			
		2	56	58	8	6			
		3	52	56	8	6			
	D	1	53	58	11	9			
		2	59	61	8	6			
		3	52	56	10	7			
	E	1	53	58	10	9			
		2	57	59	12	8			
		3	55	57	8	7			

NSWC Crane BioFacility Full Scale Windrow S001

Constructed April 15, 1998



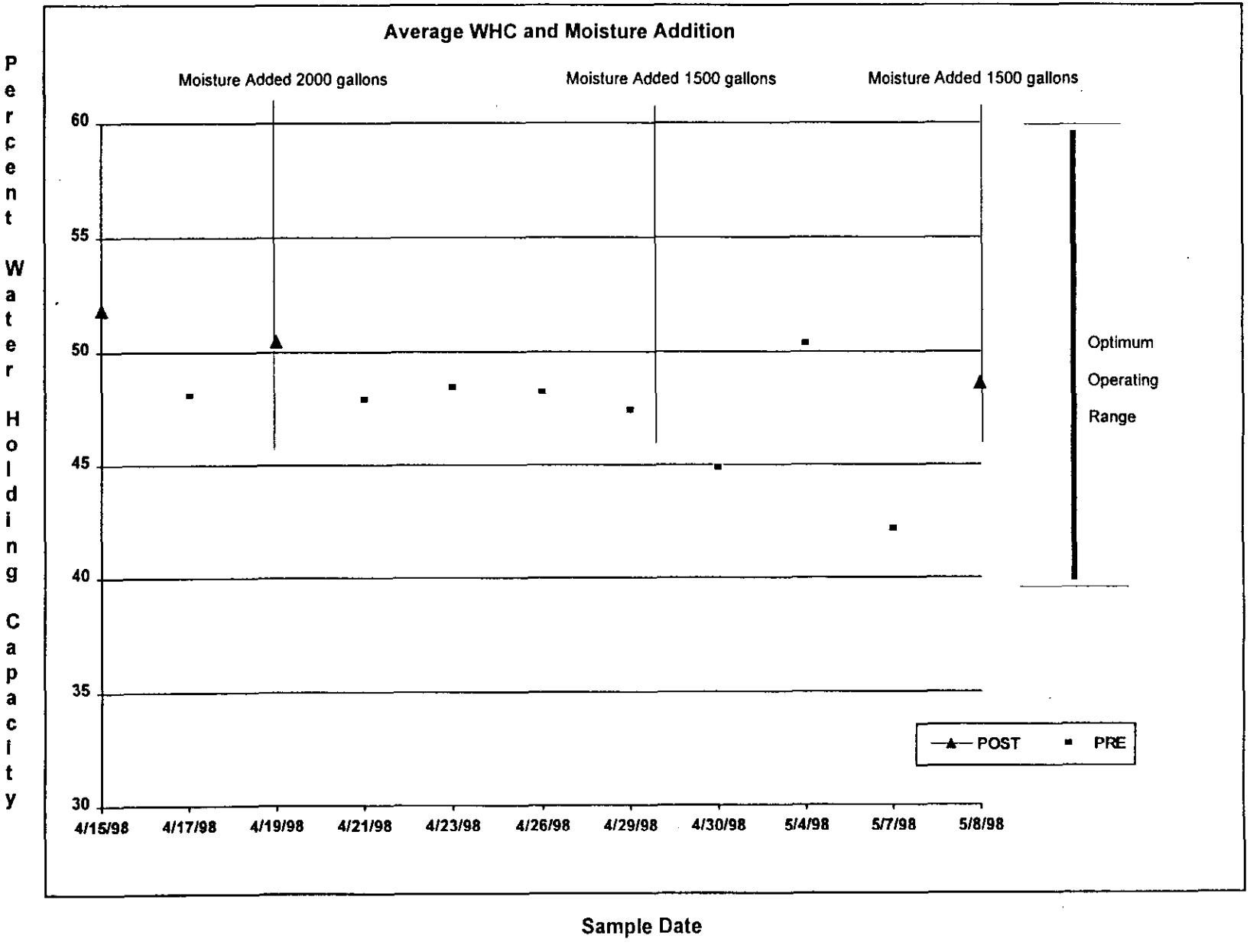
Morrison Knudsen Corporation

Average Daily Windrow Temperature Summary Report

Windrow Number	*Construction Date*	*Date Monitored*	*Age (Days)*	*PRE-Turn (Deg C)*	*POST-Turn (Deg C)*
S001	4/15/98	4/15/98	0		33.53
		4/16/98	1	48.57	43.07
		4/17/98	2	59.90	49.70
		4/18/98	3	61.20	51.67
		4/19/98	4	62.30	50.87
		4/20/98	5	56.83	51.53
		4/21/98	6	67.70	58.60
		4/22/98	7	59.40	53.30
		4/23/98	8	67.03	60.73
		4/24/98	9	71.37	61.50
		4/25/98	10	63.50	59.47
		4/26/98	11	64.37	56.10
		4/27/98	12	61.13	56.93
		4/28/98	13	70.00	59.83
		4/29/98	14	69.60	62.83
		4/30/98	15	71.77	63.50
		5/1/98	16	70.33	60.20
		5/2/98	17	69.20	61.43
		5/3/98	18	67.70	61.40
		5/4/98	19	67.83	60.80
		5/5/98	20	68.90	60.07
		5/6/98	21	67.43	60.87
		5/7/98	22	67.50	60.07
		5/8/98	23	66.07	54.33
		5/9/98	24	67.10	53.87
		5/10/98	25	61.30	54.77
		5/11/98	26	59.17	55.80

