mmSF
2.7 v4

FINAL REMEDIAL INVESTIGATION REPORT

VOLUME 4

Appendices

Martin Marietta Reduction Facility
The Dalles, Oregon

GERAGHTY & MILLER, INC.
Ground-Water Consultants

APPENDIX D

558/13

APPENDIX D

QUALITY ASSURANCE SUMMARY REVIEW
FOR
MARTIN MARIETTA - THE DALLES
REMEDIAL INVESTIGATION AND
FEASIBILITY STUDY

558/13

CONTENTS

Page

SECTION 1

Page

SECTION 2

Page

SECTION 3

SECTION 4

COLOR CODES FOR INFORMATION ACCESS

PINK - INDIVIDUAL LABORATORY REPORTS/DATA VALIDATION

BLUE - SUBJECT HEADER PAGE

GREEN - DATA CLASSIFICATION

TAN - QC SUPPORT DATA

NOTE: ALL LABORATORY REPORTS ARE ARRANGED IN CHRONOLOGICAL ORDER

558/11

SECTION 1

- INTRODUCTION
  - Laboratory Data Validation Process Review
  - Data Classification Process Review
- ANALYTICAL LABORATORIES AND AUDITS
  - Martin Marietta Environmental Systems
  - Laucks Testing Laboratory
  - Compuchem Laboratory, Inc.
- FIELD PROCEDURES SUMMARY
  - Sample Collection
  - Field Measurements
    - General Overview
    - Sulfate and Oxidation Screen Test
  - Field Records
    - General Overview
- ANALYTICAL METHODS
- DETECTION LIMITS
- CONCLUSION SUMMARY

558/11

QUALITY ASSURANCE SUMMARY REVIEW

INTRODUCTION

Geraghty & Miller, Inc., (G&M) was retained by Martin Marietta Corporation (MMC) to conduct a Remedial Investigation (RI) and Feasibility Study (FS) at the Martin Marietta Reduction Facility (MMRF) located at The Dalles, Oregon. A Quality Assurance Project Plan (QAPP) was prepared for the RI/FS in accordance with the U.S. Environmental Protection Agency (EPA) requirements to standardize the sampling and analysis procedures employed during the investigation. Due to the complexity and number of the RI tasks, samples from designated locations at the site were collected and analyzed at different times during the period March 1986 through August 1987.

The samples collected included soil, sediment, surface water, air, and ground water. These samples were submitted to approved analytical laboratories for chemical analyses defined by the work plan in accordance with procedures specified by the QAPP and where applicable in accordance with the EPA Contract Laboratory Program (CLP). The results of these analyses were reported separately in five major laboratory reports covering each type of sample matrix. Report No. 1 was submitted for analysis of soil, sediment, and surface-water samples collected in March 1986; report No.

2 was submitted for analysis of ground-water samples collected between August and September 1986; report No. 3 was for analysis of air samples collected between June and July 1986; report No. 4 was for analysis of additional soil and surface-water samples collected between June and August 1987; and, report No. 5 was submitted for analysis of ground-water samples collected during the months of July through September 1987.

At the beginning of this Appendix D is located a complete table of contents which enables the reader to conveniently select sections for review. Observation of this table of contents will reveal that the appendix is divided into four sections. Section 1 is introductory and describes the general procedures followed in validating and classifying the data.

Section 2 of the Appendix D documents the analytical data validation and data classification of each laboratory report developed for this investigation. This section also contains tables of supporting laboratory QA data and the control limits employed. It is important to understand that each laboratory report was validated independently using the same procedure. The results of the validation and classification for each laboratory report are included in Section 2 of the appendix report by report. Also included in each laboratory report segment of Section 2, are tables identifying the samples which had chemical parameters that failed QC criteria and had to be flagged with data qualifier codes (J, U, UJ, or R). This organizational format is easily seen by reviewing the table of contents of the appendix. The procedures followed and the forms used for summarizing the validation of each type of QC sample are taken from the procedures used by the Sample Management Office (SMO) of EPA in Washington, DC. Provided at the end of each laboratory report data validation and classification section are all of the reported quality assurance support data for that particular laboratory report in support of the conclusions reached. These data have been arranged in tables according to the type of control sample and include the appropriate QC limits and associated sample batch information.

Section 3 of Appendix D contains the comparative results of split sample analyses. Section 4 contains the support documentation for detection limits used by the laboratory and the results of two separate studies evaluating the effects of iron and the sulfide scrubber on the measurement of cyanide.

The quality assurance review of each laboratory report was conducted in accordance with EPA guidelines described in the QAPP and involved two kinds of review: (1) a Laboratory Data Validation Review, and (2) Data Classification Review. In order for the reader to understand the data validation/ classification process which is shown in Section 2, a description of the laboratory data validation review and data classification review processes are provided below.

Laboratory Data Validation Review

Validation of laboratory data was performed, where applicable, in accordance with the EPA "Functional Guidelines for the Validation of Laboratory Data for Organics and Inorganics Analyses" (Technical Directive Document No. HQ-8410-01) and the contract laboratory program (CLP) statement of work. This review is strictly an evaluation of the analytical performance of the laboratory without regard for the sample source, field procedures, or records. The information and data evaluated is divided into three categories: (1) general information, (2) inorganics data, and (3) organics data. A brief description of each is given below.

1. General Information:

   - Results of sample analyses;
   - Methods of analysis and parameters of interest;
   - Detection limits or limits of quantitation;
   - Master list of laboratory tracking I.D. numbers;
   - Sample collection dates and laboratory received dates;
   - Sample preparation and extraction dates;
   - Sample analysis dates.

A review of the above information permits the reviewer to evaluate whether requested parameters were measured by the laboratory employing the required analytical methods, within the allowable sample holding times specified in the QAPP to achieve the data quality objectives.

It should be noted that samples that exceeded holding times for analysis were flagged as unusable and new samples were collected for each one. It is recognized that data generated from samples exceeding holding times may sometimes be considered qualitative, and in some cases, this was done to help determine where additional samples should be collected. Generally, however, to avoid potential criticism, it was deemed more appropriate to recollect samples that exceeded holding times.

2. Inorganic Analysis Data:

- Concentration of calibration curve standards;
- Results of initial calibration verification standards (ICVS), percent recoveries, and expected values;
- Results of continuing calibration verification standards (CCVS), percent recoveries, and expected values;
- Results of laboratory control samples (LCS) recoveries and expected values;
- Results of the latest QC check samples recoveries, expected values, and source (Lot No. and manufacturer);

- o Results of method (laboratory control) blank analyses;
- o Results of interference check sample and dilution check sample for ICP analysis and expected values;
- o Results of laboratory duplicate analyses, relative percent difference, and control limits;
- o Results of matrix spike (digested spike) analysis, percent recovery, and control limits;
- o Results of analytical (post digested) spike analysis (furnace AAS only).

This information constitutes the reduced analytical quality control data used for evaluating whether the analysis of samples for inorganic parameters was performed in a controlled contaminant-free state providing acceptable accuracy and precision.

3. Organic analysis data for analysis by gas chromatograph/mass spectrometer:

- o Results of tuning with bromofluorobenzene (BFB) or decafluorotriphenylphosphine (DFTPP) showing compliance with acceptance criteria;
- o Documentation showing results of initial calibration;
- o Results of continuing calibration standards, including results of system performance check compounds

(SPCC) and expected value and calibration check compounds (CCC) and expected results;

- Results of water blanks, extraction (method) blanks and reagent (solvent) blanks;
- Results of matrix spike and matrix spike duplicates, percent recoveries, relative percent differences, and control limits;
- Results of surrogate spike recoveries, control limits, and a statement of control limit source;
- Results of latest independent QC (EPA or NBS traceable) check samples, the value expected for each parameter, and the source (Lot No. and manufacturer).

As with inorganic analyses, this information constitutes the reduced analytical quality control data used for evaluating whether the analysis of samples for organic parameters was accomplished in a controlled, contaminant-free state with acceptable accuracy and precision.

The process of laboratory data validation in some instances also requires a review of the raw (non-reduced) analytical data including department log (work) book entries, percent solids and dilution factor calculations, instrument strip charts and printouts, chromatograms, etc. This information including that described above for inorganic and organic analyses should be routinely reviewed by the laboratory quality assurance officer and each department supervisor prior to final report preparation and submittal. However, because of the vast quantity of data, the review by laboratory personnel does not preclude the possibility of an overlooked error. Therefore, upon delivery of each laboratory report to the project QA officer, a second data validation review of the submitted QA data was performed. During this review, sample batches not meeting quality control (QC) limit criteria were flagged with specific letter codes if they had not been previously flagged by the laboratory. For this investigation, the letter codes are J, U, and R. The explanations for each code are as follows:

J - The associated numerical value is an estimated quantity (i.e., quantitatively questionable) because quality control criteria were not completely met, e.g., matrix spike percent recoveries out of control limits or laboratory duplicates exceeding allowable relative percent differences, etc.

U - The parameter was analyzed for but was not detected. The associated numerical value is the estimated sample quantitation limit.

For this investigation, U qualifiers are only used in conjunction with J qualifiers. Samples in which analyte was analyzed for but not detected and QA samples met criteria are indicated by a "less than" (<) symbol in laboratory reports or BDL (below detection limit) in the RI report.

R - Quality control data indicates that data are unusable (compound may or may not be present). Resampling and reanalysis is necessary for verification.

As stated earlier, five major laboratory reports were developed over the two-year period of the RI. These reports included the results of analyses of submitted samples and a portion of the associated, reduced analytical quality assurance information generated by the laboratory. Full CLP deliverables were not specified by the approved Work Plan or QAPP, and therfore, were not required in the data package, although as stated earlier, full CLP protocol was followed where applicable. All of the analytical quality assurance information submitted with each laboratory report was reviewed and validated by the G&M project QA officer. The QC data described above for inorganic and organic analyses were routinely developed by the laboratory for each sampling and analysis program conducted during this investigation; however, during the early stages of the investigation (1986), the amount and type of QA data submitted with each laboratory report was not sufficient for a comprehensive data validation by the project QA officer. Consequently, for the 1986 reports, audits of the data were conducted at the laboratory facility. During these audits, at least 10 percent of the remaining QA data were reviewed. The results of these reviews are presented where appropriate in Section 2 of the appendix and are clearly stated they were obtained by audit. Supporting tables of QA data for these reports are not included in the appendix. This information is on file with the primary laboratory (Versar Laboratory, Inc., Columbia, Maryland).

More recent laboratory reports (developed in 1987) contained greater quantities of QA data because the laboratory was instructed by the project QA officer to include this information in their reports. This additional QA data enabled the project QA officer to conduct data validation of the laboratory reports without an additional on-site audit. Tables of these support data are included where appropriate in Section 2 of the Appendix D QA report.

Data Classification Review

Analytical data validation procedures only account for laboratory performance. Acceptable laboratory performance, however, must also be combined with acceptable field performance, i.e., sample collection procedures, field measurements, records, chain-of-custody documentation etc., in order for analytical data to be considered legally defensible and useful for quantitative purposes. Therefore, following the data validation review, the data were classified in accordance with procedures specified in the QAPP. These procedures were adopted from an EPA document entitled "Evaluation Criteria for Existing Data from CERCLA Study Areas," (EPA Region 8, January 5, 1985). These criteria serve as guidance for decisions regarding the acceptability of data gathered by potentially responsible parties in CERCLA cases. The contents of the EPA guidance document do not constitute rules and do not legally bind the user to the course of action suggested by the document. However, the guidelines do represent a logical and legally defensible approach to combining field data with validated analytical data to produce a level of data "use" classification. The guidelines classify data as either chemical or physical and provide the screening criteria for both classes.

Chemical Data

The screening criteria for chemical data classifies the data into three "use" categories:

1. Unusable data: These are data that may not be used because they do not meet Level A criteria or have been flagged with an R in the Laboratory Data Validation process.

2. Level A data: These are data that, following data validation, meet the first level of

screening criteria (Level A Criteria) but not the second level criteria (Level B Criteria). These data may or may not have been flagged as a J (estimated) value during data validation. These data may be used for qualitative purposes. This includes helping develop or refine study plans, evaluating different sampling or analysis techniques or identify gaps in the data base.

3. Level B data: These are data that meet both sets of screening criteria (A and B) and have not been flagged with a qualifier during data validation. This refers to use of data for quantitative purposes. These data should be fully considered when evaluating conditions such as risks, potential solutions to problems and engineering design specificaitons for remedial actions. Only data meeting Level A criteria may be considered for level B except data that have been qualified by a J flag as an estimated value during data validation.

Level A Criteria

To meet level A criteria, the following information where applicable must be fully documented through field records and/or laboratory records:

1. Sampling date;
2. Sampling team;
3. Sampling locations;
4. Physical description of the sampling location;
5. Sampling depth increment for soils;
6. Sample collection technique;
7. Field preparation techniques;
8. Sample preservation techniques;
9. Sample shipping data and laboratory analysis data;
10. Laboratory preparation techniques;
11. Laboratory analysis methods;
12. Laboratory analysis detection limits.

Furthermore, the documented data must conform to the requirements specified by the QAPP.

Level B Criteria

To be considered for level B, only the data which have met level A criteria and have not been flagged as an estimated value (J) may be considered. To meet level B criteria, three categories of information must be fully documented: (1) quantitative statistical significance, (2) custody and document control, and (3) sample represenatativeness information.

1. Quantitative Statistical Significance: To meet the requirements for this category, the following documentation must be available and meet QAPP requirements:

- Laboratory and field instrumentation, standardization, and methods;
- Sample bottle preparation;
- Procedural references and/or calibration data;
- Laboratory QC check sample standards (EPA or NBS traceable) are used at least once each three months;
- Laboratory reagent (method) blanks are analyzed at a frequency of at least 1 per 20 samples;
- Laboratory duplicates are analyzed at a frequency of at least 1 per 20 samples;
- Laboratory matrix spikes and matrix spike duplicates are analyzed at a frequency of at least 1 per 20 samples;
- Field replicates are analyzed at a frequency of at least 1 per 20 samples per matrix;
- Field splits are analyzed at a frequency of at least 1 per 20 samples per matrix;
- Presentation of QC data and acceptance criteria (control limits);

- Certification of the laboratory and/or participation in round-robin testing by EPA and/or with EPA accredited agencies;
- Quality control limits consistent with the limits established for EPA's contract laboratory program.

It should be noted that field replicates and field splits data are only used to support data validation or decisions regarding laboratory data. Because of non-detectable and non-controllable differences in matrix homogeneity, sampling technique, laboratory facilities, equipment, procedures, and personnel, it is common that differences in analytical results of replicate and split samples may exist.

2. Custody and Document Control: To meet the requirements in this category, the following documentation must be available or obtainable:

- Field custody of samples must be noted in a bound field log book;
- Transfer of Custody documentation (Chain-of-Custody forms) signed by persons/laboratories delivering and receiving samples must be available;

- Laboratory custody must be documented by Chain-of-Custody forms from field personnel or shipper;
- Laboratory custody must be documented through designated laboratory sample custodian with secured sample storage area;
- Sample identification and assigned laboratory tracking numbers must be traceable through the entire sampling and analysis system;
- Field notebook, log sheets, log books, checklists, and all custody documents must be in a secure repository under the control of a document custodian;
- All forms must be filled out completely in indelible ink without alterations except as initialed;
- Sample log sheets must be signed by the sample collector.

3. Sample Representativeness: In order for a sample to be considered representative, the following criteria must be met where applicable:

- o Compatibility must exist between field and laboratory measurements or suitable explanation of the discrepancy must be obtainable;
- o Laboratory analysis and/or sample preparation or extraction must be within allowable holding times established for the sample preservation and methods used; this is also a requirement of laboratory data validation;
- o Sample storage must have been maintained within suitable temperature, light, and moisture conditions to guarantee sample integrity;
- o Proper sample containers must have been used for the parameters analyzed;
- o Proper sample collection equipment must have been used such that the equipment would neither contribute or remove any substance to or from the sample;
- o Sample site selection criteria are consistent with the objectives of the investigation and will provide the required data.

Physical Data

The criteria for physical data are designed to classify physical data into two categories: acceptable or unacceptable, on a case-by-case basis. Full documentation is required for all physical data.