All average temperatures are in degrees centigrade

NSWC Crane BioFacility Full Scale Windrow Monitoring Activity



Average Daily Windrow WHC Summary Report

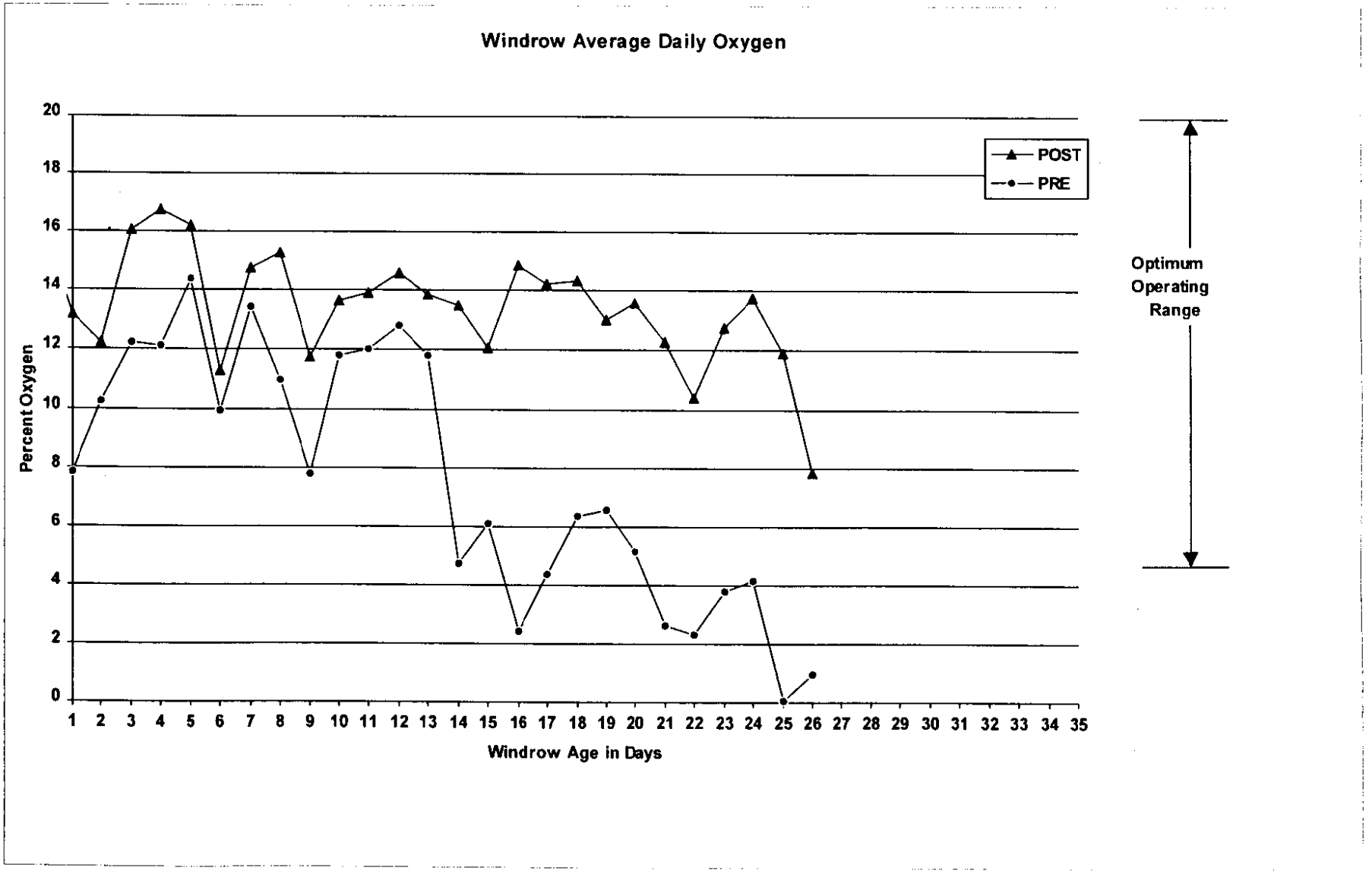
Windrow Number	*Construction Date*	*Date Monitored*	*Age (Days)*	*PRE-Turn (%)*	*POST-Turn (%)*
S001	4/15/98	4/15/98	0		51.86
		4/17/98	2	48.08	
		4/19/98	4		50.48
		4/21/98	6	47.88	
		4/23/98	8	48.40	
		4/26/98	11	48.22	
		4/29/98	14	47.40	
		4/30/98	15	44.86	
		5/4/98	19	50.30	
		5/7/98	22	42.14	
		5/8/98	23		48.60

All average MWHC values are expressed in percent

Generated: *29-Sep-98*

NSWC Crane BioFacility Full Scale Windrow S-001

Constructed April 15, 1998



Morrison Knudsen Corporation

Average Daily Windrow Oxygen Summary Report

Windrow Number	*Construction Date*	*Date Monitored*	*Age (Days)*	*PRE-Turn (%)*	*POST-Turn (%)*
S001	4/15/98	4/15/98	0		16.00
		4/16/98	1	7.83	13.17
		4/17/98	2	10.23	12.23
		4/18/98	3	12.23	16.07
		4/19/98	4	12.13	16.73
		4/20/98	5	14.37	16.20
		4/21/98	6	9.93	11.27
		4/22/98	7	13.43	14.77
		4/23/98	8	10.97	15.27
		4/24/98	9	7.77	11.77
		4/25/98	10	11.83	13.67
		4/26/98	11	12.03	13.93
		4/27/98	12	12.83	14.60
		4/28/98	13	11.80	13.87
		4/29/98	14	4.70	13.50
		4/30/98	15	6.07	12.07
		5/1/98	16	2.40	14.87
		5/2/98	17	4.37	14.23
		5/3/98	18	6.37	14.33
		5/4/98	19	6.57	13.00
		5/5/98	20	5.17	13.60
		5/6/98	21	2.60	12.27
		5/7/98	22	2.30	10.40
		5/8/98	23	3.77	12.77
		5/9/98	24	4.13	13.73
		5/10/98	25	0.07	11.90
		5/11/98	26	0.97	7.83

All average Oxygen values are expressed as a percent

Generated: *29-Sep-98*

Average Daily Windrow PH Summary Report

Vindrow Number	*Construction Date*	*Date Monitored*	*Age (Days)*	*PRE-Turn (STD Units)*
S001	4/15/98	4/15/98	0	
		4/23/98	8	8.44
		4/29/98	14	8.56
		5/8/98	23	8.66

All average PH values are expressed in standard units

Generated: *08-Jul-98*

APPENDIX F

CONTROL WINDROW EXPLOSIVE CONCENTRATION SUMMARY REPORT

TABLE OF CONTENTS

DESCRIPTION **PAGES**

Windrow Explosive Concentrations Summary Report . . . . . 15 pages

Windrow Explosive Concentrations Summary Report

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
135TNB	4/24/98	4/24/98	0	0	1	LT 250	
	4/24/98	4/24/98			2	LT 250	
	4/24/98	4/24/98			3	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	250
					Standard Deviation		0
135TNB	4/24/98	5/20/98	26	0	C	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
13DNB	4/24/98	4/24/98	0	0	1	LT 250	
	4/24/98	4/24/98			2	LT 250	
	4/24/98	4/24/98			3	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	250
					Standard Deviation		0
13DNB	4/24/98	5/20/98	26	0	C	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
246TNT	4/24/98	4/24/98	0	0	1	LT 250	
	4/24/98	4/24/98			2	15200	
	4/24/98	4/24/98			3	LT 250	
				Average Concentration for Cross Section		0	5233
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	5233
					Standard Deviation		8631
246TNT	4/24/98	5/20/98	26	0	C	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
24DNT	4/24/98	4/24/98	0	0	1	LT 250	
	4/24/98	4/24/98			2	LT 250	
	4/24/98	4/24/98			3	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	250
					Standard Deviation		0
24DNT	4/24/98	5/20/98	26	0	C	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
26DNT	4/24/98	4/24/98	0	0	1	LT 260	
	4/24/98	4/24/98			2	LT 260	
	4/24/98	4/24/98			3	LT 260	
				Average Concentration for Cross Section		0	260
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	260
					Standard Deviation		0
26DNT	4/24/98	5/20/98	26	0	C	LT 260	
				Average Concentration for Cross Section		0	260
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	260
					Standard Deviation		

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
2A46DT	4/24/98	4/24/98	0	0	1	LT 250	
	4/24/98	4/24/98			2	LT 250	
	4/24/98	4/24/98			3	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	250
					Standard Deviation		0
2A46DT	4/24/98	5/20/98	26	0	C	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
2NT	4/24/98	4/24/98	0	0	1	LT 250	
	4/24/98	4/24/98			2	LT 250	
	4/24/98	4/24/98			3	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	250
					Standard Deviation		0
2NT	4/24/98	5/20/98	26	0	C	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
3NT	4/24/98	4/24/98	0	0	1	LT 250	
	4/24/98	4/24/98			2	LT 250	
	4/24/98	4/24/98			3	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	250
					Standard Deviation		0
3NT	4/24/98	5/20/98	26	0	C	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
4A26DT	4/24/98	4/24/98	0	0	1	LT 250	
	4/24/98	4/24/98			2	LT 250	
	4/24/98	4/24/98			3	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	250
					Standard Deviation		0
4A26DT	4/24/98	5/20/98	26	0	C	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
4NT	4/24/98	4/24/98	0	0	1	LT 250	
	4/24/98	4/24/98			2	LT 250	
	4/24/98	4/24/98			3	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	250
					Standard Deviation		0
4NT	4/24/98	5/20/98	26	0	C	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
HMX	4/24/98	4/24/98	0	0	1	LT 2200	
	4/24/98	4/24/98			2	LT 2200	
	4/24/98	4/24/98			3	LT 2200	
				Average Concentration for Cross Section		0	2200
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	2200
					Standard Deviation		0
HMX	4/24/98	5/20/98	26	0	C	LT 2200	
				Average Concentration for Cross Section		0	2200
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	2200
					Standard Deviation		

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
NB	4/24/98	4/24/98	0	0	1	LT 260	
	4/24/98	4/24/98			2	LT 260	
	4/24/98	4/24/98			3	LT 260	
				Average Concentration for Cross Section		0	260
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	260
					Standard Deviation		0
NB	4/24/98	5/20/98	26	0	C	LT 260	
				Average Concentration for Cross Section		0	260
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	260
					Standard Deviation		

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
PETN	4/24/98	4/24/98	0	0	1	LT 250	
	4/24/98	4/24/98			2	LT 250	
	4/24/98	4/24/98			3	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	250
					Standard Deviation		0
PETN	4/24/98	5/20/98	26	0	C	LT 250	
				Average Concentration for Cross Section		0	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
RDX	4/24/98	4/24/98	0	0	1	LT 1000	
	4/24/98	4/24/98			2	LT 1000	
	4/24/98	4/24/98			3	LT 1000	
				Average Concentration for Cross Section		0	1000
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	1000
					Standard Deviation		0
RDX	4/24/98	5/20/98	26	0	C	1200	
				Average Concentration for Cross Section		0	1200
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	1200
					Standard Deviation		

Windrow Number N-CONTROL

Compound	*Construction Date*	*SampleDate*	*DaysOld*	*CrossSection*	*Location*	*Concentration*	
TETRYL	4/24/98	4/24/98	0	0	1	LT 650	
	4/24/98	4/24/98			2	LT 650	
	4/24/98	4/24/98			3	LT 650	
				Average Concentration for Cross Section		0	650
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	650
					Standard Deviation		0
TETRYL	4/24/98	5/20/98	26	0	C	LT 650	
				Average Concentration for Cross Section		0	650
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	650
					Standard Deviation		

APPENDIX G

WINDROW S-001 EXPLOSIVE CONCENTRATION SUMMARY REPORT

TABLE OF CONTENTS

DESCRIPTION **PAGES**

Windrow Explosive Concentrations Summary Report . . . . . 15 pages

Windrow Explosive Concentrations Summary Report

Windrow Number S001

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
135TNB	4/15/98	4/15/98	0	03	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			03	12500
135TNB	4/15/98	4/15/98	0	05	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			05	12500
135TNB	4/15/98	4/15/98	0	07	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			07	12500
135TNB	4/15/98	4/15/98	0	09	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			09	12500
135TNB	4/15/98	4/15/98	0	11	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			11	12500
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	12500
					Standard Deviation		0
135TNB	4/15/98	5/11/98	26	03	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			03	250
135TNB	4/15/98	5/11/98	26	05	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			05	250
135TNB	4/15/98	5/11/98	26	07	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			07	250
135TNB	4/15/98	5/11/98	26	09	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			09	250
135TNB	4/15/98	5/11/98	26	11	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			11	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		0
					Precent Reduction		98.00

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
13DNB	4/15/98	4/15/98	0	03	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			03	12500
13DNB	4/15/98	4/15/98	0	05	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			05	12500
13DNB	4/15/98	4/15/98	0	07	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			07	12500
13DNB	4/15/98	4/15/98	0	09	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			09	12500
13DNB	4/15/98	4/15/98	0	11	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			11	12500
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	12500
					Standard Deviation		0
13DNB	4/15/98	5/11/98	26	03	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			03	250
13DNB	4/15/98	5/11/98	26	05	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			05	250
13DNB	4/15/98	5/11/98	26	07	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			07	250
13DNB	4/15/98	5/11/98	26	09	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			09	250
13DNB	4/15/98	5/11/98	26	11	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			11	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		0
					Precent Reduction		98.00

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
246TNT	4/15/98	4/15/98	0	03	1	25000	
	4/15/98	4/15/98			2	86300	
	4/15/98	4/15/98			3	79800	
			Average Concentration for Cross Section			03	63700
246TNT	4/15/98	4/15/98	0	05	1	216000	
	4/15/98	4/15/98			2	3050	
	4/15/98	4/15/98			3	77000	
			Average Concentration for Cross Section			05	98683
246TNT	4/15/98	4/15/98	0	07	1	281000	
	4/15/98	4/15/98			2	104000	
	4/15/98	4/15/98			3	296000	
			Average Concentration for Cross Section			07	227000
246TNT	4/15/98	4/15/98	0	09	1	178000	
	4/15/98	4/15/98			2	152000	
	4/15/98	4/15/98			3	157000	
			Average Concentration for Cross Section			09	162333
246TNT	4/15/98	4/15/98	0	11	1	42400	
	4/15/98	4/15/98			2	15400	
	4/15/98	4/15/98			3	37800	
			Average Concentration for Cross Section			11	31867
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	116717
					Standard Deviation		93727
246TNT	4/15/98	5/11/98	26	03	1	523	
	4/15/98	5/11/98			2	744	
	4/15/98	5/11/98			3	375	
			Average Concentration for Cross Section			03	547
246TNT	4/15/98	5/11/98	26	05	1	592	
	4/15/98	5/11/98			2	274	
	4/15/98	5/11/98			3	457	
			Average Concentration for Cross Section			05	441
246TNT	4/15/98	5/11/98	26	07	1	LT 250	
	4/15/98	5/11/98			2	434	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			07	311
246TNT	4/15/98	5/11/98	26	09	1	241	
	4/15/98	5/11/98			2	310	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			09	267
246TNT	4/15/98	5/11/98	26	11	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	259	
			Average Concentration for Cross Section			11	253
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	364
					Standard Deviation		155
					Precent Reduction		99.69