ANALYTICAL LABORATORIES AND AUDITS

Three analytical laboratories were contracted during the course of the investigation to conduct analyses of all samples. These laboratories include: (1) Martin Marietta Environmental Systems, (2) Laucks Testing Laboratory, Inc., and (3) Compuchem Laboratory.

Martin Marietta Environmental Systems

The primary laboratory for the entire investigation was Martin Martin Environmental Systems (MMES) located in Columbia, Maryland. In April 1987, MMES was purchased by Versar, Inc., but was retained as the primary laboratory for the investigation. No changes in standard operating procedures (SOP) or QA procedures were made. At the start of the investigation in March 1986, Versar (then MMES) was approved by the EPA but did not participate in the EPA's Contract Laboratory Program (CLP) for inorganic parameter analysis. During the course of the investigation in 1986, the laboratory performed successfully in performance evaluations conducted by the EPA for approval to participate in the EPA's CLP for organic parameter analysis. Subsequently, in early 1987, the laboratory was awarded four EPA CLP contracts for Volatile Organic Compound Analysis. Other certifications awarded to the laboratory include approval by the Army Corps of Engineers to perform chemical analyses of environmental samples.

The laboratory also has successfully participated for four years in the State of Florida Department of Environmental Regulation (FDER), Analytical Quality Assurance and Performance Evaluation Program; has an approved FDER Generic Quality Assurance Plan; and is in the process of being certified by the State of Florida Health and Rehabilitative Services (HRS) Environmental Laboratory Certification program.

As the primary laboratory, Versar's role in the investigation was to conduct chemical analyses of all samples submitted to the laboratory from the MMRF at The Dalles, Oregon, in accordance with methods approved by the EPA, Region X.

Two systems audits and a performance evaluation audit of MMES were conducted during the course of the investigation. These audits verified the laboratory was performing in an acceptable manner. The results of these audits have been submitted to EPA Region X in Seattle, Washington, and are on file in the central records repository for the investigation located at G&M's Tampa, Florida, office.

Laucks Testing Laboratory, Inc.

Laucks Testing Laboratory, Inc., (Laucks), located in Seattle, Washington, was initially contracted as the split laboratory for the investigation. The laboratory was on EPA's list of laboratories approved for the contract laboratory program in organics analysis. As the split laboratory, Lauck's role in the investigation was to analyze field split samples submitted for each parameter at a frequency of at least 10 percent. The methods of analysis to be used by Laucks were to be identical to those employed by MMES and approved by the EPA Region X.

Following the analysis of ground water samples in August 1986, a systems and performance audit of both Laucks and MMES was conducted by G&M. In addition to complying with the QAPP requirements, another objective of this audit was to obtain an explanation for the difference in free cyanide results reported by Laucks as compared to MMES. The audit revealed that Laucks generally exceeded allowable holding times for most samples and employed a method of analysis for free cyanide that was not approved by EPA Region X for the investigation. The results of the audit were submitted to the EPA Region X and are on file in the central record repository located at G&M's Tampa, Florida, office.

Because of the quality assurance problems created by the improper analysis of split samples submitted to Laucks, it was decided in January 1987 that Laucks be released from its contract and a new confirming (split) laboratory be contracted. To accomplish this task, prequalification systems and performance evaluation audits were conducted of three laboratories before selecting the new laboratory. These laboratories were: (1) Coffee Laboratory, Inc., Portland, Oregon; (2) Century Testing Laboratory, Inc., Bend, Oregon; and (3) Compuchem Laboratory, Inc., Research Triangle Park, North Carolina. The results of these audits have also been submitted to EPA Region X and records are on file in the central records repository for the investigation.

Compuchem Laboratory, Inc.

Based on the results of the prequalification systems audit, Compuchem Laboratory, Inc., (Compuchem) was selected as the new split laboratory for the sampling and analysis program to be conducted in 1987. This laboratory is located in Research Triangle Park, North Carolina. Compuchem is also a participating EPA CLP laboratory in both organic and inorganic analysis programs.

As the split laboratory, Compuchem's role in the investigation was to analyze field split samples submitted for each parameter at a frequency of at least 10 percent. Methods of analysis to be used by Compuchem were to be identical to those approved for use by the EPA, Region X.

FIELD PROCEDURES SUMMARY

Sample Collection and Analysis

During the course of the remedial investigation, samples collected have included soils, sediments, surface-water, ground-water, and air. These samples were collected in accordance with approved EPA sample collection procedures specified by reference in Section 6.0 of the QAPP.

The soil and sediment samples were collected using stainless steel scoops, augers, spoons, bowls, and sample splitters. Surface-water samples were collected directly into sample containers (prior to addition of preservatives) by the direct-dipping method. Ground-water samples were collected from monitor wells and production wells following a three- to five-well volume purge by either dedicated Teflon bailer, peristaltic pump, air-lift/nitrogen-lift pump, piston pumps or submersible pumps. All pumps were equipped with Teflon tubing. Air samples were collected using the Photovac TIP meter for total ionizable pollutants and Draeger tubes for hydrogen cyanide and fluoride. Air impinger samples were also collected by means of MSA or Sensidyne personal protection air monitoring pumps.

Sampling equipment was properly decontaminated, where applicable, both before and after sample collection, by approved EPA methodology. Stainless steel apparatus was first steam cleaned prior to detergent wash and rinsed with 10% nitric acid, isopropyl alcohol, and distilled water.

The samples were collected into properly labeled containers appropriate for the parameters to be analyzed. Each sample was chemically preserved in the field after sample collection with the appropriate chemical. The samples were immediately placed in coolers with "blue" ice and maintained in that manner during shipment to the laboratory. Prior to and during shipment of samples to the laboratory, sample custody was maintained as specified by the QAPP. Samples were analyzed by approved methods as illustrated in Table 1.

Finally, all samples were collected observing all appropriate health and safety precautions specified in the health and safety plan for the investigation. Ground water purged from monitor wells prior to sampling was properly containerized in 55-gallon steel drums and then disposed in a manner appropriate for protecting the environment, public safety, health, and welfare.

Field Measurements

General Overview

During the collection of samples, various types of field measurements were routinely made to: (1) ensure sample representativeness, (2) screen for potential health hazards

Table 1. Summary of Methods, Holding Times, and Preservatives

Parameter	Instrument	Method	Preservative	Holding Time
VOCs	GC/MS	624/CLP Mod. 1/	HCL to pH <2 Cool 4°C	14 days from sampling date
BNAs	GC/MS	625/CLP Mod. 1/	None Cool 4°C	Extract in 7 days from sampling date, analyze in 40
PCBs	GC/ECD	Mod. 608	None Cool 4°C	Same as for BNAs
Free Cyanide	Spectro-photometer	Std. Meth. 16th ed. 412.H	NaOH to pH> 12 Cool 4°C	Distillation - 14 days from sampling date
Total Cyanide	Spectro-photometer	Mod. 335.2 CLP 1/	NaOH to pH> 12 Cool 4°C	Distillation - 14 days from sampling date
Fluoride	TSE	340.2 + Leaching	None Cool 4°C	28 days from sampling date
Sodium	ICP/Flame AA	200.7/ 273.2	HN03 to pH< 2 Cool 4°C	6 months from sampling date
Arsenic	Furnace AA	206.2	HN03 to pH< 2 Cool 4°C	6 months from sampling date
Sulfate	IC Nephel-ometer	300.0 375.4	None Cool 4°C	28 days from sampling date
EP Tox. Metals	ICP	SW846/ 1310 CLP (metals)	None Cool 4°C	Extrction - ASAP Analysis - 6 months from sampling date

---

1/ Method is from July 1985 version of the CLP Statement of Work.

to sampling personnel, (3) screen for potential interfering substances within the sample matrix, and (4) to provide additional analytical data. These measurements were made in accordance with approved EPA, ASTM, or standard methods procedures referenced in the QAPP. The parameters measured routinely included pH, temperature, and specific conductivity of all water samples (surface water and ground water); wind direction and velocity measurements; barometric pressure; total ionizing pollutants; hydrogen cyanide gas; hydrogen fluoride gas; dust and particulate (e.g., coal tar); and sulfide and oxidizer screening tests for water samples collected for cyanide analysis.

Sulfide and Oxidizer Screen Test

The accepted analytical methods for cyanide in water require the sample either to be analyzed for the compound within one day or tested (and treated if necessary) for the presence of either sulfide or oxidizing agents, then preserved with NaOH, and analyzed within 14 days. During the initial surface-water sampling in March 1986, the sulfide and oxidizer screen tests were not employed. Subsequently, upon request from EPA Region X, a procedure was developed by MMES to screen all water samples collected for total and free cyanide for the presence of sulfide and oxidizers prior to preservation with NaOH. This procedure was approved and adopted by EPA Region X as standard operating procedure. In addition, the procedure was adopted for use during the

EXHIBIT A

NOV 4 1986

M/S 337

SUBJECT: Aqueous Sample Cyanide Preservation; Acceptance & Stipulation

FROM: Roy R. Jones, Environmental Scientist,
RQAMO/ESD

TO: All Project Officers, Field Operations and Lab Staff

A recent review of Cyanide analyses results revealed that the sample holding times were routinely being exceeded. The accepted analytical methods for Cyanide in water require the sample either to be analyzed for the compound within 1 Day or tested (and treated if needed) for the presence of either sulfide or oxidizing agents, then preserved with NaOH, and analyzed within 14 days. This information was not clearly presented in existing documents. As a result, untested, untreated but preserved samples were being held for the 14 day period.

Martin Marietta Environmental Systems (MMES), an involved contract laboratory, documented a sound approach to correct the problem. Their solution was reviewed with comment from us and EMSL, Cincinnati, and finalized per peer suggestions by MMES. As a result, the following policy is adopted by the Region 10 RQAMO:

1. The attached protocol is to be used for all future sampling for Cyanide for the reporting of data for EPA purposes and actions. The protocol should be cited in all QA plans dealing with such samples, and is to be included in all audits of such sampling operations.

2.. Alternate methods may be acceptable for screening purposes; but where used, must initially provide 10 % or more replicate samples for protocol analyses to provide for QA of the alternate method, and such methods are subject to pre-use peer review during the QAP process

Region 10 RQAMO would like to thank Gary Mckee, EMSL Cincinnati, and the developmental and QA Staff of MMES for their review, cooperation, and reiterative assistance in handling this problem. It is viwed as an on-going, evolutionary process to provide acceptable, workable solutions to complex technical/regulatory problems.

If there are comments or questions, please call me at (206) 442-7373; FTS 399-7373.

DEC 19 1986

Aqueous Cyanide Preservation Protocol
(as adopted by Region 10 RQAMO)
October, 1986

I. SUMMARY

In order to meet EPA requirements for collection of aqueous samples for cyanide analysis the spot tests for sulfide and oxidizing agents described below should be performed in the field prior to preservation of the sample with sodium hydroxide. Sulfide and oxidizing agents (e.g., chlorine) are interferences in the measurement of cyanide in aqueous samples and must be removed the day of sample collection. Samples must be analyzed for cyanide within 14 days of collection.

Note: Perform the sulfide spot test first. If positive, it may be assumed that oxidizing agents are not present and therefore the oxidizing agent test need not be performed.

II. SULFIDE SPOT TEST AND REMOVAL

A. Test Summary

In general, a small aliquot of the sample will be tested for the presence of sulfide using two techniques: the lead acetate indicator paper spot test and the cadmium nitrate powder spot test. Both tests result in a color change in the presence of sulfide. The lead acetate paper darkens in the presence of sulfide while a yellow precipitate is formed upon addition of cadmium nitrate powder. Both visual tests will be used and if positive, sulfide will be removed before sample preservation. Sulfide will be removed before sample preservation. Sulfide is removed as a yellow precipitate by the addition of cadmium nitrate powder and separated from the sample by filtration.

B. Apparatus

1. Eyedropper or Pastuer pipette
2. Plastic weighing boat or disposable beaker
   (for performing spot test)
3. Lead acetate indicator paper
4. Spatula
5. Filtration apparatus

a) A suitable apparatus of polyethlene or glass construction to rapidly filter the volume of sample needed should be used. All pieces must be thoroughly cleaned between uses to avoid contamination.

b) Filter papers of Whatman #1 grade or equivalent

C. Reagents

1. Cadmium nitrate powder $[CD(NO_3)_2]$

2. Sodium acetate buffer solution (ph 4.0)

—Dissolve 146 g anhydrous $NaC_2H_3O_2$), or 243 g $NaC_2H_3O_2$ *$3H_2O$, in 400 ml distilled water. Add 480 g conc. acetic acid, and dilute to 1 L with distilled water.

D. Procedure — Spot Test

....Collect the appropriate volume of sample (at least 1 Liter) in the plastic bottle (Note: do not preserve the sample with NaOH). Pour about 50 ml of the sample into the plastic weighing boat or disposable beaker. The spot tests will be performed on this aliquot.

1. Lead acetate indicator paper spot test

a) Moisten a strip of the lead acetate indicator paper with the sodium acetate buffer solution.

b) Using an eyedropper or Pastuer pipette, place a drop of sample to be tested on the moistened lead acetate indicator paper.

c) Observe any color change of the lead acetate indicator paper. Darkening of the paper indicates the presence of sulfide.

d) If a positive test should occur then the sulfide must be removed from the sample by precipitation with cadmium nitrate powder, followed by filtration to remove the cadmium sulfide precipitate (described below, Section E).

2. Cadmium nitrate powder addition spot test

a) Add a small portion (spatula tip) of cadmium nitrate powder to the sample aliquot. The formation of a yellow precipitate indicates the presence of sulfide.

b) If a positive test should occur then the sulfide must be removed from the sample by precipitation with cadmium nitrate powder, followed by filtration to remove the cadmium sulfide precipitate (described below, Section E).

E. Procedure -- Sulfide Removal

1. If there are any particulates present in the sample (indicated by the presence of sediment on bottom or turbid sample), and especially if metal/cyanide complexes are suspected in the sample, then the sample must be filtered (using the same apparatus and paper as for the sulfide precipitation) before sulfide removal. Save the filtered particulates for reconstitution of the sample (step 4 below) once sulfide removal has been completed.

2. To precipitate sulfide from the sample add cadmium nitrate powder in small amounts (spatula tip) until a drop of treated sample no longer causes the lead acetate indicator paper to darken and a yellow ppt. no longer forms.

3. Filter the sample to remove the cadmium sulfide precipitate. Discard the yellow precipitate.

4. Reconstitute the sample by returning the particulates removed in step (1) with the filter paper to the sample.

F. Quality Control

A clean distilled water sample should be treated as described above at a frequency of 1 per 10 samples. Label the sample as a cyanide spot test blank (e.g., CN spot test BLK) and note the group of corresponding samples if more than one CN spot test blk was run that day. Send samples to the laboratory for cyanide analysis. This procedure checks for contamination introduced during sample pretreatment.

III. OXIDIZING AGENT SPOT TEST AND REMOVAL

A. Test Summary

In general a small aliquot of the sample will be tested for the presence of oxidizing agents (e.g., chlorine) using potassium iodide-starch indicator paper. A bluish discoloration of the potassium iodide-starch paper indicates the presence of oxidizing agents. Oxidizing agents can be removed by the addition of ascorbic acid.

B. Apparatus

1. Eyedropper or Pastuer pipette

2. Spatula

3. Filtration apparatus

a) A suitable apparatus of polyethylene or glass construction to rapidly filter the volume of sample needed should be used. All pieces must be thoroughly cleaned between uses to avoid contamination.

b) Filter papers of Whatman #1 grade or equivalent

C. Reagents

1. Potassium iodide-starch indicator paper
(KI-starch paper)

2. Ascorbic acid, crystal ($C_6H_8O_6$)

3. Sodium acetate buffer solution (ph 4.0)

Dissolve 146 g anhydrous $NaC_2H_3O_2$, or 243 g $NaC_2H_3O_2$ $3H_2O$, in 400 ml distilled water. Add 480 g conc. acetic acid, and dilute to 1 L with distilled water.