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
24DNT	4/15/98	4/15/98	0	03	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			03	12500
24DNT	4/15/98	4/15/98	0	05	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			05	12500
24DNT	4/15/98	4/15/98	0	07	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			07	12500
24DNT	4/15/98	4/15/98	0	09	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			09	12500
24DNT	4/15/98	4/15/98	0	11	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			11	12500
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	12500
					Standard Deviation		0
24DNT	4/15/98	5/11/98	26	03	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			03	250
24DNT	4/15/98	5/11/98	26	05	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			05	250
24DNT	4/15/98	5/11/98	26	07	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			07	250
24DNT	4/15/98	5/11/98	26	09	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			09	250
24DNT	4/15/98	5/11/98	26	11	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			11	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		0
					Precent Reduction		98.00

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
26DNT	4/15/98	4/15/98	0	03	1	LT 13000	
	4/15/98	4/15/98			2	LT 13000	
	4/15/98	4/15/98			3	LT 13000	
			Average Concentration for Cross Section			03	13000
26DNT	4/15/98	4/15/98	0	05	1	LT 13000	
	4/15/98	4/15/98			2	LT 13000	
	4/15/98	4/15/98			3	LT 13000	
			Average Concentration for Cross Section			05	13000
26DNT	4/15/98	4/15/98	0	07	1	LT 13000	
	4/15/98	4/15/98			2	LT 13000	
	4/15/98	4/15/98			3	LT 13000	
			Average Concentration for Cross Section			07	13000
26DNT	4/15/98	4/15/98	0	09	1	LT 13000	
	4/15/98	4/15/98			2	LT 13000	
	4/15/98	4/15/98			3	LT 13000	
			Average Concentration for Cross Section			09	13000
26DNT	4/15/98	4/15/98	0	11	1	LT 13000	
	4/15/98	4/15/98			2	LT 13000	
	4/15/98	4/15/98			3	LT 13000	
			Average Concentration for Cross Section			11	13000
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	13000
					Standard Deviation		0
26DNT	4/15/98	5/11/98	26	03	1	LT 260	
	4/15/98	5/11/98			2	LT 260	
	4/15/98	5/11/98			3	LT 260	
			Average Concentration for Cross Section			03	260
26DNT	4/15/98	5/11/98	26	05	1	LT 260	
	4/15/98	5/11/98			2	LT 260	
	4/15/98	5/11/98			3	LT 260	
			Average Concentration for Cross Section			05	260
26DNT	4/15/98	5/11/98	26	07	1	LT 260	
	4/15/98	5/11/98			2	LT 260	
	4/15/98	5/11/98			3	LT 260	
			Average Concentration for Cross Section			07	260
26DNT	4/15/98	5/11/98	26	09	1	LT 260	
	4/15/98	5/11/98			2	LT 260	
	4/15/98	5/11/98			3	LT 260	
			Average Concentration for Cross Section			09	260
26DNT	4/15/98	5/11/98	26	11	1	LT 260	
	4/15/98	5/11/98			2	LT 260	
	4/15/98	5/11/98			3	LT 260	
			Average Concentration for Cross Section			11	260
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	260
					Standard Deviation		0
					Precent Reduction		98.00

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
2A46DT	4/15/98	4/15/98	0	03	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	3660	
			Average Concentration for Cross Section			03	9553
2A46DT	4/15/98	4/15/98	0	05	1	6110	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			05	10370
2A46DT	4/15/98	4/15/98	0	07	1	7690	
	4/15/98	4/15/98			2	6550	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			07	8913
2A46DT	4/15/98	4/15/98	0	09	1	9010	
	4/15/98	4/15/98			2	6960	
	4/15/98	4/15/98			3	2750	
			Average Concentration for Cross Section			09	6240
2A46DT	4/15/98	4/15/98	0	11	1	1460	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			11	8820
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	8779
					Standard Deviation		4050
2A46DT	4/15/98	5/11/98	26	03	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			03	250
2A46DT	4/15/98	5/11/98	26	05	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			05	250
2A46DT	4/15/98	5/11/98	26	07	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			07	250
2A46DT	4/15/98	5/11/98	26	09	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			09	250
2A46DT	4/15/98	5/11/98	26	11	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			11	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		0
					Precent Reduction		97.15

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
2NT	4/15/98	4/15/98	0	03	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			03	12500
2NT	4/15/98	4/15/98	0	05	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			05	12500
2NT	4/15/98	4/15/98	0	07	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			07	12500
2NT	4/15/98	4/15/98	0	09	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			09	12500
2NT	4/15/98	4/15/98	0	11	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			11	12500
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	12500
					Standard Deviation		0
2NT	4/15/98	5/11/98	26	03	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			03	250
2NT	4/15/98	5/11/98	26	05	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			05	250
2NT	4/15/98	5/11/98	26	07	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			07	250
2NT	4/15/98	5/11/98	26	09	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			09	250
2NT	4/15/98	5/11/98	26	11	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			11	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		0
					Precent Reduction		98.00

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
3NT	4/15/98	4/15/98	0	03	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			03	12500
3NT	4/15/98	4/15/98	0	05	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			05	12500
3NT	4/15/98	4/15/98	0	07	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			07	12500
3NT	4/15/98	4/15/98	0	09	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			09	12500
3NT	4/15/98	4/15/98	0	11	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			11	12500
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	12500
					Standard Deviation		0
3NT	4/15/98	5/11/98	26	03	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			03	250
3NT	4/15/98	5/11/98	26	05	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			05	250
3NT	4/15/98	5/11/98	26	07	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			07	250
3NT	4/15/98	5/11/98	26	09	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			09	250
3NT	4/15/98	5/11/98	26	11	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			11	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		0
					Precent Reduction		98.00

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
4A26DT	4/15/98	4/15/98	0	03	1	5610	
	4/15/98	4/15/98			2	10900	
	4/15/98	4/15/98			3	20000	
			Average Concentration for Cross Section			03	12170
4A26DT	4/15/98	4/15/98	0	05	1	21100	
	4/15/98	4/15/98			2	2620	
	4/15/98	4/15/98			3	6700	
			Average Concentration for Cross Section			05	10140
4A26DT	4/15/98	4/15/98	0	07	1	23800	
	4/15/98	4/15/98			2	29100	
	4/15/98	4/15/98			3	10100	
			Average Concentration for Cross Section			07	21000
4A26DT	4/15/98	4/15/98	0	09	1	28500	
	4/15/98	4/15/98			2	30100	
	4/15/98	4/15/98			3	10400	
			Average Concentration for Cross Section			09	23000
4A26DT	4/15/98	4/15/98	0	11	1	7030	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			11	10677
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	15397
					Standard Deviation		9238
4A26DT	4/15/98	5/11/98	26	03	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			03	250
4A26DT	4/15/98	5/11/98	26	05	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			05	250
4A26DT	4/15/98	5/11/98	26	07	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			07	250
4A26DT	4/15/98	5/11/98	26	09	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			09	250
4A26DT	4/15/98	5/11/98	26	11	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			11	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		0
					Precent Reduction		98.38

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
4NT	4/15/98	4/15/98	0	03	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			03	12500
4NT	4/15/98	4/15/98	0	05	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			05	12500
4NT	4/15/98	4/15/98	0	07	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			07	12500
4NT	4/15/98	4/15/98	0	09	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			09	12500
4NT	4/15/98	4/15/98	0	11	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			11	12500
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	12500
					Standard Deviation		0
4NT	4/15/98	5/11/98	26	03	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			03	250
4NT	4/15/98	5/11/98	26	05	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			05	250
4NT	4/15/98	5/11/98	26	07	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			07	250
4NT	4/15/98	5/11/98	26	09	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			09	250
4NT	4/15/98	5/11/98	26	11	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			11	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		0
					Precent Reduction		98.00

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
HMX	4/15/98	4/15/98	0	03	1	76600	
	4/15/98	4/15/98			2	181000	
	4/15/98	4/15/98			3	157000	
			Average Concentration for Cross Section			03	138200
HMX	4/15/98	4/15/98	0	05	1	178000	
	4/15/98	4/15/98			2	28800	
	4/15/98	4/15/98			3	97200	
			Average Concentration for Cross Section			05	101333
HMX	4/15/98	4/15/98	0	07	1	290000	
	4/15/98	4/15/98			2	157000	
	4/15/98	4/15/98			3	224000	
			Average Concentration for Cross Section			07	223667
HMX	4/15/98	4/15/98	0	09	1	247000	
	4/15/98	4/15/98			2	236000	
	4/15/98	4/15/98			3	177000	
			Average Concentration for Cross Section			09	220000
HMX	4/15/98	4/15/98	0	11	1	103000	
	4/15/98	4/15/98			2	27800	
	4/15/98	4/15/98			3	86200	
			Average Concentration for Cross Section			11	72333
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	151107
					Standard Deviation		79513
HMX	4/15/98	5/11/98	26	03	1	LT 2200	
	4/15/98	5/11/98			2	LT 2200	
	4/15/98	5/11/98			3	LT 2200	
			Average Concentration for Cross Section			03	2200
HMX	4/15/98	5/11/98	26	05	1	LT 2200	
	4/15/98	5/11/98			2	LT 2200	
	4/15/98	5/11/98			3	LT 2200	
			Average Concentration for Cross Section			05	2200
HMX	4/15/98	5/11/98	26	07	1	LT 2200	
	4/15/98	5/11/98			2	LT 2200	
	4/15/98	5/11/98			3	571	
			Average Concentration for Cross Section			07	1657
HMX	4/15/98	5/11/98	26	09	1	LT 2200	
	4/15/98	5/11/98			2	LT 2200	
	4/15/98	5/11/98			3	LT 2200	
			Average Concentration for Cross Section			09	2200
HMX	4/15/98	5/11/98	26	11	1	LT 2200	
	4/15/98	5/11/98			2	LT 2200	
	4/15/98	5/11/98			3	LT 2200	
			Average Concentration for Cross Section			11	2200
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	2091
					Standard Deviation		421
					Precent Reduction		98.62

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
NB	4/15/98	4/15/98	0	03	1	LT 13000	
	4/15/98	4/15/98			2	LT 13000	
	4/15/98	4/15/98			3	LT 13000	
			Average Concentration for Cross Section			03	13000
NB	4/15/98	4/15/98	0	05	1	LT 13000	
	4/15/98	4/15/98			2	LT 13000	
	4/15/98	4/15/98			3	LT 13000	
			Average Concentration for Cross Section			05	13000
NB	4/15/98	4/15/98	0	07	1	LT 13000	
	4/15/98	4/15/98			2	LT 13000	
	4/15/98	4/15/98			3	LT 13000	
			Average Concentration for Cross Section			07	13000
NB	4/15/98	4/15/98	0	09	1	LT 13000	
	4/15/98	4/15/98			2	LT 13000	
	4/15/98	4/15/98			3	LT 13000	
			Average Concentration for Cross Section			09	13000
NB	4/15/98	4/15/98	0	11	1	LT 13000	
	4/15/98	4/15/98			2	LT 13000	
	4/15/98	4/15/98			3	LT 13000	
			Average Concentration for Cross Section			11	13000
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	13000
					Standard Deviation		0
NB	4/15/98	5/11/98	26	03	1	LT 260	
	4/15/98	5/11/98			2	LT 260	
	4/15/98	5/11/98			3	LT 260	
			Average Concentration for Cross Section			03	260
NB	4/15/98	5/11/98	26	05	1	LT 260	
	4/15/98	5/11/98			2	LT 260	
	4/15/98	5/11/98			3	LT 260	
			Average Concentration for Cross Section			05	260
NB	4/15/98	5/11/98	26	07	1	LT 260	
	4/15/98	5/11/98			2	LT 260	
	4/15/98	5/11/98			3	LT 260	
			Average Concentration for Cross Section			07	260
NB	4/15/98	5/11/98	26	09	1	LT 260	
	4/15/98	5/11/98			2	LT 260	
	4/15/98	5/11/98			3	LT 260	
			Average Concentration for Cross Section			09	260
NB	4/15/98	5/11/98	26	11	1	LT 260	
	4/15/98	5/11/98			2	LT 260	
	4/15/98	5/11/98			3	LT 260	
			Average Concentration for Cross Section			11	260
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	260
					Standard Deviation		0
					Precent Reduction		98.00

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
PETN	4/15/98	4/15/98	0	03	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			03	12500
PETN	4/15/98	4/15/98	0	05	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			05	12500
PETN	4/15/98	4/15/98	0	07	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			07	12500
PETN	4/15/98	4/15/98	0	09	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			09	12500
PETN	4/15/98	4/15/98	0	11	1	LT 12500	
	4/15/98	4/15/98			2	LT 12500	
	4/15/98	4/15/98			3	LT 12500	
			Average Concentration for Cross Section			11	12500
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	12500
					Standard Deviation		0
PETN	4/15/98	5/11/98	26	03	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			03	250
PETN	4/15/98	5/11/98	26	05	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			05	250
PETN	4/15/98	5/11/98	26	07	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			07	250
PETN	4/15/98	5/11/98	26	09	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			09	250
PETN	4/15/98	5/11/98	26	11	1	LT 250	
	4/15/98	5/11/98			2	LT 250	
	4/15/98	5/11/98			3	LT 250	
			Average Concentration for Cross Section			11	250
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	250
					Standard Deviation		0
					Precent Reduction		98.00