D. Procedure

1. The sample aliquot collected for the spot test procedure, Section II, D above, may be used for this test.

2. Potassium iodide-starch indicator paper spot test.

a) Moisten a strip of KI-starch paper with the sodium acetate buffer solution.

b) Using an eyedropper or Pastuer Pipette, place a drop of sample to be tested on the moistened KI-starch paper.

c) Observe any color change of the KI-starch paper. A bluish discoloration of the paper indicates the presence of oxidizing agents.

d) If a positive test should occur then the oxidizing agents must be removed by the addition of ascorbic acid.

e) If there are any particulates present in the sample, and especially if metal cyanide complexes are suspected in the sample, then the sample must be filtered before oxidizing agents are removed. Save the filtered particulates for reconstitution of the sample (step h) once oxidizing agents have been removed.

f) To remove oxidizing agents in the sample, add 0.6 g of ascorbic acid and retest with the KI-starch paper. Repeat addition if necessary.

g) When a drop of treated sample no longer discolors the KI-starch paper an additional 0.6 g of ascorbic acid should be added to the sample.

h) Reconstitute the sample by returning the particulates removed in step (e) with the filter paper to the sample.

E. Quality Control

A clean distilled water sample should be treated as described above at a frequency of 1 per 10 samples. Label the sample as a cyanide spot test blank (e.g., CN spot test BLK) and note the group of corresponding samples if more than one CN spot test blk was run that day. Send samples to the laboratory for cyanide analysis. This procedure checks for contamination introduced during during sample pretreatment.

References:

1. USEPA 40 CFR Part 136, Federal Register, Vol. 49, No. 209, October 26, 1984, and Vol. 50, No. 3, January 4, 1985.

2. Standard Methods for the Examination of Water and Waste Water, 16th Edition, 1985.

Remedial Investigation and carried out in a small field laboratory set up at the site. A copy of the protocol is included as Exhibit A. Following institution of this procedure, all water samples to be analyzed for cyanides were screened for sulfides and oxidizers prior to addition of preservatives. No positive responses were observed with any water samples. All positive and negative controls were satisfactory.

Field Records

General Overivew

Field records employed for the project include bound, sequentially numbered master log books for recording all sample identifications, parameters, methods of analysis, chain-of-custody numbers, sample preservation, container type, field mesurements, sample collection and shipping dates, cooler identification, receiving laboratory, bill of lading numbers, common carriers, sample team identification and sample custodian signatures; a daily log for workers activities, soil/sediment log sheets (only for 1987 sampling), water sampling log sheets, instrument calibration log books, chain-of-custody forms, geological sample core log sheets, QA/QC sampling checklists (1987 sampling), and copies of shipping records (bill of lading or air bill).

573/13

ANALYTICAL METHODS

All analytical methods employed in this investigation were consistent with the methods specified by the QAPP and contained in the Standard Operating Procedures and Quality Assurance Manuals of each laboratory used during the investigation. These manuals have been approved by EPA Region X and are on file with the EPA and in the Central Records Depository for the project located at Geraghty & Miller, Inc.'s Tampa, Florida office. A list of analytical methods is presented in Table 1 page D-26 in this Section and in Section 2 with the data validation of each laboratory report.

DETECTION LIMITS

General Principles

In order to effectively describe how the detection limits for the RI were developed, it is first necessary to define some terms that are frequently misused or misunderstood.

The limit of detection (LOD) as defined by the American Chemical Society (ACS) is the lowest concentration level that can be determined to be statisticaly different from a blank. Additional concepts include the method detection limit (MDL) which is defined as the lowest concentration of analyte that a method can detect reliably in either a sample or blank; and the instrument detection limit (IDL) is the smallest signal above background noise that an instrument can reliably detect. Sometimes, depending on the particular analytical procedure, the IDL and LOD can be the same. The recommended value of LOD is 3 SD and LOD is numerically equivalent to the MDL as the laboratory blank value approaches zero.

Another term of significance is the limit of quantitation (LOQ). The LOQ is defined as the level above which quantitative results may be reported with a specified degree of confidence. Obviously, confidence in the apparent analyte concentration increases as the analyte signal (instrument signal measurement) increases above the LOD. The maximum recommended value for LOQ is 10 SD but may be less depending upon the method and professional considerations. This corresponds to an uncertainty of ±30% in the measured value at the 99% confidence level. The LOQ is most useful for defining the lower limit of the quantitative range of measurement methodology. This range extends from this lower value to an upper value where the response is no longer linear and sometimes is referred to as the limit of linearity. The following table presents some ACS recommended guidelines for reporting data.

Analyte Concentrations in Units of SD	
<3 SD	Region of questionable detection (and therefore, unacceptable)
3SD	Limit of Detection (LOD)
3 SD to 10 SD	Region of less certain quantitation
10 SD	Limit of quantitation (LOQ)
> 10 SD	Region of quantitation

LABORATORY DETECTION LIMIT DETERMINATIONS FOR THE DALLES, RI

The reported detection limits employed for laboratory reports submitted by Versar are LOQ's. The LOQ's were determined by first deriving the IDL or LOD. In the above described determinations, the IDL and LOD were equal when the method did not require a distillation, dilution, or concentration step in the procedure.

Determination of IDL

The IDL or LOD for the organics analyses conducted by Versar were determined using the procedure specified in the U.S. EPA Contract Laboratory Program Statement of Work, July 1985 Revision, Page A-4, Paragraph C. This method requires the analyst to perform three analyses of standards (prepared from standard reference materials) for all components being measured at 3 to 5 times the required detection limit concentrations specified by the CLP Statement of Work. These analyses are required to be performed using the instrumental conditions specified by the CLP Statement of Work on standards in solvent for base-neutral and acid- extractable organic compounds and PCB's and on standards diluted into reagent water for volatile organics. The IDL's are calculated as three times the standard deviation of the measured value. In actual practice, for volatiles, Versar analyzed the standard sample by making seven replicate measurements instead of the required three; semi-volatiles

LOD's were determined using the required three measurements. For inorganics analysis, the IDL was determined using the procedure specified in the U.S. EPA CLP Statement of Work, 7/85 Revision for inorganics analysis, page E-4 for all parameters of interest. This method requires the IDL to be determined by multiplying by 3, the average of the standard deviations obtained on three nonconsecutive days from the analysis of a standard solution (each analyte in reagent water) prepared at a concentration three to five times the CLP required detection limit with seven consecutive measurements made per day.

Determination of LOQ

For volatile organic compounds and semi-volatile organic compounds for which there is a Contract Laboratory Program Contract Required Quantitation Limit (CLP-CRQL), the reported LOQ was established as equal to or less than the CLP-CRQL. There were several compounds of interest in this program that have no CLP-CRQL. The LOQ for these compounds have been set between 3 to 10 times the average standard deviation determined by the detection level (IDL) study, with the exception of Trichlorofluoromethane and Benzidine. For Trichlorofluoromethane, 10 times the average standard deviation is 3, whereas, the reported LOQ is 5. This number was adopted arbitrarily to allow easier preparation of standards. For Benzidine, the reported LOQ is 80 ug/L based on the CLP-CRDL (Contract Required Detection Limit) for Benzidene from pre-1985 revisions of CLP.

In some cases, the EPA CLP-CRQL were not met and are indicated as such in Section 4.0 of the Appendix D, Item 1.0, Table 2. The compounds in which the calculated IDL was greater than the reported LOQ include: 4-chloro-3-methylphenol, 2,4-dinitrotoluene, hexachlorocyclopentadiene, and N-nitrosodiphenylamine. In these instances, the difference between the IDL and the reported LOQ (for water matrices) for each of these compounds is 7, 5, 7, and 9 parts per billion (ppb), respectively. The derivation of the LOQs for these compounds and other volatile and semi-volatile organic compounds in soil matrices is based upon a calculation method presented in Section 4.0 which employs the IDL determined for each compound in a water matrix. Soil LOQs are presented for volatile organic compounds in Section 4.0 of the Appendix D, Item II, Section I, Table 7 and for semi-volatile organic compounds in Section 4.0 of the Appendix D, Item I, Table 2.

For inorganic parameters, the determined LOQ was computed as a value three to five times the LOD. Generally, if it was determined that the computed LOQ was a value lower than the Contract Laboratory Program Contract Required Quantitaion Limit (CLP-CRQL), the reported LOQ was defaulted to the CLP-CRQL. This applied to those parameters for which there exists a CLP-CRQL. For those parameters analyzed in the RI for which no CLP-CRQL exists, the LOQ was also established as described above and then defaulted to a concentration value set below the U.S. EPA drinking water standards when available or the published detection limit for the EPA method.

Variable Detection Limits

Reviewers of the inorganic data sometimes are confused because the actual LOQ for each sample appears to vary. This is because the LOQ calculation described above is based on measurement of the analyte under ideal analytical conditions (eg., the determination is on a standardized analyte suspended in a pure reagent water matrix). Because sample analysis varies acording to sample size, dilution, matrix, etc., the LOQ will also vary. This is particularly true with soil matrices because CLP requires that inorganic values be reported on a dry weight basis. This requires determining the percent solids of each sample and entering that data into final calculations. As an example, the LOQ for a particular analyte to be measured in a soil matrix will first be determined in a reagent water matrix and converted to soil concentration units by the calculation:

$$\frac{[\text{ A mg/L }] \times [\text{ Final Volume (ml) }]}{\text{B (grams) / \% Solids}} = \begin{array}{l}\text{mg/kg}\\ \text{(dry weight)}\end{array}$$

where:

A = the concentration of the analyte in a reagent water matrix at the LOQ determined for water;

B = the weight of the soil aliquot normally used in analyzing the soil sample

An assumption is made in this calculation that the soil is 100% solid. Therefore, the % solids is equal to 1. It can be seen from this calculation then that the LOQ for any particular soil sample will vary as a function of the percent solids.

The LOQ's and supporting documentation for LOD determinations performed for this investigation are presented in Item I and Section 1 of Item II of Section 4 of this appendix.

CONCLUSION SUMMARY

Soil, sediment, surface-water, ground-water and air samples were collected and analyzed during the period March 1986 through September 1987 at the Martin Marietta Aluminum Reduction Facility, The Dalles, Oregon, as part of the Remedial Investigation and Feasibility Study (conducted by Geraghty & Miller, Inc.). The results of the analysis of these samples by the primary laboratory, Versar, Inc. (formerly Martin Marietta Environmental Systems) have been submitted in five separate laboratory reports entitled: (1) Results of Chemical Analysis of Soil, Sediment, and Surface-Water Samples Collected During 19-28 March 1986; (2) Results of Chemical Analysis of Ground-Water Samples Collected During 26 August to 4 September 1986; (3) Results of Chemical Analysis of Air, Drilling Fluid, and Tank Truck Samples Collected Between 4 June and 25 July 1986; (4) Results of Chemical Analysis of Soil and Surface-Water Samples Collected Between 22 and 26 June and on 2 August 1987; and (5) Analytical Data for Aqueous Samples Collected Between 27 July and 1 September 1987.

Validation and classification of the analytical data presented in these reports was conducted for each report independently according to EPA Sample Management Office (SMO) procedures described in the introduction. The detailed results of the validation and the classification are presented in Section 2 (Laboratory Data Validation, Data

Classification, and Quality Control (QC) Support Data). During validation, analytical data was categorized using standardized SMO forms as either "Acceptable," (i.e., meeting applicable QC criteria established in the EPA Functional Guidelines as defined in the QAPP); "Provisional," (i.e., only partially meeting the QC criteria); or "Unacceptable," (i.e., not meeting any of the QC criteria). These terms (Acceptable, Provisional, and Unacceptable) were not described earlier in the Introduction but were used as the organizational and summarizying steps followed during the analytical data validation.

Analytical data that was rated "Acceptable" received no qualifier codes; data that was rated "Provisional" was flagged with qualifier codes J, U, or UJ as required by the EPA Functional Guidelines; and, data rated "Unacceptable" was flagged R. It should be noted that when parameters analyzed in batch QC samples did not meet acceptance criteria (were rated Provisional), the same qualifier codes were also applied to the other samples analyzed within the same batch as required by the validation guidelines.

In summarizing the overall laboratory data validation, a majority of the analytical data was rated "Acceptable." No data was rated "Unacceptable" excepting those few samples which exceeded holding times. In these cases, the samples were recollected and analyzed. All data flagged with qualifier codes have been summarized for each laboratory report in tables entitled "Data Qualifiers." Where required, a Data Qualifier table is presented for each of the five major laboratory reports in the Data Validation Component of Section 2 of this appendix. These tables list the samples and parameters that have been flagged with the data qualifier codes and provides a brief explanation of the reason for the qualification.

To assure the validity of the analyzed samples, Field Data Packages associated with each sample submitted for analysis were further evaluated to provide an overall "use" classification for the validated analytical data. Data was classed as Unusable, Level A (qualitative data) or Level B (qualitative and quantitative data). These classifications were described earlier in the introduction and conform to procedures described in the QAPP. Using this system, analytical data rated "Acceptable" was classified for use as either Unusable, Level A or Level B based on the review of the field data. "Provisional" data was similarly classified based on the review of the field data but applicable "use" classes only included Unusable or Level A. Provisional data was not classified to a level greater than qualitative use. "Unacceptable" analytical data was classed as Unusable. A flow chart (Figure 1) is presented to help illustrate the overall data validation and classification process.

The laboratory QC difficulties observed that resulted in data being flagged were few but include the following:

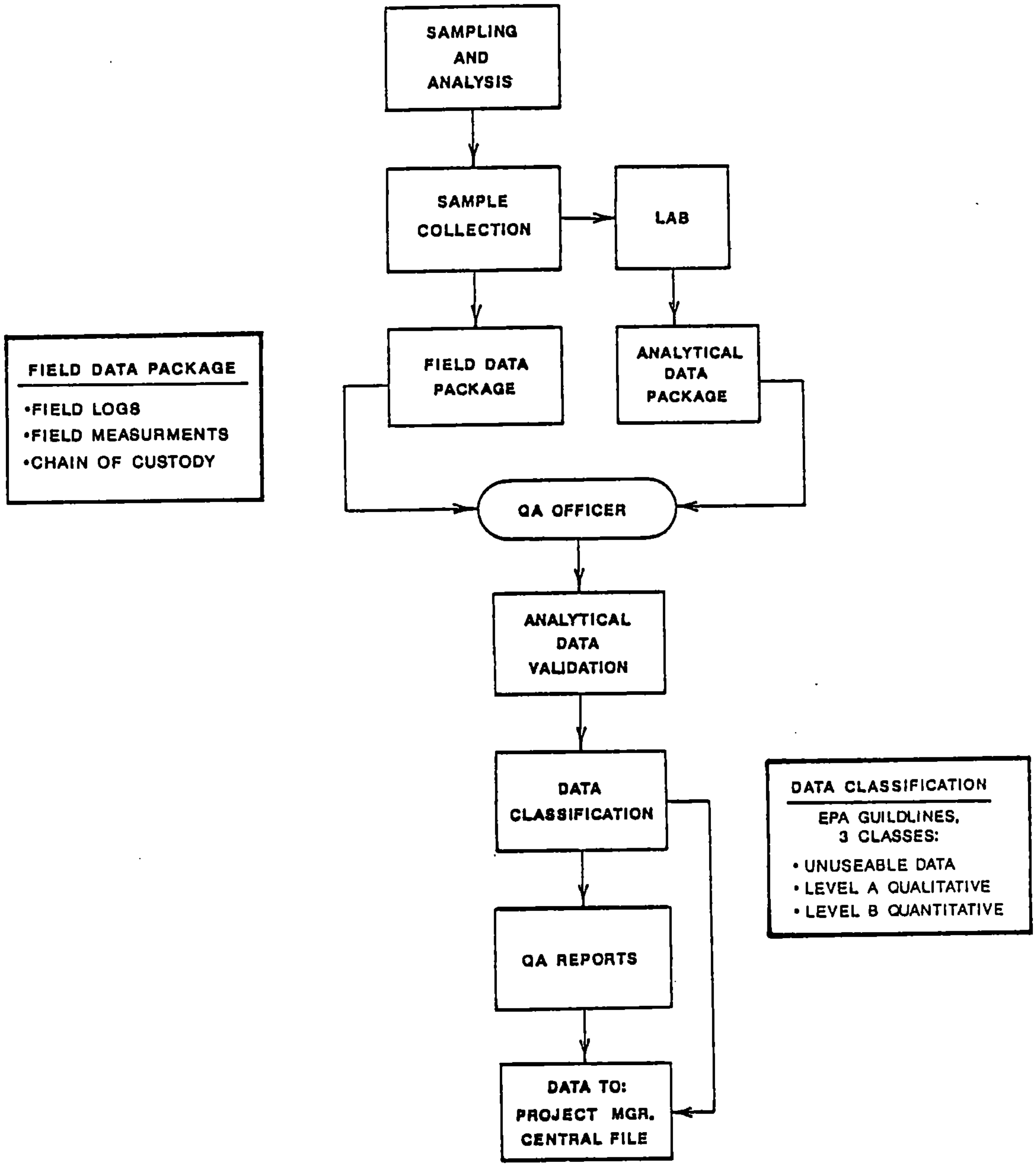


Figure 1.