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
RDX	4/15/98	4/15/98	0	03	1	616000	
	4/15/98	4/15/98			2	1490000	
	4/15/98	4/15/98			3	1140000	
			Average Concentration for Cross Section			03	1082000
RDX	4/15/98	4/15/98	0	05	1	1470000	
	4/15/98	4/15/98			2	163000	
	4/15/98	4/15/98			3	691000	
			Average Concentration for Cross Section			05	774667
RDX	4/15/98	4/15/98	0	07	1	2400000	
	4/15/98	4/15/98			2	1370000	
	4/15/98	4/15/98			3	1750000	
			Average Concentration for Cross Section			07	1840000
RDX	4/15/98	4/15/98	0	09	1	1840000	
	4/15/98	4/15/98			2	1800000	
	4/15/98	4/15/98			3	1450000	
			Average Concentration for Cross Section			09	1696667
RDX	4/15/98	4/15/98	0	11	1	786000	
	4/15/98	4/15/98			2	156000	
	4/15/98	4/15/98			3	536000	
			Average Concentration for Cross Section			11	492667
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	1177200
					Standard Deviation		661926
RDX	4/15/98	5/11/98	26	03	1	LT 1000	
	4/15/98	5/11/98			2	LT 1000	
	4/15/98	5/11/98			3	LT 1000	
			Average Concentration for Cross Section			03	1000
RDX	4/15/98	5/11/98	26	05	1	LT 1000	
	4/15/98	5/11/98			2	LT 1000	
	4/15/98	5/11/98			3	LT 1000	
			Average Concentration for Cross Section			05	1000
RDX	4/15/98	5/11/98	26	07	1	LT 1000	
	4/15/98	5/11/98			2	LT 1000	
	4/15/98	5/11/98			3	LT 1000	
			Average Concentration for Cross Section			07	1000
RDX	4/15/98	5/11/98	26	09	1	LT 1000	
	4/15/98	5/11/98			2	LT 1000	
	4/15/98	5/11/98			3	LT 1000	
			Average Concentration for Cross Section			09	1000
RDX	4/15/98	5/11/98	26	11	1	LT 1000	
	4/15/98	5/11/98			2	LT 1000	
	4/15/98	5/11/98			3	LT 1000	
			Average Concentration for Cross Section			11	1000
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	1000
					Standard Deviation		0
					Precent Reduction		99.92

Compound	Construction Date	SampleDate	DaysOld	CrossSection	Location	Concentration	
TETRYL	4/15/98	4/15/98	0	03	1	LT 32500	
	4/15/98	4/15/98			2	LT 32500	
	4/15/98	4/15/98			3	LT 32500	
			Average Concentration for Cross Section			03	32500
TETRYL	4/15/98	4/15/98	0	05	1	LT 32500	
	4/15/98	4/15/98			2	LT 32500	
	4/15/98	4/15/98			3	LT 32500	
			Average Concentration for Cross Section			05	32500
TETRYL	4/15/98	4/15/98	0	07	1	LT 32500	
	4/15/98	4/15/98			2	LT 32500	
	4/15/98	4/15/98			3	LT 32500	
			Average Concentration for Cross Section			07	32500
TETRYL	4/15/98	4/15/98	0	09	1	LT 32500	
	4/15/98	4/15/98			2	LT 32500	
	4/15/98	4/15/98			3	LT 32500	
			Average Concentration for Cross Section			09	32500
TETRYL	4/15/98	4/15/98	0	11	1	LT 32500	
	4/15/98	4/15/98			2	LT 32500	
	4/15/98	4/15/98			3	LT 32500	
			Average Concentration for Cross Section			11	32500
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					0	32500
					Standard Deviation		0
TETRYL	4/15/98	5/11/98	26	03	1	LT 650	
	4/15/98	5/11/98			2	LT 650	
	4/15/98	5/11/98			3	LT 650	
			Average Concentration for Cross Section			03	650
TETRYL	4/15/98	5/11/98	26	05	1	LT 650	
	4/15/98	5/11/98			2	LT 650	
	4/15/98	5/11/98			3	LT 650	
			Average Concentration for Cross Section			05	650
TETRYL	4/15/98	5/11/98	26	07	1	LT 650	
	4/15/98	5/11/98			2	LT 650	
	4/15/98	5/11/98			3	LT 650	
			Average Concentration for Cross Section			07	650
TETRYL	4/15/98	5/11/98	26	09	1	LT 650	
	4/15/98	5/11/98			2	LT 650	
	4/15/98	5/11/98			3	LT 650	
			Average Concentration for Cross Section			09	650
TETRYL	4/15/98	5/11/98	26	11	1	LT 650	
	4/15/98	5/11/98			2	LT 650	
	4/15/98	5/11/98			3	LT 650	
			Average Concentration for Cross Section			11	650
	AVERAGE CONCENTRATION FOR WINDROW ON DAY					26	650
					Standard Deviation		0
					Precent Reduction		98.00

APPENDIX H

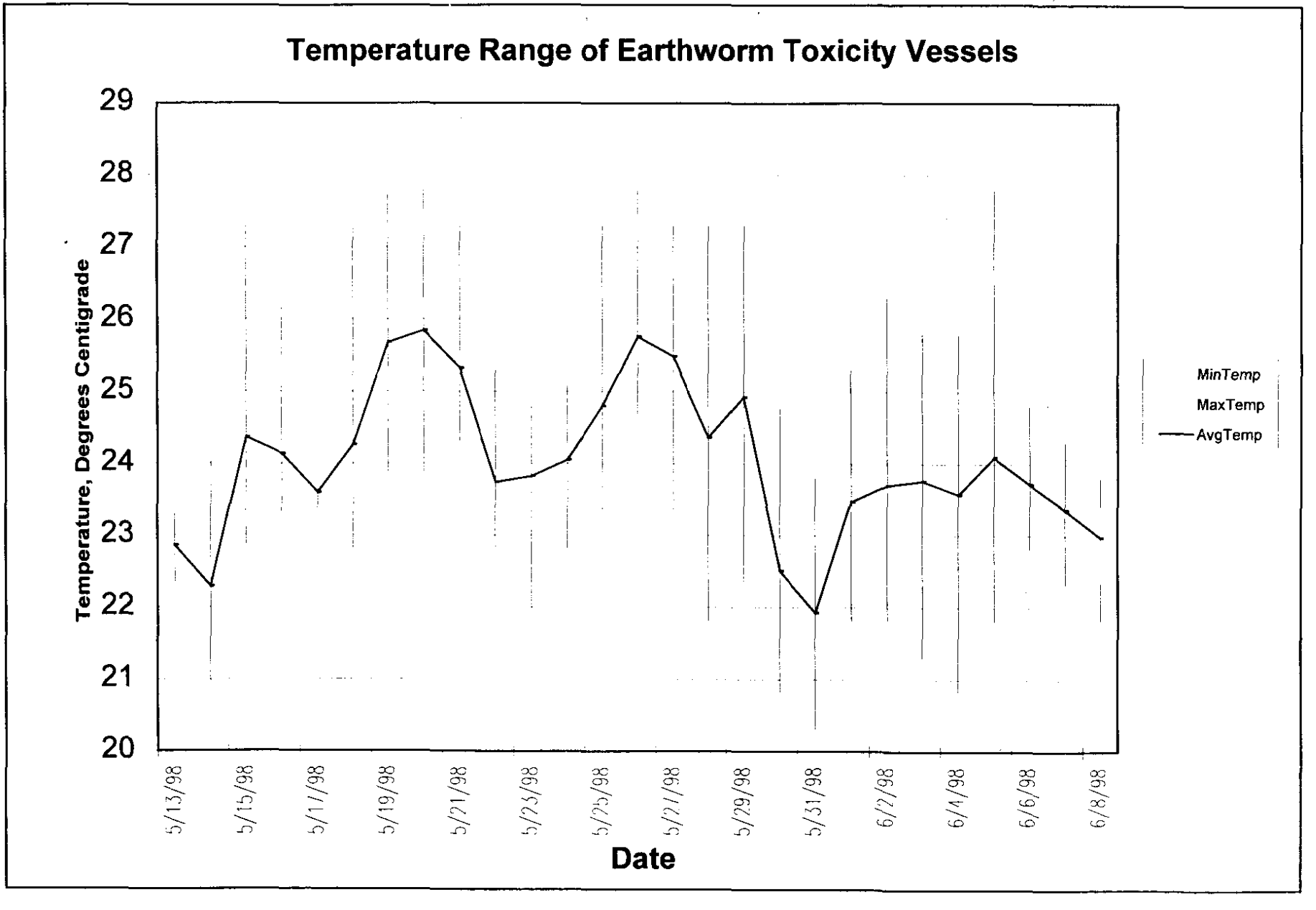
DETAILED SUMMARY OF ANALYTICAL RAW DATA

TABLE OF CONTENTS

DESCRIPTION	PAGES
Temperature Range of Earthworm Toxicity Vessels	2 pages
Detailed Summary of Earthworm Results including pH values	3 pages
Summary of Positive and Negative Controls for Earthworm Toxicity Analysis	1 page
Detailed Summary of Microtox® Results	1 page
Summary of Method Blanks for Microtox® Analysis	1 page

DETAIL SUMMARY OF VESSEL TEMERATURES FOR EARTHWORM ANALYSIS

Date	Minimum Temperature Degrees C	Maximum Temperature Degrees C	Average Temperature Degrees C
5/13/98	22.3	23.3	22.86
5/14/98	20.8	24.3	22.29
5/15/98	22.8	27.3	24.36
5/16/98	23.3	26.3	24.13
5/17/98	23.3	23.8	23.59
5/18/98	22.8	27.3	24.26
5/19/98	23.8	27.8	25.68
5/20/98	23.8	27.8	25.84
5/21/98	24.3	27.3	25.32
5/22/98	22.8	25.3	23.74
5/23/98	21.8	24.8	23.82
5/24/98	22.8	25.3	24.05
5/25/98	23.3	27.3	24.80
5/26/98	24.3	27.8	25.76
5/27/98	23.3	27.3	25.49
5/28/98	21.8	27.3	24.36
5/29/98	22.3	27.3	24.93
5/30/98	20.8	24.8	22.51
5/31/98	20.3	23.8	21.93
6/1/98	21.8	25.3	23.47
6/2/98	21.8	26.3	23.70
6/3/98	21.3	25.8	23.76
6/4/98	20.8	25.8	23.57
6/5/98	21.8	27.8	24.09
6/6/98	22.8	24.8	23.72
6/7/98	22.3	24.3	23.36
6/8/98	21.8	23.8	22.98


Temperature Range of Earthworm Toxicity Vessels
Temperature, Degrees Centigrade
29
28
27
26
25
24
23
22
21
20
5/13/98
5/15/98
5/17/98
5/19/98
5/21/98
5/23/98
5/25/98
5/27/98
5/29/98
5/31/98
6/2/98
6/4/98
6/6/98
6/8/98
Date
MinTemp
MaxTemp
AvgTemp

DETAIL SUMMARY OF EARTHWORM RESULTS

Position	Concentration	Sample #	Sample ID	Initial PH	Final PH	7-DAY Live Count	14-DAY Live Count
6	6.25	80885	Column 3	4.9	6.6	10	10
38	6.25	80885	Column 3			10	10
55	6.25	80885	Column 3			10	10
66	12.5	80885	Column 3	4.9		10	9
80	12.5	80885	Column 3			10	10
89	12.5	80885	Column 3			8	8
37	25	80885	Column 3	5.4	7.2	10	10
56	25	80885	Column 3			9	9
69	25	80885	Column 3			10	10
28	50	80885	Column 3	6.9	8.4	1	0
34	50	80885	Column 3			0	0
45	50	80885	Column 3			2	0
8	100	80885	Column 3	8.3		0	0
32	100	80885	Column 3			0	0
81	100	80885	Column 3			0	0
23	6.25	80886	Column 5	4.8	6.9	10	10
50	6.25	80886	Column 5			10	10
88	6.25	80886	Column 5			10	10
0	12.5	80886	Column 5			10	10
21	12.5	80886	Column 5	5.6	6.5	10	10
68	12.5	80886	Column 5			10	10
4	25	80886	Column 5	5.7	8	10	10
48	25	80886	Column 5			10	10
92	25	80886	Column 5			10	10
13	50	80886	Column 5	6.6	8.4	10	9
27	50	80886	Column 5			9	9
51	50	80886	Column 5			10	6
2	100	80886	Column 5	8.4		0	0
53	100	80886	Column 5			0	0
67	100	80886	Column 5			0	0
30	6.25	80887	Column 7	5.7	7.0	10	9
33	6.25	80887	Column 7			10	10
73	6.25	80887	Column 7			9	8
15	12.5	80887	Column 7	5.6	7.8	8	8
40	12.5	80887	Column 7			9	9
76	12.5	80887	Column 7			10	9
49	25	80887	Column 7	6.2	7.8	8	8
78	25	80887	Column 7			9	9
86	25	80887	Column 7			10	10
16	50	80887	Column 7			0	0
25	50	80887	Column 7			0	0
36	50	80887	Column 7	6.7	8.3	10	10
39	100	80887	Column 7	8.4		0	0
54	100	80887	Column 7			0	0
87	100	80887	Column 7			0	0
5	6.25	80888	Column 9	5	6.8	10	10
72	6.25	80888	Column 9			10	9