Data Validation Flow Chart.

1. Occasional exceedence of holding times by laboratories;

Holding times were exceeded by Versar only for a few samples during the course of the investigation. In all cases, immediate notification was given by the laboratory to the project QA officer, or field manager and holding time exceedences were properly noted in laboratory reports. All samples that exceeded holding times were recollected and properly analyzed within required holding times.

Holding times were exceeded frequently by Laucks Laboratory resulting in most of the Laucks field-split data being flagged as estimated and classified for qualitative use only. This problem was resolved by contracting Compuchem Labortories as the split laboratory for the project. Compuchem generally did a good job analyzing samples within required holding times. Holding times, however, were exceeded on a few samples; three ground-water samples for sulfate and fluoride and one surface-water sample for fluoride. The data for these samples have been flagged with a J.

2. Initial Calibration Verifictaion Standards (ICVS) and Continuing Calibration Verification Standards (CCVS) for Sulfate were outside Control limits.

This problem was only observed to occur during the analysis for sulfate in three batches of ground-water samples collected between July and September 1987. The ICVS and CCVS percent recoveries (%R) were slightly below the required 90-110% control limits but were still greater than 50% R. The data for these samples was flagged J in accordance with the guidelines. All other QC data was within control limits.

3. Sample Misidentification

Only one instance of sample misidentification appears to have occurred during the investigation. This occurred during the analysis of two surface-water samples collected from the landfill ditch in January 1987. The misidentification appears to have occurred in the organic extractions laboratory during sample extraction for base/neutral and acid extractables. The two sample extracts appear to have been reversed. This could not be verified so the data was flagged. A discussion of this is presented in the data validation and classification components of Section 2. These samples were also recollected and reanalyzed.

4. Contaminated Laboratory Method Blanks

Laboratory blanks including extraction blanks were generally not a problem. Only two instances occurred during the investigation in which laboratory blanks appeared to have contaminants. The first instance involved a method blank for metals analysis prepared by Versar (MMES) during the analysis of soil, sediment, and surface-water samples collected in March 1986. The contaminants were trace amounts of mercury and zinc and the source was traced back to the laboratory. The problem was corrected and never appeared again in subsequent analyses. No data was compromised by this blank.

The second instance of blank contamination occurred in June of 1987 during the analysis of surface-water samples collected from the landfill ditch. A low concentration of bis(2-ethylhexyl) phthalate was detected in an extraction blank for base and neutral extractable organic compounds. The concentration of the parameter in the blank was similar to the concentrations of the parameter measured in samples extracted at the same time. The data was flagged (UJ).

5. Matrix spike percent recoveries in the analysis of free cyanide in soil samples and total cyanide in some ground-water samples were outside control limits.

   The analytes in question (i.e., free cyanide and total cyanide) and their methods of analysis are independent of each other and based on slightly different principles. Therefore, the following discussion addresses the QA problems encountered with each method separately.

   Free Cyanide in Soil: Throughout the investigation, it has been observed that matrix spike percent recoveries from the analysis of "free" cyanide in soil samples collected at the site have consistently (except for one batch) been lower than QC limits. This has led to considerable speculation and debate as to the cause of this observed phenomenona, its interpretation, as it applies to the values of free cyanide measured in the samples and also the validity of the analytical method employed in this investigation for the analysis of free cyanide.

In discussing the method employed for the analysis of free cyanide in soil and ground-water samples, it must first be noted that there is currently no regulatory definition for "free" cyanide, nor is there a commonly accepted definition based on an analytical method (see Federal Register, Vol. 51, No. 238, page 44720, 11 Dec. 1986, Hazardous Waste Management System: Land Disposal Restriction; proposed rule). The term free cyanide generally refers to the total of CN^- and HCN, the ratio of which in water is a function of pH and the degree of dissociation of simple and complex cyanides. For this investigation, Method 412.H from Standard Methods for the Examination of Water and Wastes, 16th edition was used. This method measures the free and potentially or readily dissociable cyanide species such as the simple alkali cyanide (i.e., NaCN, KCN, and NH_4CN) and some metal cyanides (i.e., mercuric, cadmium, nickel, copper, and zinc cyanides (see ASTM, 1987 Standard Test Methods for Cyanide in Water, D-2036). This ASTM reference states that the weak and acid dissociable method measures "all but the most refractory metal-cyanide complexes."

The principle of this method is based on converting to HCN gas, those readily dissociable cyanide species in a slightly acidified (pH, 4.5 to 6.0 using acetate buffer) sample during a 1-hour reflux distillation and absorbing in a sodium hydroxide solution the HCN that is purged from the sample by an air stream. The breakdown of iron cyanides is prevented by eliminating the $MgCl_2$ catalyst used in the total Cyanide Method 335.2 and adding zinc acetate to render the iron cyanides insoluble. Cyanide in the distillate is then measured colorimetrically. Thus, the method is designed not to recover CN^- from the tightly bound complexes such as iron cyanide, that would not be amenable to oxidation by chlorine.

The method, 412.H Weak and Dissociable Cyanide, was selected for this investigation because the somewhat less vigorous conditions of the procedure (pH only 4.5 to 6.0) make the test slightly more comparable to environmental conditions than the cyanide-amenable-to-chlorination procedure. Also, the analytical protocol of Method 412.H provides better control of test conditions and the method is not subject to interferences from unidentified organic chemicals which may occur with the cyanide-amenable-to-chlorination procedure. Thus, because the method measures those cyanide complexes capable of readily dissociating and forming HCN, this method was most representative of "free" cyanide as defined analytically and toxicolgically by Standard Methods and ASTM.

From this point of view, the method is an exceptionally valid method, barring the presence of interfering substances such as oxidizers and sulfides. These compounds will interfere with the cyanide analysis by destroying cyanide or converting it to thiocyanate which is not measured by the method. To account for these interferences, water samples were screened prior to preservation for the presence of these substances and all samples (water and soil) were prepared (distilled) with a sulfide scrubber (lead acetate scrubber) attached to the distillation flask to assure removal of sulfide. The use of this scrubber during the distillation process was a requirement added to the cyanide analysis by EPA Region X.

Another point that should be brought out is that a study measuring the total iron concentrations of soil samples compared to cyanide concentrations was conducted on selected soil samples from the site in which matrix spike recovery problems were experienced. This data is presented in section four of the appendix. The study revealed that significant concentrations of total iron (both ferrous and ferric) and leachable iron were present in the tested soil samples. Therefore, it is hypothesized that a possible cause of the low matrix spike recoveries may be the presence of soluble iron species in the sample acting to bind up the potassium cyanide spikes added to the reaction vessel prior to reagent addition and refluxing. It is proposed the soluble iron species may be forming insoluble iron cyanide complexes with the matrix spike cyanide.

Thus, when reagents are added, the zinc acetate which acts to precipitate out iron cyanide complexes in the sample preventing their conversion to HCN and eventual measurement may also be binding the matrix spike cyanide as an insoluble iron cyanide complex resulting in a lowered spike recovery. It is understood, however, that this explanation is theoretical since the results of the iron study are inconclusive. Additional research on this hypothesis by qualified analysts is required for verification and substantiation.

An additional factor that may have contributed to the low matrix spike recoveries is the use of the sulfide scrubber on the distillation apparatus. A separate study investigating this possibility was undertaken during the course of the RI by Versar Laboratory. The results of this study are also presented in section four of the appendix along with the iron study. An attempt was made to obtain independent quality assurance information on this subject from EPA's Environmental and Monitoring Support Laboratory (EMSL) in Cincinnati, but quality assurance information was not available from this source on the effects the sulfide scrubber has on recovery of the cyanide analyte. The results of the study conducted by Versar, however, appear to indicate the sulfide scrubber may act to lower the recovery of the analyte and matrix spikes. However, it is understood that the Versar sulfide scrubber study is potentially subjective, and further research by other qualified analysts is required to verify the findings.

Therefore, in conformance with the EPA laboratory data validation guidelines, all samples analyzed for free cyanide in a batch having a low matrix spike were flagged "J" to indicate they are estimated. It is also recognized, however, that although these samples have been flagged "J" as estimated values, the method appears to be the best method currently available for measuring weak acid dissociable cyanide, and therfore, the free cyanide values in soil have been used quantitatively in the RI, providing all other QC criteria for the analysis were satisfactory.

Total Cyanide in Ground Water: Matrix spike percent recoveries in the analysis of total cyanide in two batches of ground-water samples collected in August 1987 were low and outside CLP control limits. All other QC data for these samples were within required control limit criteria. In accordance with the EPA laboratory data validation guidelines, all samples analyzed for total cyanide in a batch having a low matrix spike were flagged "J" to indicate they were estimated values.

The method employed for the measurement of total cyanide in this investigation was EPA Method 335.2 and employed the addition of a lead acetate, sulfide scrubber in accordance with Section 8.2 of the method as per EPA Region X directions. The principle of this method involves converting to HCN gas, most of the cyanide complexes (strong, weak, and free) contained within the samples, by means of a rigorous reflux-distillation operation carried out in a sealed distillation flask with heat and in the presence of strong acid (sulfuric acid) and a magnesium chloride catalyst. The released HCN is absorbed for measurement in a scrubber containing sodium hydroxide solution and the absorbed cyanide is then measured colorimetrically or titrametrically. For the RI, the colorimetric method of measurement was employed.

As stated above, the method measures most species of cyanide; however, because of the catalytic decomposition of cyanide in the presence of cobalt at high temperature in a strong acid solution, cobalticyanide is not recovered completely. Evidence also appears to indicate that complexes of cyanide with the nobel metals (gold, platinum, and palladium) are also not fully recovered by the distillation procedure.

It is known that certain substances in the sample can interfere with the recovery of cyanide from the sample. Most interferences, however, are eliminated or reduced by using the distillation procedure. Certain interfering substances, notably sulfide and oxidizing agents, are not removed by distillation and samples must be prescreened for these substances. If these substances are present, the sample should be pretreated. The procedures for accomplishing this task are described in the method and were strictly followed during the course of the RI (except during the initial sampling performed in March 1986).

Since sulfide was thought to be the most prevalent matrix interference, all aqueous samples (except the surface-water samples collected in March 1986) were field tested before preservation for the presence of sulfide and oxidizer compounds. In addition, bound sulfide, which is released during sample distillation in the laboratory and is not detected by the field screening test was theoretically removed by using the lead acetate scrubber.

In all the sulfide screening tests conducted at the site on every surface or ground-water sample, no positive sulfide or oxidizer screening tests were observed. As discussed previously for free cyanide, one possible factor that may be contributing to the matrix spike recoveries was the use of the sulfide scrubber during distillation. As discussed previously, a study was undertaken during the course of the RI to determine the affect of the sulfide scrubber on cyanide recovery. The results of that study, presented in Section

Four of the appendix, appear to indicate the scrubber may have the affect of lowering the recovery of cyanide including matrix spikes. Again, it is understood that the scrubber study may be subjective.

Since ground-water samples were generally silty, it is also possible some other unidentified compound or substance may have been present in ground-water samples and acted to cause the observed low matrix spike recoveries.

It is further noted that the low matrix spike recoveries only occurred in the total cyanide analysis of two batches of ground-water samples collected in August 1987. Earlier analyses did not appear to have a matrix spike recovery problem for total cyanide in either water or soil matrix. The possibility of a laboratory error in spiking samples for the analysis of these two sample batches cannot be ruled out. However, other QC data was within required control limits.

Conclusion: To conclude the discussion on matrix spike recoveries in free and total cyanide analysis, it must be pointed out that as of this date, to our knowledge, an interlaboratory method study for cyanide has not been performed for ground water and soil matrices. Therefore, the CLP-M QA/QC acceptable spike recovery and relative percent difference (RPD) control limits appear to be excessively stringent for soil samples. This point is further supported by the fact that there are no procedures for the removal of potential analytical interfering substances (except for sulfides released during distillation that are removed by the sulfide scrubber) from soil. Data generated from analysis of soils, therefore, should not be required to be invalidated on the basis of apparently arbitrarily assigned QC control limits. This is particularly true for Weak and Dissociable Cyanide Analysis since the CLP control limits have only been developed for total cyanide.

6. Laboratory duplicates for total cyanide in ground water outside CLP Relative Percent Difference (RPD) control limits.

Laboratory duplicates for total cyanide in ground-water samples were outside CLP RPD control limits in two batches of samples collected August 1987(see pages 643, 669, 751, and 760). Since ground-water samples containing considerable amounts of silt were analyzed unfiltered, it is believed these high RPD's were due to sample inhomogeneity.

The functional guidelines for data validation require flagging with "J" all samples of a batch having a laboratory duplicate with a high RPD outside control limits, as estimated. However, although this procedure was followed, (see page 643) a review of other batch QC data revealed no discrepancies, and it is felt the data may be considered valid for quantitative use.

Conclusion: No other significant quality assurance deficiencies were noted.

SECTION TWO

LABORATORY DATA VALIDATION,
DATA CLASSIFICATION, AND
QC SUPPORT DATA

LABORATORY DATA VALIDATION OF RESULTS OF CHEMICAL ANALYSIS OF SOIL, SEDIMENT, AND SURFACE-WATER SAMPLES COLLECTED DURING 19-28 MARCH 1986 ACCORDING TO THE WORK PLAN OF THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY AT THE MARTIN MARIETTA REDUCTION FACILITY, THE DALLES, OREGON

REPORT SUMMARY

Soil - 1986

Between March 24 and May 13, 1986, ten composite soil samples were submitted to MMES along with four aqueous field blanks. Five of the soil samples and three of the aqueous field blanks were analyzed for free cyanide, fluoride, and sodium. The results of these analyses were presented in a report entitled, "Results of Chemical Analysis of Samples Collected During 19-28 March 1986 According to the Work Plan of the Remedial Investigation and Feasibility Study at the Martin Marietta Reduction Facility, The Dalles, Oregon."

The remaining five composite soil samples were submitted for landfill waste characterization studies. These samples were analyzed for total cyanide, fluoride, sodium, EP Toxicity metals, volatile organic compounds (VOCs), base/neutral and acid extractable organic compounds (B/N/A) and polychlorinated biphenyls (PCBs). The results of these analyses were presented in a report entitled, "Results of Chemical Analyses of Soil Samples Collected 10 May, 1986, According to the Work Plan of the Remedial Investigation and Feasibility Study at the Martin Marietta Reduction Facility, The Dalles, Oregon."

Sediment - 1986

Results of analyses of the sediment samples collected during March 19-28, 1986, were presented in a report entitled, "Results of Chemical Analysis of Samples Collected During 19-28 March, 1986, According to the Work Plan of the Remedial Investigation and Feasibility Study at the Martin Marietta Reduction Facility, The Dalles, Oregon."

A total of 30 sediment samples were submitted from seven different locations at MMRF along with seven aqueous field blanks and 12 aqueous trip blanks. These were selectively analyzed for free cyanide, fluoride, arsenic, sodium, EP toxicity metals, VOCs, B/N/As and PCBs.

Surface Water - 1986

Analyses of surface-water samples collected during March 19-28, 1986, were presented in a report entitled, "Results of Chemical Anaysis of Samples Collected During 19-28 March, 1986, According to the Work Plan of the Remedial Investigation and Feasibility Study at the Martin Marietta Reduction Facility, The Dalles, Oregon." A total of 38 surface-water samples from six locations at the site were submitted along with six aqueous field blanks and 23 aqueous trip blanks. These were analyzed for total cyanide, free cyanide, fluoride, arsenic, sodium, sulfate, EP toxicity metals, VOCs, B/N/A's, and PCBs.

558/5

LABORATORY DATA VALIDATION SUMMARY
MARTIN MARIETTA - THE DALLES
QUALITY ASSURANCE REVIEW
SOIL/SEDIMENT/SURFACE WATER
SAMPLES COLLECTED
MARCH 1986

DATA QUALIFIERS

Matrix	Qualifier	Sample	Lab ID	Parameter	Explanation
	J	Batch 1			
Sediment		2806	2806	Free Cyanide	Matrix spike low % R due to matrix interference, cause unknown, believed interference associated with leachable ferrous and ferric ions in soil samples matrix
"		SSPIAS	2792		
"		SSPIBS	2793		
"		SSPICS	2794		
"		SSPIDS	2795		
"		SSP2ES	2796		
Water		TB3	2797		
Sediment		SSP2FS	2798		
"		SSP3GS	2799		
"		SSP3HS	2800		
"		SSP4IS	2801		
"		SSP4JS	2802		
Water		TB29	2803		
"		SSPFBS	2804		
	J	Batch 2			
Surface Water		DPGW	2620	Free Cyanide	Matrix spike low % R due to matrix interference cause unknown, maybe attributed to iron in water or low concentration of spike (10 ug/L), or possible presence of sulfide in water.
		DPGW	2612		
"		DPGW	2613		
"		DPFBW	2614		
"		TB1	2615		
"		RPEW	2616		
"		RPFW	2617		
"		DPEW	2624		
"		DPEW	2625		
"		RPIW	2626		
"		RPW	2649		
"		RPW	2650		
"		DPGW	2598		
"		DPBW	2599		
"		DPAW	2600		
"		TB22	2601		

Surface Water (Cont'd).

Matrix	Qualifier	Sample	Lab ID	Parameter	Explanation
Surface Water	J	DDBW	2606		
		RPFBW	2603		
	J	Batch 3			
Soil		MPAS	2733	Free Cyanide	Matrix spike low % R due to matrix interference cause unknown, believed associated with leachable ferrous and ferric ions in soil matrix.
Sediment		DDASG	2712		
"		DDBSG	2714		
"		DDDSG	2725		
"		DDESG	2726		
Soil		RRAS	2730		
"		RRRS	2731		
"		OCAS	2732		
"		OCS	2718		
Sediment		SDAS	2720		
Sediment		DPAS	2632	Free Cyanide duplicate	Matrix spike low % R due to matrix interference, cause unknown, believed interference associated with leachable ferrous and ferric ions in soil matrix.
"		DPAS	2633		
Water		DPFBS	2634		
	J	Batch 4			
Surface Water		DPAW		Arsenic (total)	Matrix spike low % R low.
		DPBW			
"		DPCW			
"		DPDW			
"		DPEW			
"		DPFW			
"		DPGW			
"		DPHW			
"		DPIW			
"		DPFBW			

METHODS SUMMARY

SUMMARY OF METHODS AND HOLDING TIMES

Parameter	Instrument	Method Reference	Holding Time
VOCs	Finnigan GC/MS	Modified 624/CLP (7/85)	14 days from sampling date
BNAs	Finnigan GC/MS	Modified 625/CLP (7/85)	Extracted within 14 days from sampling date*
PCBs	GC/ECD	Modified 608	Extracted within 14 days from sampling date*
Free cyanide	Spectrophotometer	Std. Meth. 412 B,D,H	Distillation - 14 days from sampling date
Total cyanide	Spectrophotometer	Modified 335.2/ CLP (7/85)	14 days from sampling date
Fluoride-water	Ion chromatograph	300.0	28 days from sampling date
- sludges/soils	Ion selecteve electrode	340.2 + leaching	28 days from sampling date
Sodium	ICP/flame AA	200.7/273.2	6 months from sampling date
Arsenic	Furnace AA	206.2	6 months from sampling date
Sulfate	Ion chromatograph	300.0	28 days from sampling date
EP tox metals	ICP	SW 846/1310 CLP (metals)	Extraction - ASAP Analysis - 6 months from sampling date

---

* Samples must be completely analyzed within 40 days of extraction.

SOIL/SEDIMENT/SURFACE WATER ANALYSIS 1986

RESAMPLING DATA

SUMMARY OF METHODS

Parameter	Method
VOCs	Modified 624/CLP (7/85)
BNAs	Modified 625/CLP (7/85)
PCBs	Modified 608
Free Cyanide	Standard Method (16th Ed) 412B, D, H
Total Cyanide	Modified 335.2/CLP (7/85)

LABORATORY DATA VALIDATION

LABORATORY DATA VALIDATION SUMMARY
MARTIN MARIETTA - THE DALLES
QUALITY ASSURANCE REVIEW
SOIL, SEDIMENT, AND SURFACE WATER
SAMPLES COLLECTED MARCH 19-28, 1986

Holding Times

Parameters:

Soil: Free Cyanide A Fluoride A Sodium A

Sediment: Free Cyanide A Fluoride A Arsenic A
Sodium A EP Toxicity Metals A VOC P
B/N P Acids P PCBs P

Surface Water: Total Cyanide A Free Cyanide A
Fluoride A Arsenic A Sodium A
Sulfate A EP Toxicity Metals A VOC A
B/N A Acids A PCBs A

Criteria:

A - Acceptable: All QAPP and 40 CFR 136 specific holding times met.

P - Provisional: Some QAPP and 40 CFR 136 specified holding times exceeded.

U - Unacceptable: All holding time exceeded.

Remarks:

The laboratory report dated June 5, 1986, from MMES (Versar) acknowledged that samples 2605, 2606, 2608, 2609 (RPAS, RPBS, RPCS, and RPDS) exceeded holding time for extraction of PCB. Samples 2537 and 2538 (DCDG and DCEG) exceeded holding times for VOCs; samples 2605, 2606, 2608, 2609, and 2620 (RPAS, RPBS, RPCS, RPDS, and SDAS) exceeded extraction holding times for base/neutral and acid extractables. All samples exceeding holding times were resampled and analyzed within allowable holding times.

SOIL/SAMPLE/SURFACE WATER ANALYSIS
MARCH 1986

GC/MS Tuning and Performance

Parameters:

Soil:	VOC (BFB)	A	B/N/A (DFTPP)	A
Sediment:	VOC (BFB)	A	B/N/A (DFTPP)	A
Surface Water:	VOC (BFB)	A	B/N/A (DFTPP)	A

Criteria:

A -	Acceptable:	All criteria met, spectra of good quality
P -	Provisional:	All criteria not met, spectra of reasonable quality, data useable
U -	Unacceptable:	Criteria not met, spectra of poor quality, data unuseable

Remarks:

A review of 10 percent of the data during an on-site audit of MMES conducted in December 1986 by G&M did not reveal any tuning discrepancies with either BFB or DFTPP.

SOIL/SEDIMENT/SURFACE WATER ANALYSIS
ANALYSIS MARCH 1986

Initial and Continuing Calibration Checks - Organics

Parameters:

Soil:	VOC	N	B/N	N	Acid	N
Sediment:	VOC	A	B/N	A	Acid	A
Surface Water:	VOC	A	B/N	A	Acid	A

Criteria:

A -	Acceptable:	All criteria met.
P -	Provisional:	Some criteria met, data useable
U -	Unacceptable:	Criteria not met, data unuseable
N -	Not Applicable	

Remarks:

A review of 10 percent of the data during an on-site audit of MMES conducted in December 1986 by G&M did not reveal any calibration discrepancies with either system performance check compounds (SPCC) or calibration check compounds (CCC).

SOIL/SEDIMENT/SURFACE WATER ANALYSIS
MARCH 1986

Laboratory Blanks - Organics Analysis

Parameters:

Soil: VOC N B/N N Acids N PCBs N

Sediment: VOC A B/N A Acids A PCBs A

Surface Water: VOC A B/N A Acids A PCBs A

Criteria:

A - Acceptable: No contaminants above minimum detection limit, no interferences with sample results, appropriate blank used for each GC/MS system and extraction method.

P - Provisional: Contaminants present but minimal interference with sample results

U - Unacceptable: Gross contamination, too much interference to use data for certain components or the entire fraction, appropriate blanks not analyzed.

N - Not applicable

Remarks:

None required. All blanks acceptable.

SOIL/SEDIMENT/SURFACE WATER ANALYSIS
MARCH 1986

Surrogate Spike Results

Parameters:

Soil:	VOC	A	B/N	A	Acids	A	PCBs	N
Sediment:	VOC	A	B/N	A	Acids	A	PCBs	A
Surface Water:	VOC	A	B/N	A	Acids	P	PCBs	A

Judging Criteria:

Evaluation of surrogate data and application to individual samples is complex. The basic criteria for evaluating surrogate compound recoveries is as follows:

Valid Performance:	All surrogate recoveries within QC limits (VOCs, B/N/As, PCBs) or one surrogate out of QC limits per fraction but percent recovery (%R) > 10% (B/N/As, PCBs only).
Invalid Performance:	VOC: One or more surrogates out of QC limits; B/N/A or PCBs: Two or more surrogates out of QC limits per fraction or one surrogate out of QC limits but % recovery < 10%.

Surrogate Spikes Continued:

A. Individual Sample Flagging Criteria:

Analysis Acceptable: All surrogate recoveries with criteria.

Analysis Suspect: Any surrogate recoveries outside criteria and/or recoveries of <10% substantiated as a matrix effect by re-purge, reinject, or re-extract and reanalyze.

Invalid: Any compound recoveries of <10% that are unsubstantiated as a matrix effect by re-purge, re-inject, or re-extract and reanalyze.

Matrix	Parameters	No. Samples	No. Suspect	No. Invalid
Soil:	VOC	7	0	0
	B/N	13	0	0
	Acid	13	0	0
	PCBs	0	0	0
Sediment:	VOC	24	0	0
	B/N	24	3	0
	Acid	24	2	0
	PCBs	2	1	0
Surface Water:	VOC	76	0	0
	B/N	32	2	0
	Acid	32	5	0
	PCBs	30	0	0

Surrogate Spikes Continued:

B. Summary of Surrogates

A - Acceptable: <10% of samples reported as suspect

P - Provisional: >10% but <50% of samples reported as suspect

U - Unacceptable: >50% of samples reported as suspect and/or >10% samples reported as invalid

N - Not applicable

Remarks:

Sample ID		Compound Out of QC Limit		Matrix
B/N	2798	Nitrobenzene-D5	Low	Sediment
Acids	2796	Phenol-D5	Low	Sediment
Acids	2798	Phenol-D5	Low	Sediment
Acids	2800	Phenol-D5	Low	Sediment
B/N	2502	P-Torphenyl-D14	High	Sediment
Acids	2502	2,4,6-Tribromophenol	High	Sediment
B/N	2504	Nitrobenzene-D5	Low	Sediment
B/N	2609	P-Terphenyl-D14	High	Sediment
PCBs	2604**	HCB	Low	Sediment
B/N	2473**	2-Fluorobiphenyl	Low (field)	Water blank
Acids	2723	2-Fluorobiphenyl	Low	Surface water
B/N	2475	Nitrobenzene-D5	Low	Sediment
Acids	2602	2,4,6-Tribromophenol	High	Surface water
Acids	2612	2,4,6-Tribromophenol	High	Surface water
Acids	2615	2-Fluorophenol	High	Trip blank

All samples fit judging criteria. Two samples, notably 2604 and 2473 could not be repeated because of insufficient sample quantity. The data are considered acceptable as regards surrogate spikes.

SOIL/SEDIMENT/SURFACE WATER ANALYSIS
MARCH 1986

Matrix Spike/Matrix Spike Duplicate - Organics

A. Matrix Spikes

Parameters:

Soil: VOC N B/N A Acid A

Sediment: VOC P B/N P Acid U

Surface Water: VOC P B/N A Acid P

Note: No action is taken on matrix spike results alone

Criteria:

A -	Acceptable	<10% of compounds outside criteria
P -	Provisional	>10% but <50% of compounds outside criteria
U -	Unacceptable	>50% of compounds outside criteria and/or > 10% of compounds with recoveries of <10%.

Matrix	Parameter (Spikes)	No. Compounds	No. Outside Criteria	No. <10% R
Soil:	VOC (5)	2 x 5 = 10	0	0
	B/N (6)	2 x 6 = 12	1	0
	Acid (5)	2 x 5 = 10	0	0
Sediment:	VOC (5)	4 x 5 = 20	5	0
	B/N (6)	5 x 6 = 30	5	1
	Acids (5)	5 x 5 = 25	9	3
Surface Water:	VOC (5)	6 x 5 = 30	6	0
	B/N (6)	4 x 6 = 24	0	0
	Acids (5)	4 x 5 = 20	10	0

Matrix Spikes Continued

Remarks:

Soils: B/N: Only one compound was outside QC limits. No effect on the results.

Sediment: VOC: Five (5) compounds were outside QC limits but none were less than 10%R. No bias was evident.

B/N: Five (5) compounds were outside QC limits but only one was less than 10%R. Bias evident. Sample is DCAG (2476). Compound is 1,1-Dichloroethylene - result <45 J.

Acids: Nine (9) compounds wer outside QC limits but ony three were less than 10%R. Bias is evident. Sample: DCAG (2504) - compound is 4-Nitrophenol. Result <100 R. Sample: LPS (2502) - compound is 4-Nitrophenol. Result <12.5 R. Sample: SSP3HS (R800) - Compound is 4-Nitrophenol. Result <125 R.

Surface Water: No bias to any samples. No flags.

B. Matrix Spike Duplicates:

Parameters:

Soil:	VOC	A	B/N	A	Acid	A
Sediment:	VOC	P	B/N	P	Acid	P
Surface Water:	VOC	P	B/N	A	Acid	U

Criteria: See Matrix Spikes

Matrix Spikes Continued

Matrix	Parameter (Spikes)	No. Compounds	No. Outside Criteria	No. <10% R
Soil:	VOC (5)	2 x 5 = 10	0	0
	B/N (6)	2 x 6 = 12	1	0
	Acid (5)	2 x 5 = 10	0	0
Sediment:	VOC(5)	4 x 5 = 20	5	
	B/N (6)	5 x 6 = 30	7	2
	Acids(5)	5 x 5 = 20	10	5
Surface Water:	VOC (5)	6 x 5 = 30	4	0
	B/N (6)	4 x 6 = 24	0	0
	Acids (5)	4 x 5 = 20	11	0

Remarks:

Sediment: B/N: 7 compounds outside QC limits with 2 <10%R. Sample SSP3HS (2800) - compound is Pyrene. Result 1400 - J. Sample DCAG (2504). Compound is Pyrene. Result 640 J.

Acids: 10 compounds outside QC limits with 4 <10% R. Sample SSP1HS (2795). Compound is 4-Nitrophenol - R. Sample SSP3HS (2800). Compound is 4-Nitrophenol - R. Sample LPS (2502). Compound is 4-Nitrophenol - R. Sample - DCAG (2504). Compound is 4-Nitrophenol - R.

SOIL/SEDIMENT/SURFACE WATER ANALYSIS
MARCH 1986

Trip Blanks

Parameters:

Water: Total Cyanide _A_ Free Cyanide _A_ Fluoride _A_
Arsenic _A_ Sodium _A_ Sulfate _A_
E.P. Toxicity Metals _A_ VOC _A_ B/N _A_
Acids _A_ PCBs _A_

Criteria:

A -	Acceptable:	No evidence of contamination above minimum detection limits.
B -	Provisional:	Contaminants present but minimal or no evidence of interference with sample results.
C -	Unacceptable:	Gross contamination resulting in definite compromise to the sample data integrity.

Remarks:

All data acceptable.

SOIL/SEDIMENT/SURFACE WATER ANALYSIS
MARCH 1986

Concentration of Calibration Curve Standards - Inorganics

Parameters:

Soil/Sediment/Water: T. Cyanide A F. Cyanide A
Fluoride A Sulfate A Arsenic P
Sodium A EP Toxicity Metals (ICP) A

Criteria:

A -	Acceptable:	All curves five point curves with lowest standard at the LOQ, ICP - One point.
P -	Provisional:	Three point curve with lowest standard at the LOQ.
U -	Unacceptable:	Less than three point curve, and/or lowest standard not at the LOQ; no one-point verification for ICP.

Remarks:

Audit review of 10% of the data verified that curves employed acceptable standard concentrations. Only a three-point curve is used for arsenic; however, other QC was acceptable - data are not affected and are acceptable.

SOIL/SEDIMENT/SURFACE WATER ANALYSIS
MARCH 1986

Laboratory Blanks - Inorganics

Parameters:

Soil/Sediment/Water: T. Cyanide A F. Cyanide A
Fluoride A Sulfate A
E.P. Toxicity A Sodium A
Arsenic A

Criteria:

A -	Acceptable:	No contaminants above LOQ, no interference with sample results.
P -	Provisional:	Contaminants present but minimal interference with sample results.
U -	Unacceptable:	Gross contamination, too much interference to use data or appropriate blanks not analyzed.