DETAIL SUMMARY OF EARTHWORM RESULTS

Position	Concentration	Sample #	Sample ID	Initial PH	Final PH	7-DAY Live Count	14-DAY Live Count
83	6.25	80888	Column 9			10	10
1	12.5	80888	Column 9	5.4	7.8	9	9
41	12.5	80888	Column 9			8	7
71	12.5	80888	Column 9			9	9
7	25	80888	Column 9	6.2	7.9	10	10
44	25	80888	Column 9			10	10
82	25	80888	Column 9			9	9
18	50	80888	Column 9	6.7		0	0
24	50	80888	Column 9			0	0
79	50	80888	Column 9			0	0
9	100	80888	Column 9	8.6		0	0
58	100	80888	Column 9			0	0
77	100	80888	Column 9			0	0
11	6.25	80889	Column 11	5.5		0	0
42	6.25	80889	Column 11			0	0
52	6.25	80889	Column 11			0	0
20	12.5	80889	Column 11	5.9		10	10
47	12.5	80889	Column 11			10	10
65	12.5	80889	Column 11			10	10
14	25	80889	Column 11	6.5		0	0
15	25	80889	Column 11			0	0
64	25	80889	Column 11			6	4
12	50	80889	Column 11	6.8		9	8
75	50	80889	Column 11			0	0
90	50	80889	Column 11			10	9
46	100	80889	Column 11	8.7		0	0
61	100	80889	Column 11			0	0
63	100	80889	Column 11			0	0
22	1250	80890	KCl - Positive Control			10	10
70	1250	80890	KCl - Positive Control			10	10
31	1280	80890	KCl - Positive Control			10	10
29	2500	80890	KCl - Positive Control			10	9
35	2500	80890	KCl - Positive Control			10	10
43	2500	80890	KCl - Positive Control			10	10
57	5000	80890	KCl - Positive Control			10	10
60	5000	80890	KCl - Positive Control			9	9
74	5000	80890	KCl - Positive Control			10	10
19	10000	80890	KCl - Positive Control			0	0
26	10000	80890	KCl - Positive Control			0	0
59	10000	80890	KCl - Positive Control			0	0
17	20000	80890	KCl - Positive Control			0	0
62	20000	80890	KCl - Positive Control			0	0
85	20000	80890	KCl - Positive Control			0	0
3	CONTROL	80890	Blank Control	4.6	5	10	10
84	CONTROL	80890	Blank Control			10	10
91	CONTROL	80890	Blank Control			10	10
1	0.00	81036	Control Pile	5.9	5.52	9	9

DETAIL SUMMARY OF EARTHWORM RESULTS

Position	Concentration	Sample #	Sample ID	Initial PH	Final PH	7-DAY Live Count	14-DAY Live Count
3	0.00	81036	Control Pile			10	10
11	0.00	81036	Control Pile			10	10
4	6.25	81036	Control Pile	5.8	5.84	10	10
13	6.25	81036	Control Pile			10	10
16	6.25	81036	Control Pile			10	9
6	12.5	81036	Control Pile	6.1	8.06	7	7
9	12.5	81036	Control Pile			7	7
17	12.5	81036	Control Pile			10	8
5	25	81036	Control Pile	6.1		0	0
12	25	81036	Control Pile		8.13	3	3
18	25	81036	Control Pile			0	0
7	50	81036	Control Pile	6.4		0	0
10	50	81036	Control Pile		8.58	0	0
14	50	81036	Control Pile			0	0
2	100	81036	Control Pile	7.5		0	0
8	100	81036	Control Pile			0	0
15	100	81036	Control Pile			0	0

SUMMARY OF POSITIVE AND NEGATIVE CONTROLS FOR EARTHWORM TOXICITY ANALYSIS

Position	Concentration (mg/L)	Sample #	Sample ID	Initial PH	Final PH	7-DAY Live Count	14-DAY Live Count
22	1250	80890	KCl - Positive Control			10	10
70	1250	80890	KCl - Positive Control			10	10
31	1280	80890	KCl - Positive Control			10	10
29	2500	80890	KCl - Positive Control			10	9
35	2500	80890	KCl - Positive Control			10	10
43	2500	80890	KCl - Positive Control			10	10
57	5000	80890	KCl - Positive Control			10	10
60	5000	80890	KCl - Positive Control			9	9
74	5000	80890	KCl - Positive Control			10	10
19	10000	80890	KCl - Positive Control			0	0
26	10000	80890	KCl - Positive Control			0	0
59	10000	80890	KCl - Positive Control			0	0
17	20000	80890	KCl - Positive Control			0	0
62	20000	80890	KCl - Positive Control			0	0
85	20000	80890	KCl - Positive Control			0	0
			LC-50			6826	6826
			Published LC-50			6340	6340
			% Difference			7.7%	7.7%
3	CONTROL	80890	Blank Control	4.6	5	10	10
84	CONTROL	80890	Blank Control			10	10
91	CONTROL	80890	Blank Control			10	10
			Precent Mortality			0%	0%
			Acceptable Mortality			10%	10%

DETAIL SUMMARY OF MICROTOX DATA

Concentration (Percent)	Sample #	Sample ID	Initial Light Reading	5 minute Light Reading	15 minute Light Reading
0.00	80885	Column 3	93	64	57
5.6	80885	Column 3	66	47	43
11.3	80885	Column 3	71	41	39
22.5	80885	Column 3	66	34	32
45	80885	Column 3	60	22	20
0.00	80886	Column 5	72	50	45
5.6	80886	Column 5	68	47	43
11.3	80886	Column 5	67	39	36
22.5	80886	Column 5	62	31	29
45	80886	Column 5	61	19	19
0.00	80887	Column 7	64	44	40
5.6	80887	Column 7	64	42	39
11.3	80887	Column 7	70	39	36
22.5	80887	Column 7	69	29	27
45	80887	Column 7	65	17	15
0.00	80888	Column 9	59	45	41
5.6	80888	Column 9	58	38	34
11.3	80888	Column 9	59	29	27
22.5	80888	Column 9	54	21	18
45	80888	Column 9	54	11	9
0.00	80889	Column 11	62	40	36
5.6	80889	Column 11	52	36	33
11.3	80889	Column 11	60	33	30
22.5	80889	Column 11	55	23	22
45	80889	Column 11	54	14	14
0.00	81036	Control Pile	58	43	39
5.6	81036	Control Pile	54	40	38
11.3	81036	Control Pile	56	38	36
22.5	81036	Control Pile	54	30	29
45	81036	Control Pile	57	22	20

SUMMARY OF METHOD BLANKS FOR MICROTOX ANALYSIS

Concentration (Percent)	Sample #	Sample ID	Initial Light Reading	5 minute Light Reading	15 minute Light Reading
0.00	80885	Column 3	93	64	57
		BLANK RATIO		1.45	1.63
0.00	80886	Column 5	72	50	45
		BLANK RATIO		1.44	1.60
0.00	80887	Column 7	64	44	40
		BLANK RATIO		1.45	1.60
0.00	80888	Column 9	59	45	41
		BLANK RATIO		1.31	1.44
0.00	80889	Column 11	62	40	36
		BLANK RATIO		1.55	1.72
0.00	81036	Control Pile	58	43	39
		BLANK RATIO		1.35	1.49

Note: Blank Ratio should be greater than 0.75

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

SIGNATURE

Director, Environmental Protection Department
By direction of
the Commander
TITLE

10 NOV 1999
DATE