Remarks:

Audit review of 10 percent of the data verified that laboratory blanks were acceptable. Blanks included extraction blanks, digestion blanks, and distillation blanks. Blanks were run at proper frequencies of 1 per 20 samples per matrix.

SOIL/SEDIMENT/SURFACE WATER ANALYSIS
MARCH 1986

Initial and Continuing Calibration Verification - Inorganics

Parameters:

Soil/Sediment/Water: T. Cyanide A F. Cyanide A
Fluoride A Sodium A Sulfate A
Arsenic A Barium A Cadmium A
Chromium A Lead A Mercury A
Selenium A Silver A

Criteria:

A - Acceptable: % R of ICVS and CCVS inside QC limits.

P - Provisional: % R of ICVS or CCVS outside QC limits but not less than 50% nor greater than 150%.

U - Unacceptable: % R of ICVS or CCVS outside QC limits but less than 50% or greater than 150%.

N - Not applicable

Remarks:

An on-site audit review of 10 percent of the data revealed ICVSs and CCVSs were consistent with acceptance criteria.

SOIL/SEDIMENT/SURFACE WATER ANALYSIS
MARCH 1986

Laboratory Duplicates - Inorganics

Parameters:

Soil/Sediment/Water: E.P. Toxicity Metals A Sodium A
Fluoride A Arsenic A
T. Cyanide A F. Cyanide A

Criteria:

A -	Acceptable:	All Relative Percent Differences (RPDs) are within QC limits.
P -	Provisional:	Some RPD's outside QC limits but <35%.
U -	Unacceptable:	All RPDs outside QC limits but >35%.

Remarks:

Audit review of 10 percent of the data revealed lab duplicates were consistent with acceptance criteria.

SOIL/SEDIMENT/SURFACE WATER ANALYSIS
MARCH 1986

Matrix Spikes - Inorganics

Parameters:

Soil: T. Cyanide A F. Cyanide P Fluoride A

Water/Leachate: T. Cyanide A F. Cyanide A Fluoride N
Arsenic (total) A Arsenic A Barium A
Cadmium A Chromium A Lead A
Mercury A Selenium A Silver A

Criteria:

A - Acceptable: All % R within QC limits.

P^1 - Provisional 1: Some % R not within QC limits but are not <30%; or are >125% and analyte is >instrument detection limit (IDL) - flag data J.

P_2 - Provisional 2: Some % R not within QC limit but are not <30% and analyte was reported <IDL - flag data UJ.

P_3 - Provisional 3: % R are less than 30% and analyte was detected at >Limit of Quantitation (LOQ) - flag data J.

U - Unacceptable: % R <30% and sample results are reported as <IDL - flag data R.

N - Not applicable or matriix spike diluted out, and not reported due to high analyte concentration.

Remarks:

Soil - P - Free Cyanide - Matrix interference -
All matrix spikes were low with every batch. See batch qualifers for:

spikes 2800 batch 2792-2806
2620 batch 2612-2617, 2624-2626, 2649-2650, 2718-2720

2632 batch 2632-2634

SOIL/SEDIMENT/SURFACE WATER ANALYSIS
MARCH 1986

Laboratory Control Sample (LCS) - Inorganics

Parameters:

Soil/Sediment/
Surrogate Water: T. Cyanide A F. Cyanide A Sodium A
Arsenic A Barium A Cadmium A
Chromium A Lead A Mercury A
Selenium A Silver A

Criteria:

A - Acceptable:	% R within QC limits.
P - Provisional:	% R outside QC limits but not <30% or is >120% - flag data J.
U - Unacceptable:	If LCS recovery falls less than 30%, this is indicative of severe laboratory or method deficiencies and the data should be reported as unuseable - flag data R.

Remarks:

Audit review of 10 percent of the data revealed that all LCSs were within acceptable QC limits.

LCS analysis was performed on all inorganic parameters covered by CLP. These included total and free cyanide and all metals that were analyzed. It should be noted that free cyanide is not covered by CLP, but an LCS was analyzed for this parameter anyway. Fluoride and sulfate are not included under the CLP protocol. Therefore, an LCS was not analyzed for these parameters.

The sources used for the LCS included aqueous LCS solution from EPA when available or the Initial Calibration Verification Standard (ICVS) when LCS solution was not available. For cyanide, the distilled mid-range calibration standard was used as the LCS when a formal LCS solution was not available.

DATA CLASSIFICATION

SOIL/SEDIMENT/SURFACE WATER

MARCH 1986

DATA CLASSIFICATION

Sampling and Analysis March - September 1986

Samples collected and analyzed during this time period included soil, sediment, surface water, groundwater and air. The data generated by the analysis of these samples has previously been validated (i.e., qualified) and data flags have been applied as required. In order to determine the data usefulness and applicability, the data must also be classified as required by the QAPP in accordance with procedures described in the introduction of this report.

Classification Process

As with the laboratory data validation, the classification of data is based on specifically defined criteria. Samples are evaluated by matrix against the criteria and judged as acceptable, provisional, or unacceptable. The explanation of the criteria is as follows:

A - Acceptable:	All criteria have been successfully met for all samples.
P - Provisional:	Some samples have not fully met the criteria but the information is obtainable.
U - Unacceptable:	The criteria has not been met with any samples and is not obtainable. This data may not be classified for use unless

sufficient other data criteria have been met and scientific judgement indicate the data may be useful if classified.

N - Not Applicable.

Soil - 1986

Between March 24 and May 13, 1986, ten composite soil samples were submitted to MMES along with four aqueous field blanks. Five of the soil samples and three of the aqueous field blanks were analyzed for free cyanide, fluoride, and sodium. The results of these analyses were presented in a report entitled, "Results of Chemical Analysis of Samples Collected During 19-28 March 1986 According to the Work Plan of the Remedial Investigation and Feasibility Study at the Martin Marietta Reduction Facility, The Dalles, Oregon."

The remaining five composite soil samples were submitted for landfill waste characterization studies. These samples were analyzed for total cyanide, fluoride, sodium, EP Toxicity metals, volatile organic compounds (VOCs), base/neutral and acid extractable organic compounds (B/N/A) and polychlorinated biphenyls (PCBs). The results of these analyses were presented in a report entitled, "Results of Chemical Analyses of Soil Samples Collected 10 May, 1986, According to the Work Plan of the Remedial Investigation and Feasibility Study at the Martin Marietta Reduction Facility, The Dalles, Oregon."

DATA CLASSIFICATION SUMMARY CHECKLIST

Level A Criteria

Matrix: Soil - 1986

To be classified for Level A use, the data must meet the following criteria:

	Criteria	Evaluation Result
1.	Sampling dates were recorded;	A
2.	Signatures of Sampling Team on each water sample log or soil sample log;	A
3.	Sampling locations were clearly designated and described;	A
4.	Sampling depth increment for soils was recorded;	A
5.	Sample collection technique was described on water sample log or soil sample log;	A
6.	Field preparation techniques were clearly described where applicable;	A
7.	Sample preservation techniques were clearly described, consistent, and adequate for the parameters to be analyzed and the sample matrix;	A
8.	Shipping bill of lading or constant surveillance documentation is available;	A
9.	The laboratory sample preparation or extraction date is recorded and available;	A
10.	The laboratory sample analysis date is recorded and available;	A

Level A Criteria - Soil (Continued)

	Criteria	Evaluation Result
11.	The laboratory sample preparation technique is recorded and available either in the laboratory report or in the laboratories approved SOP;	A
12.	The methods of analysis are listed in the laboratory reports and are consistent with the methods specified in the QAPP and laboratory contract;	A
13.	The laboratory analytical detection limits or limits of quantitation (LOQ) are given in lab reports and are adequate for project objectives;	A
14.	Field records include:	
	o Soil/sediment log sheets	P
	o Water sampling log sheets	N
	o QC field checklist	N
	o Field instrument calibration logs	A
	o Master bound log book with sequentially numbered pages	A
	o Daily log book	A
	o Chain-of-Custody forms	A
15.	All applicable records described above were properly created and are on file;	A
16.	Samples passed laboratory data validation without any R flags (samples with J flags may be accepted at this level).	A

Remarks:

14.P Soil/Sediment log sheets are not a required record specified by the QAPP. Soil samples were recorded in the field master log during March-May 1986.

Conclusion:

All soil data is classified to Level A.

DATA CLASSIFICATION SUMMARY CHECKLIST

Level B Criteria

Matrix: Soil - 1986

To be classified for Level B use, the data must meet the following criteria:

	Criteria	Evaluation Result
A.	**Data Validation Result**	
1.	Samples of this matrix have not been flagged J or R during data validation;	P
2.	All samples of this matrix have been classified as Level A data;	A
B.	**Quantitative Statistical Significance**	
1.	Laboratory and field instruments were properly standardized (calibrated) employing proper methods and records are available;	A
2.	Sample bottle preparation was proper and appropriate for the parameters measured and the sample matrix;	A
3.	All laboratory procedures were referenced to approved EPA methods and were contained in an approved SOP manual;	A
4.	Analytical QC data was available to demonstrate proper instrument calibration;	P
5.	Laboratory QC check sample standards are EPA and NBS traceable and were used at least once each three months;	A

Level B Criteria - Soil (Continued)

	Criteria	Evaluation Result
6.	Laboratory reagent (method) blanks were analyzed at a frequency of at least 1 per 20 samples;	A
7.	Laboratory duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
8.	Laboratory matrix spikes and matrix spike duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
9.	Field replicates were analyzed at a frequency of at least 1 per 20 samples;	P
10.	Field blanks were submitted at a frequency of at least 1 per 20 samples;	A
11.	One trip blank was submitted for VOCs analysis with each cooler;	A
12.	Field split samples were analyzed at a frequency of at least 1 per 20 samples per matrix;	P
13.	Appropriate and sufficient QC data with acceptance criteria were presented to allow data validation by the project QA officer;	P
14.	The laboratories used were approved by the EPA for participation in the Contract Laboratory Program (CLP);	A
15.	The laboratories participated in round-robin testing program by EPA or other accrediting agency;	A
16.	Quality control limits were consistent with the limits established for EPA's CLP;	A
17.	All samples submitted were analyzed for the requested parameters.	A

Level B Criteria - Soil (Continued)

	Criteria	Evaluation Result
C.	Custody and Document Control	
1.	Field custody of all samples was noted in a bound field log book;	A
2.	Transfer of custody documentation (chain-of-custody form) signed by field and laboratory sample custodians is available and properly completed;	A
3.	Laboratory custody is documented by a designated lab sample custodian in a master log and a secured sample storage area;	A
4.	Sample identification and assigned laboratory tracking numbers are traceable through the entire monitoring system;	A
5.	Field notebooks, log sheets, log books, checklists, reports, data validations, and all custody documents are stored in a secure repository or under the control of a document custodian;	A
6.	All records, forms, log books, etc., are filled out completely in indelible ink without alterations except as initialed;	P
7.	All sample log sheets have been signed by the sample collector;	P
8.	Field log book sheets signed by the field sample custodian.	A
D.	Sample Representativeness	
1.	Compatibility exists between field and laboratory measurements or incompatibilities have been suitably explained;	N

Level B Criteria - Soil (Continued)

Criteria	Evaluation Result
2. Laboratory analysis and/or sample preparation or extraction were within allowable holding times established for the sample preservation and methods used;	A
3. Sample storage was maintained within suitable temperature, light and moisture conditions to guarantee sample integrity;	A
4. Proper sample containers were used for the parameters analyzed;	A
5. Proper sample collection equipment was used such that the equipment would neither contribute nor remove any substance to or from the sample;	A
6. The sample site selection criteria are consistent with the ojbectives of the investigation and will provide the required data.	A

Remarks:

Section A.1. P Five soil samples (MPAS, RRAS, RRBS, OCAS, and OCS) have been flagged J for estimated free cyanide value. These samples may not be classified above Level A.

Section B.4. P Analytical QC data provided in laboratory report for this data consisted of inorganics: lab duplicates, matrix spikes, and leachate blanks; and organics: lab blanks, surrogate spikes, matrix spikes, and matrix spike duplicates. The remaining QC data was verified by G&M by review of 10% of the data during an on-site audit of MMES and also by a review of a representative portion of the data by EPA Region 10 (see attached letters, Exhibits 1, 2, and 3 under Exhibits at end of Surface Water Classification Section).

Level B Criteria - Soil (Continued)

	Criteria	Evaluation Result
Section B.9. P	Field replicates apparently were not collected. This, however, does not appear to have affected the data validity.	
Section B.12. P	Field split samples were collected by EPA during the March 1986 sampling program. Split samples, however, were not submitted to a second laboratory at that time.	
Section B.13. P	Appropriate and sufficient QC data with acceptance criteria were developed by the laboratory during the analysis of these samples. However, the majority of this data was retained by the laboratory and not included in the laboratory report. During an audit of the laboratory conducted by G&M, 100% of this non-reported data was observed and 10% of this data was closely reviewed for data validation.	
Section C.6. P	Some records were not completed in ink; some were filled out in pencil. No corrections or erasures were observed.	
Section C.7. P	Some log sheets were not signed by the sample collector; however, the identity of the person is obtainable from hand writing comparison.	

<u>Conclusion</u>:

Except for the soil samples that have been J flagged, the discrepancies observed do not disqualify the data. All soil data for March 1986 - May 1986 is classified as Level B data.

Sediment - 1986

Results of analyses of the sediment samples collected during March 19-28, 1986, were presented in a report entitled, "Results of Chemical Analysis of Samples Collected During 19-28 March, 1986, According to the Work Plan of the Remedial Investigation and Feasibility Study at the Martin Marietta Reduction Facility, The Dalles, Oregon."

A total of 30 sediment samples were submitted from seven different locations at MMRF along with seven aqueous field blanks and 12 aqueous trip blanks. These were selectively analyzed for free cyanide, fluoride, arsenic, sodium, EP toxicity metals, VOCs, B/N/As and PCBs.

DATA CLASSIFICATION SUMMARY CHECKLIST

Level A Criteria

Matrix: Sediment - 1986

To be classified for Level A use, the data must meet the following criteria:

Criteria	Evaluation Result
1. Sampling dates were recorded;	A
2. Signatures of Sampling Team on each water sample log or soil sample log;	A
3. Sampling locations were clearly designated and described;	A
4. Sampling depth increment for soils was recorded;	A
5. Sample collection technique was described on water sample log or soil sample log;	A
6. Field preparation techniques were clearly described where applicable;	A
7. Sample preservation techniques were clearly described, consistent, and adequate for the parameters to be analyzed and the sample matrix;	A
8. Shipping bill of lading or constant surveillance documentation is available;	A
9. The laboratory sample preparation or extraction date is recorded and available;	A
10. The laboratory sample analysis date is recorded and available;	A

Level A Criteria - Sediment (Continued)

Criteria	Evaluation Result
11. The laboratory sample preparation technique is recorded and available either in the laboratory report or in the laboratories approved SOP;	A
12. The methods of analysis are listed in the laboratory reports and are consistent with the methods specified in the QAPP and laboratory contract;	A
13. The laboratory analytical detection limits or limits of quantitation (LOQ) are given in lab reports and are adequate for project objectives;	A
14. Field records include:	
o Soil/sediment log sheets	P
o Water sampling log sheets	N
o QC field checklist	N
o Field instrument calibration logs	A
o Master bound log book with sequentially numbered pages	A
o Daily log book	A
o Chain-of-Custody forms	A
15. All applicable records described above were properly created and are on file;	A
16. Samples passed laboratory data validation without any R flags (samples with J flags may be accepted at this level)	P

Remarks:

14. P Soil/Sediment log sheets are not a required record specified by the QAPP. Sediment sample locations, descriptions, etc., were recorded in the field master log during March - May 1986.

16. P See Level B (Remarks) Section D.2

Conclusion:

All sediment data is classified to Level A except that described under 16 above.

DATA CLASSIFICATION SUMMARY CHECKLIST

Level B Criteria

Matrix: Sediment - 1986

To be classified for Level B use, the data must meet the following criteria:

Criteria	Evaluation Result
A. Data Validation Result	
1. Samples of this matrix have not been flagged J or R during data validation;	P
2. All samples of this matrix have been classified as Level A data;	A
B. Quantitative Statistical Significance	
1. Laboratory and field instruments were properly standardized (calibrated) employing proper methods and records are available;	A
2. Sample bottle preparation was proper and appropriate for the parameters measured and the sample matrix;	A
3. All laboratory procedures were referenced to approved EPA methods and were contained in an approved SOP manual;	A
4. Analytical QC data was available to demonstrate proper instrument calibration;	P
5. Laboratory QC check sample standards are EPA and NBS traceable and were used at least once each three months;	A

Level B Criteria - Sediment (Continued)

Criteria	Evaluation Result
6. Laboratory reagent (method) blanks were analyzed at a frequency of at least 1 per 20 samples;	A
7. Laboratory duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
8. Laboratory matrix spikes and matrix spike duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
9. Field replicates were analyzed at a frequency of at least 1 per 20 samples;	P
10. Field blanks were submitted at a frequency of at least 1 per 20 samples;	A
11. One trip blank was submitted for VOCs analysis with each cooler;	A
12. Field split samples were analyzed at a frequency of at least 1 per 20 samples per matrix;	P
13. Appropriate and sufficient QC data with acceptance criteria were presented to allow data validation by the project QA officer;	P
14. The laboratories used were approved by the EPA for participation in the Contract Laboratory Program (CLP);	A
15. The laboratories participated in round-robin testing program by EPA or other accrediting agency;	A
16. Quality control limits were consistent with the limits established for EPA's CLP;	A
17. All samples submitted were analyzed for the requested parameters.	A

Level B Criteria - Sediment (Continued)

Criteria	Evaluation Result
C. Custody and Document Control	
1. Field custody of all samples was noted in a bound field log book;	A
2. Transfer of custody documentation (chain-of-custody form) signed by field and laboratory sample custodians is available and properly completed;	A
3. Laboratory custody is documented by a designated lab sample custodian in a master log and a secured sample storage area;	A
4. Sample identification and assigned laboratory tracking numbers are traceable through the entire monitoring system;	A
5. Field notebooks, log sheets, log books, checklists, reports, data validations, and all custody documents are stored in a secure repository or under the control of a document custodian;	A
6. All records, forms, log books, etc., are filled out completely in indelible ink without alterations except as initialed;	A
7. All sample log sheets have been signed by the sample collector;	A
8. Field log book sheets signed by the field sample custodian.	A
D. Sample Representativeness	
1. Compatibility exists between field and laboratory measurements or incompatibilities have been suitably explained;	N

Level B Criteria - Sediment (Continued)

Criteria	Evaluation Result
2. Laboratory analysis and/or sample preparation or extraction were within allowable holding times established for the sample preservation and methods used;	P
3. Sample storage was maintained within suitable temperature, light and moisture conditions to guarantee sample integrity;	A
4. Proper sample containers were used for the parameters analyzed;	A
5. Proper sample collection equipment was used such that the equipment would neither contribute nor remove any substance to or from the sample;	A
6. The sample site selection criteria are consistent with the ojbectives of the investigation and will provide the required data.	A

Remarks:

Section A.1. P Eighteen sediment samples listed in the data qualifer table have been flagged J for estimated free cyanide value. These samples may not be classified above Level A.

Section B.4. P See Soil Data Classification Remarks.

Section B.9. P See Soil Data Classification Remarks.

Section B.12. P See Soil Data Classification Remarks.

Section B.13. P See Soil Data Classification Remarks.

Section D.2. P The laboratory report for June 5, 1986 from MMES acknowledges samples 2605, 2606, 2608, 2609, (RPAS, RPBS, RPCS, and RPDS) exceeded holding time for extraction of PCB's. Also, samples 2537 and 2538 (DCDG and DCEG) exceeded holding times for VOCs; samples

2605, 2606, 2608, 2609, and 2620 (RPAS, RPBS, RPCS, RPDS, SDAS) exceeded extraction holding times for B/N/As. These samples are flagged as R, may not be used and have been resampled.

Conclusion:

Except for the samples described above as flagged with J or R code, the data appears to be acceptable for quantitative (Level B) use.

Surface Water - 1986

Analyses of surface-water samples collected during March 19-28, 1986, were presented in a report entitled, "Results of Chemical Anaysis of Samples Collected During 19-28 March, 1986, According to the Work Plan of the Remedial Investigation and Feasibility Study at the Martin Marietta Reduction Facility, The Dalles, Oregon." A total of 38 surface-water samples from six locations at the site were submitted along with six aqueous field blanks and 23 aqueous trip blanks. These were analyzed for total cyanide, free cyanide, fluoride, arsenic, sodium, sulfate, EP toxicity metals, VOCs, B/N/A's, and PCBs.

DATA CLASSIFICATION SUMMARY CHECKLIST

Level A Criteria

Matrix: Surface Water - 1986

To be classified for Level A use, the data must meet the following criteria:

Criteria	Evaluation Result
1. Sampling dates were recorded;	A
2. Signatures of Sampling Team on each water sample log or soil sample log;	A
3. Sampling locations were clearly designated and described;	A
4. Sampling depth increment for soils was recorded;	A
5. Sample collection technique was described on water sample log or soil sample log;	A
6. Field preparation techniques were clearly described where applicable;	A
7. Sample preservation techniques were clearly described, consistent, and adequate for the parameters to be analyzed and the sample matrix;	A
8. Shipping bill of lading or constant surveillance documentation is available;	A
9. The laboratory sample preparation or extraction date is recorded and available;	A
10. The laboratory sample analysis date is recorded and available;	A

Level A Criteria - Surface Water (Continued)

	Criteria	Evaluation Result
11.	The laboratory sample preparation technique is recorded and available either in the laboratory report or in the laboratories approved SOP;	A
12.	The methods of analysis are listed in the laboratory reports and are consistent with the methods specified in the QAPP and laboratory contract;	A
13.	The laboratory analytical detection limits or limits of quantitation (LOQ) are given in lab reports and are adequate for project objectives;	A
14.	Field records include:	
	o Soil/sediment log sheets	N
	o Water sampling log sheets	A
	o QC field checklist	N
	o Field instrument calibration logs	A
	o Master bound log book with sequentially numbered pages	A
	o Daily log book	A
	o Chain-of-Custody forms	A
15.	All applicable records described above were properly created and are on file;	A
16.	Samples passed laboratory data validation without any R flags (samples with J flags may be accepted at this level)	P

Remarks:

None.

Conclusion:

All surface-water data for this sampling period is classified to Level A. It should be noted that the results for the free and total cyanides in surface-water samples collected and analyzed in March 1986 were previously only validated to Level A. This classification level was assigned because the samples were not screened for the presence of sulfide and oxidizer compounds prior to sample preservation. Two memos have been issued from EPA Region X concerning reviews of inorganics data (Memo from Gerald Muth, Chemist, September 10, 1986, Exhibit 2, Exhibits Section) and Cyanide data in sediments (Memo from Phil Davis, October 16, 1986, Exhibit 1, Exhibits Section). These memos were directed to Norma Lewis, the site manager. Although the memos approved the analytical techniques, find the QC acceptable and generally approve inorganics data from March 1986, documentation of direct approval from EPA that the cyanide (total and free) data for March 1986 surface water could be classified as quantitative was apparently not indicated.

DATA CLASSIFICATION SUMMARY CHECKLIST

Level B Criteria

Matrix: Surface Water - 1986

To be classified for Level B use, the data must meet the following criteria:

Criteria	Evaluation Result
A. Data Validation Result	
1. Samples of this matrix have not been flagged J or R during data validation;	P
2. All samples of this matrix have been classified as Level A data;	A
B. Quantitative Statistical Significance	
1. Laboratory and field instruments were properly standardized (calibrated) employing proper methods and records are available;	A
2. Sample bottle preparation was proper and appropriate for the parameters measured and the sample matrix;	A
3. All laboratory procedures were referenced to approved EPA methods and were contained in an approved SOP manual;	A
4. Analytical QC data was available to demonstrate proper instrument calibration;	P
5. Laboratory QC check sample standards are EPA and NBS traceable and were used at least once each three months;	A

Level B Criteria - Surface Water (Continued)

	Criteria	Evaluation Result
6.	Laboratory reagent (method) blanks were analyzed at a frequency of at least 1 per 20 samples;	A
7.	Laboratory duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
8.	Laboratory matrix spikes and matrix spike duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
9.	Field replicates were analyzed at a frequency of at least 1 per 20 samples;	P
10.	Field blanks were submitted at a frequency of at least 1 per 20 samples;	A
11.	One trip blank was submitted for VOCs analysis with each cooler;	A
12.	Field split samples were analyzed at a frequency of at least 1 per 20 samples per matrix;	P
13.	Appropriate and sufficient QC data with acceptance criteria were presented to allow data validation by the project QA officer;	P
14.	The laboratories used were approved by the EPA for participation in the Contract Laboratory Program (CLP);	A
15.	The laboratories participated in round-robin testing program by EPA or other accrediting agency;	A
16.	Quality control limits were consistent with the limits established for EPA's CLP;	A
17.	All samples submitted were analyzed for the requested parameters.	A

Level B Criteria - Surface Water (Continued)

Criteria	Evaluation Result
C. Custody and Document Control	
1. Field custody of all samples was noted in a bound field log book;	A
2. Transfer of custody documentation (chain-of-custody form) signed by field and laboratory sample custodians is available and properly completed;	A
3. Laboratory custody is documented by a designated lab sample custodian in a master log and a secured sample storage area;	A
4. Sample identification and assigned laboratory tracking numbers are traceable through the entire monitoring system;	A
5. Field notebooks, log sheets, log books, checklists, reports, data validations, and all custody documents are stored in a secure repository or under the control of a document custodian;	A
6. All records, forms, log books, etc., are filled out completely in indelible ink without alterations except as initialed;	A
7. All sample log sheets have been signed by the sample collector;	A
8. Field log book sheets signed by the field sample custodian.	A
D. Sample Representativeness	
1. Compatibility exists between field and laboratory measurements or incompatibilities have been suitably explained;	N

Level B Criteria - Surface Water (Continued)

Criteria	Evaluation Result
2. Laboratory analysis and/or sample preparation or extraction were within allowable holding times established for the sample preservation and methods used;	A
3. Sample storage was maintained within suitable temperature, light and moisture conditions to guarantee sample integrity;	A
4. Proper sample containers were used for the parameters analyzed;	A
5. Proper sample collection equipment was used such that the equipment would neither contribute nor remove any substance to or from the sample;	A
6. The sample site selection criteria are consistent with the ojbectives of the investigation and will provide the required data.	A

Remarks:

Section A.1. P	Thirteen samples listed in the data qualifer table (Laboratory Data Validation Section) have been flagged J for estimated free cyanide. Nine samples listed in the data qualifer table have been flagged J for estimated total arsenic.
Section B.4. P	See Soil Data Classification Remarks.
Section B.9. P	See Soil Data Classification Remarks.
Section B.12. P	See Soil Data Classification Remarks.
Section B.13. P	See Soil Data Classification Remarks.

Conclusion:

Except for the samples described above as flagged with a J code, the data appears to be acceptable for quantitative (Level B) use.

EXHIBITS 1, 2, 3

FOR

SOILS/SEDIMENT/SURFACE WATER

MARCH 1986

EXHIBIT 1

Norma

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
Manchester, Washington 98353

OCT 24 1986
Superfund Branch

REPLY TO ATTN OF: M/S Lab

October 16, 1986

MEMORANDUM

SUBJECT: Review of Free Cyanide Data - Martin Marietta, The Dalles, Oregon

FROM: Phil Davis Phil Davis

TO: Norma Lewis, Site Manager
Superfund Enforcement Branch

At your request I have reviewed the cyanide data on sediment samples collected March 27 and 28, 1986 from the Scrubber Sludge Ponds at Martin Marietta Reduction Facility, The Dalles, Oregon. Martin Marietta's and sample numbers are # 2792 - 2802,
#2804.

The information used for the review is included in the report "Supporting Raw Data for the Inorganic analysis of samples collected at the Martin Marietta Reduction Facility, The Dalles, Oregon." The results are given below:

1). Instrument calibration - Acceptable
2). QA/QC Standard - Acceptable
3). Control Standard - Acceptable
4). Spike Analysis - Acceptable
5). Duplicate Analysis - Acceptable
6). Holding Times - Acceptable
7). Analysis Methods - Acceptable

Comments

When doing cyanide analysis on sediment samples it is advisable to include a lead acetate sulfide scrubber in line as outlined in EPA Method 335.2, section 8.2. I have been informed by the Martin Marietta Lab that this is now there policy.

Data Use

Based on the information contained in the above mentioned Martin Marietta report and from conversations with Martin Marietta's laboratory analyst the data appear to present a reasonable evaluation of the free cyanide levels.

EXHIBIT 2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
SEATTLE, WASHINGTON 98101
Manchester, Washington 98353

REPLY TO ATTN OF: M/S Lab September 10, 1986

MEMORANDUM

SUBJECT: Review of Inorganic Data - Martin Marietta, The Dalles, Oregon

FROM: Gerald Muth, Chemist
ESD Laboratory, Region 10

TO: Norma Lewis, Site Manager
Superfund Enforcement Br.

This is a review of the inorganic data generated by Martin Marietta. The data reviewed includes the report "Supporting Raw Data for the Inorganic Analysis of Samples Collected at the Martin Marietta Reduction Facility, The Dalles, Oregon" prepared August 8, 1986.

Data Qualifications

The following comments refer to the laboratory performance in meeting the quality control specifications as outlined in methods SW846 and the CLP's IFB SW785.

1) Timeliness - Acceptable

2) Initial calibrations - Acceptable

3) Continuing calibrations - Acceptable

4) Blanks - Acceptable

5) Instrument detection limits - Acceptable

6) ICP interference checks - Acceptable

7) Duplicate sample analysis - Acceptable

8) Spike analysis - Acceptable

9) Method of standard additions

For furnace AA analysis only a 2 point curve was generated - the original sample plus one spike. The QC generally requires more points and a correlation coefficient to be calculated. However, the spike recovery generally indicated minimal interference were present.

SEP 11 1986
Superfund Branch

10) Mercury analysis - Acceptable

11) Comments:

Fluoride - The fluoride values appeared consistantly low when compared to the EPA Region 10 data. Samples 2730, 2732, 3294.

Barium - (Sample 2704) and lead (sample 3294) values appeared low when compared to EPA Region 10 data.

Cyanide - Not reviewed.

Data Use

The data presented in this report with the exception of comments under Item 11 appear to present a reasonable evaluation of the levels of inorganic constituents present in the samples as submitted.

EXHIBIT 3

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
Manchester, Washington 98353

REPLY TO ATTN OF: M/S Lab

August 13, 1986

AUG 15 1986
Superfund Branch

MEMORANDUM

SUBJECT: Data Review - Organics
Martin Marietta, The Dalles, Oregon

FROM: Gerald Muth, Chemist Barb Haynes for:
EPA Region 10 Laboratory

TO: Norma Lewis
Site Manager

This is a review of a small representative portion of the data generated by Martin Marietta at The Dalles, Oregon site. Two water and two soil samples each for volatiles and BNA fractions were reviewed. Sample ID's were as follows:

Volatiles		
	Soil	DCBG (MMES #2477) DCCG (MMES #2478)
	Water	LPFBW (MMES #2500) LPAW (MMES #2480)
ABN		
	Soil	SSP3GS (MMES #2799) SSP3HS (MMES #2800)
	Water	LPFBW (MMES #2499) LPW (MMES #2562)

Data Qualifications:

The following comments refer to laboratories performance in meeting the Quality Control requirements as specified in methods 624, 625, and portions of the CLP statement of work.

1) Timeliness - acceptable

2) Instrument tuning - acceptable

3) Initial & continuing calibrations.

	RRF	Criteria
SPCC		
Hexachlorocyclopentadiene	.030	> .05
CCC		
Fluoranthene	32	< 30
Di-n-octylphthalate	73	< 30

Di-n-octylphthalate is frequently a problem due to laboratory contamination.

4) Detection limits

Their estimate of detection limits was made conservatively.

5) Blanks - acceptable

6) Pesticide PCB's - acceptable

7) Surrogates - acceptable

8) Matrix spike and matrix spike duplicates - acceptable

9) Samples

A 1/5 dilution for BNA soils was used for surrogate and matrix spikes. A 1/50 dilution for the same samples was used for analysis. This practice is acceptable for the high levels of PNA's found as the instrument was saturating at the 1/5 dilution.

Data usefulness:

These data meet the requirements as set forth in methods 624 and 625 and are considered valid for all purposes.

QC SUPPORT DATA

FOR

SOILS/SEDIMENT/SURFACE WATER ANALYSIS

MARCH 1986

AND

RESAMPLING

AUGUST 1986

SOIL/SEDIMENT/SURFACE WATER ANALYSIS

MARCH 1986

AND

DATA FROM RESAMPLING

AUGUST 1986

LABORATORY BLANKS

Table B-1. Results of analysis for volatile organic compounds in daily lab blanks

	1	2	3	4	5	6
SAMPLE DATE:	3/25/86	4/3/86	4/4/86	4/5/86	4/6/86	4/7/85
ANALYSIS DATE:	3/25/86	4/3/86	4/4/86	4/5/86	4/6/86	4/7/86
HMES SAMPLE ID:	LAB BLANK	LAB BLANK	LAB BLANK	LAB BLANK	LAB BLANK	LAB BLANK
CLIENT SAMPLE ID:						
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
acrolein	<10	<10	<10	<10	<10	<10
acrylonitrile	<10	<10	<10	<10	<10	<10
benzene	<5	<5	<5	<5	<5	<5
bromodichloromethane	<5	<5	<5	<5	<5	<5
bromoform	<5	<5	<5	<5	<5	<5
bromomethane	<5	<5	<5	<5	<5	<5
carbon tetrachloride	<5	<5	<5	<5	<5	<5
chlorobenzene	<5	<5	<5	<5	<5	<5
chloroethane	<5	<5	<5	<5	<5	<5
chloroform	<5	<5	<5	<5	<5	<5
chloromethane	<5	<5	<5	<5	<5	<5
2-chloroethylvinyl ether	<10	<10	<10	<10	<10	<10
cis-1,3-dichloropropene	<5	<5	<5	<5	<5	<5
dibromochloromethane	<5	<5	<5	<5	<5	<5
1,1-dichloroethane	<5	<5	<5	<5	<5	<5
1,2-dichloroethane	<5	<5	<5	<5	<5	<5
1,1-dichloroethylene	<5	<5	<5	<5	<5	<5
1,2-dichloropropane	<5	<5	<5	<5	<5	<5
ethylbenzene	<5	<5	<5	<5	<5	<5
methylene chloride	<10	<10	<10	<10	<10	<10
1,1,2,2-tetrachloroethane	<5	<5	<5	<5	<5	<5
tetrachloroethylene	<5	<5	<5	<5	<5	<5
toluene	<5	<5	<5	<5	<5	<5
trans-1,2-dichloroethylene	<5	<5	<5	<5	<5	<5
trans-1,3-dichloropropene	<5	<5	<5	<5	<5	<5
1,1,1-trichloroethane	<5	<5	<5	<5	<5	<5
1,1,2-trichloroethane	<5	<5	<5	<5	<5	<5
trichloroethylene	<5	<5	<5	<5	<5	<5
vinyl chloride	<5	<5	<5	<5	<5	<5
cis-1,2-dichloroethylene	<5	<5	<5	<5	<5	<5

Table B-1. Continued

	1	2	3	4	5	6
SAMPLE DATE:	4/8/86	4/9/86	4/11/86	4/22/86		
ANALYSIS DATE:	4/8/86	4/9/86	4/11/86	4/22/86		
MMES SAMPLE ID:	LAB BLANK	LAB BLANK	LAB BLANK	LAB BLANK		
CLIENT SAMPLE ID:						
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
acrolein	<10	<10	<10	<10		
acrylonitrile	<10	<10	<10	<10		
benzene	<5	<5	<5	<5		
bromodichloromethane	<5	<5	<5	<5		
bromoform	<5	<5	<5	<5		
bromomethane	<5	<5	<5	<5		
carbon tetrachloride	<5	<5	<5	<5		
chlorobenzene	<5	<5	<5	<5		
chloroethane	<5	<5	<5	<5		
chloroform	<5	<5	<5	<5		
chloromethane	<5	<5	<5	<5		
2-chloroethylvinyl ether	<10	<10	<10	<10		
cis-1,3-dichloropropene	<5	<5	<5	<5		
dibromochloromethane	<5	<5	<5	<5		
1,1-dichloroethane	<5	<5	<5	<5		
1,2-dichloroethane	<5	<5	<5	<5		
1,1-dichloroethylene	<5	<5	<5	<5		
1,2-dichloropropane	<5	<5	<5	<5		
ethylbenzene	<5	<5	<5	<5		
methylene chloride	<10	<10	<10	<10		
1,1,2,2-tetrachloroethane	<5	<5	<5	<5		
tetrachloroethylene	<5	<5	<5	<5		
toluene	<5	<5	<5	<5		
trans-1,2-dichloroethylene	<5	<5	<5	<5		
trans-1,3-dichloropropene	<5	<5	<5	<5		
1,1,1-trichloroethane	<5	<5	<5	<5		
1,1,2-trichloroethane	<5	<5	<5	<5		
trichloroethylene	<5	<5	<5	<5		
vinyl chloride	<5	<5	<5	<5		
cis-1,2-dichloroethylene	<5	<5	<5	<5		

Table B-2. Results of analysis for base/neutral extractable compounds in extraction blanks

	1	2	3	4	5	6
SAMPLE DATE:	3/25/86	3/27/86	3/31/86	4/8/86	4/9/86	4/10/86
ANALYSIS DATE:	4/17/86	4/17/86	4/18/86	4/21/86	4/21/86	4/18/86
HMES SAMPLE ID:	EXT BLANK	EXT BLANK	EXT BLANK	EXT BLANK	EXT BLANK	EXT BLANK
CLIENT SAMPLE ID:						
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
N-nitroso-dimethylamine	<5	<5	<5	<5	<5	<5
bis (2-chloroethyl) ether	<5	<5	<5	<5	<5	<5
1,3-dichlorobenzene	<5	<5	<5	<5	<5	<5
1,4-dichlorobenzene	<5	<5	<5	<5	<5	<5
1,2-dichlorobenzene	<5	<5	<5	<5	<5	<5
bis(2-chloroisopropyl) ether	<5	<5	<5	<5	<5	<5
N-nitroso-di-N-propylamine	<5	<5	<5	<5	<5	<5
hexachloroethane	<10	<10	<10	<10	<10	<10
nitrobenzene	<10	<10	<10	<10	<10	<10
isophorone	<5	<5	<5	<5	<5	<5
bis (2-chloroethoxy) methane	<5	<5	<5	<5	<5	<5
1,2,4-trichlorobenzene	<5	<5	<5	<5	<5	<5
naphthalene	<5	<5	<5	<5	<5	<5
hexachlorobutadiene	<5	<5	<5	<5	<5	<5
hexachlorocyclopentadiene	<10	<10	<10	<10	<10	<10
2-chloronaphthalene	<5	<5	<5	<5	<5	<5
dimethylphthalate	<5	<5	<5	<5	<5	<5
acenaphthalene	<5	<5	<5	<5	<5	<5
2,6-dinitrotoluene	<10	<10	<10	<10	<10	<10
acenaphthene	<5	<5	<5	<5	<5	<5
2,4-dinitrotoluene	<10	<10	<10	<10	<10	<10
diethylphthalate	<10	<10	<10	<10	<10	<10
fluorene	<5	<5	<5	<5	<5	<5
4-chlorophenylphenyl ether	<5	<5	<5	<5	<5	<5
N-nitrosodiphenylamine	<10	<10	<10	<10	<10	<10
4-bromophenylphenyl ether	<5	<5	<5	<5	<5	<5
hexachlorobenzene	<5	<5	<5	<5	<5	<5
phenanthrene	<5	<5	<5	<5	<5	<5
anthracene	<5	<5	<5	<5	<5	<5

Table B-2. Continued

	1	2	3	4	5	6
SAMPLE DATE:	3/25/86	3/27/86	3/31/86	4/8/86	4/9/86	4/10/86
ANALYSIS DATE:	4/17/86	4/17/86	4/18/86	4/21/86	4/21/86	4/18/86
MMES SAMPLE ID:	EXT BLANK	EXT BLANK	EXT BLANK	EXT BLANK	EXT BLANK	EXT BLANK
CLIENT SAMPLE ID:						
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
di-N-butylphthalate	<10	<10	<10	<10	<10	<10
fluoranthene	<5	<5	<5	<5	10	<5
benzidine	<200	<200	<200	<200	<200	<200
pyrene	<5	<5	<5	7.7	8	<5
butylbenzylphthalate	<10	<10	<10	<10	<10	<10
3,3'-dichlorobenzidine	<10	<10	<10	<10	<10	<10
benzo (a) anthracene	<5	<5	<5	6.6	3	<5
chrysene	<5	<5	<5	13	9	<5
bis (2-ethylhexyl) phthalate	<10	<10	<10	<10	<10	<10
di-N-octylphthalate	<10	<10	<10	<10	<10	<10
benzo (b & k) fluoranthenes	<5	<5	<5	17	<5	<5
benzo (a) pyrene	<5	<5	<5	7	<5	<5
indeno-1,2,3 (c,d) pyrene	<10	<10	<10	<10	<10	<10
dibenzo (a,h) anthracene	<10	<10	<10	<10	<10	<10
benzo (g,h,i) perylene	<10	<10	<10	<10	<10	<10

Table B-2. Continued

	1	2	3	4	5	6
SAMPLE DATE:	4/15/86	4/17/86	4/22/86			
ANALYSIS DATE:	4/15/86	4/24/86	4/24/86			
MMES SAMPLE ID:	EXT BLANK	EXT BLANK	EXT BLANK			
CLIENT SAMPLE ID:						
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
N-nitroso-dimethylamine	<5	<5	<5			
bis (2-chloroethyl) ether	<5	<5	<5			
1,3-dichlorobenzene	<5	<5	<5			
1,4-dichlorobenzene	<5	<5	<5			
1,2-dichlorobenzene	<5	<5	<5			
bis(2-chloroisopropyl) ether	<5	<5	<5			
N-nitroso-di-N-propylamine	<5	<5	<5			
hexachloroethane	<10	<10	<10			
nitrobenzene	<10	<10	<10			
isophorone	<5	<5	<5			
bis (2-chloroethoxy) methane	<5	<5	<5			
1,2,4-trichlorobenzene	<5	<5	<5			
naphthalene	<5	<5	<5			
hexachlorobutadiene	<5	<5	<5			
hexachlorocyclopentadiene	<10	<10	<10			
2-chloronaphthalene	<5	<5	<5			
dimethylphthalate	<5	<5	<5			
acenaphthalene	<5	<5	<5			
2,6-dinitrotoluene	<10	<10	<10			
acenaphthene	<5	<5	<5			
2,4-dinitrotoluene	<10	<10	<10			
diethylphthalate	<10	<10	<10			
fluorene	<5	<5	<5			
4-chlorophenylphenyl ether	<5	<5	<5			
N-nitrosodiphenylamine	<10	<10	<10			
4-bromophenylphenyl ether	<5	<5	<5			
hexachlorobenzene	<5	<5	<5			
phenanthrene	<5	<5	<5			
anthracene	<5	<5	<5			

Table B-2. Continued.

	1	2	3	4	5	6
SAMPLE DATE:	4/15/86	4/17/86	4/22/86			
ANALYSIS DATE:	4/15/86	4/24/86	4/24/86			
NMES SAMPLE ID:	EXT BLANK	EXT BLANK	EXT BLANK			
CLIENT SAMPLE ID:						
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
di-N-butylphthalate	<10	<10	<10			
fluoranthene	<5	<5	<5			
benzidine	<200	<200	<200			
pyrene	<5	<5	<5			
butylbenzylphthalate	<10	<10	<10			
3,3'-dichlorobenzidine	<10	<10	<10			
benzo (a) anthracene	<5	<5	<5			
chrysene	<5	<5	<5			
bis (2-ethylhexyl) phthalate	<10	<10	<10			
di-N-octylphthalate	<10	<10	<10			
benzo (b & k) fluoranthenes	<5	<5	<5			
benzo (a) pyrene	<5	<5	<5			
indeno-1,2,3 (c,d) pyrene	<10	<10	<10			
dibenzo (a,h) anthracene	<10	<10	<10			
benzo (g,h,i) perylene	<10	<10	<10			

Table B-2. Continued

	1	2	3	4	5	6
SAMPLE DATE:	4/15/86	4/17/86	4/22/86			
ANALYSIS DATE:	4/15/86	4/24/86	4/24/86			
MMES SAMPLE ID:	EXT BLANK	EXT BLANK	EXT BLANK			
CLIENT SAMPLE ID:						
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
N-nitroso-dimethylamine	<5	<5	<5			
bis (2-chloroethyl) ether	<5	<5	<5			
1,3-dichlorobenzene	<5	<5	<5			
1,4-dichlorobenzene	<5	<5	<5			
1,2-dichlorobenzene	<5	<5	<5			
bis(2-chloroisopropyl) ether	<5	<5	<5			
N-nitroso-di-N-propylamine	<5	<5	<5			
hexachloroethane	<10	<10	<10			
nitrobenzene	<10	<10	<10			
isophorone	<5	<5	<5			
bis (2-chloroethoxy) methane	<5	<5	<5			
1,2,4-trichlorobenzene	<5	<5	<5			
naphthalene	<5	<5	<5			
hexachlorobutadiene	<5	<5	<5			
hexachlorocyclopentadiene	<10	<10	<10			
2-chloronaphthalene	<5	<5	<5			
dimethylphthalate	<5	<5	<5			
acenaphthalene	<5	<5	<5			
2,6-dinitrotoluene	<10	<10	<10			
acenaphthene	<5	<5	<5			
2,4-dinitrotoluene	<10	<10	<10			
diethylphthalate	<10	<10	<10			
fluorene	<5	<5	<5			
4-chlorophenylphenyl ether	<5	<5	<5			
N-nitrosodiphenylamine	<10	<10	<10			
4-bromophenylphenyl ether	<5	<5	<5			
hexachlorobenzene	<5	<5	<5			
phenanthrene	<5	<5	<5			
anthracene	<5	<5	<5			

Table B-3. Results of analysis for acid extractable compounds in extraction blanks

	1	2	3	4	5	6
SAMPLE DATE:	3/25/86	3/27/86	3/31/86	4/8/86	4/9/86	4/10/86
ANALYSIS DATE:	4/17/86	4/17/86	4/18/86	4/21/86	4/21/86	4/18/86
MMES SAMPLE ID:	EXT BLANK	EXT BLANK	EXT BLANK	EXT BLANK	EXT BLANK	EXT BLANK
CLIENT SAMPLE ID:						
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
phenol	<10	<10	<10	<10	<10	<10
2-chlorophenol	<5	<5	<5	<5	<5	<5
2-nitrophenol	<5	<5	<5	<5	<5	<5
2,3-dimethylphenol	<5	<5	<5	<5	<5	<5
2,4-dichlorophenol	<5	<5	<5	<5	<5	<5
4-chloro-3-methylphenol	<5	<5	<5	<5	<5	<5
2,4,5-trichlorophenol	<5	<5	<5	<5	<5	<5
2,4-dinitrophenol	<15	<15	<15	<15	<15	<15
4-nitrophenol	<10	<10	<10	<10	<10	<10
4,6-dinitro-o-cresol	<15	<15	<15	<15	<15	<15
pentachlorophenol	<10	<10	<10	<10	<10	<10

Table B-3. Continued

	1	2	3	4	5	6
SAMPLE DATE:	4/15/86	4/17/86	4/22/86			
ANALYSIS DATE:	4/15/86	4/24/86	4/24/86			
MMES SAMPLE ID:	EXT BLANK	EXT BLANK	EXT BLANK			
CLIENT SAMPLE ID:						
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
phenol	<10	<10	<10			
2-chlorophenol	<5	<5	<5			
2-nitrophenol	<5	<5	<5			
2,3-dimethylphenol	<5	<5	<5			
2,4-dichlorophenol	<5	<5	<5			
4-chloro-3-methylphenol	<5	<5	<5			
2,4,6-trichlorophenol	<5	<5	<5			
2,4-dinitrophenol	<15	<15	<15			
4-nitrophenol	<10	<10	<10			
4,6-dinitro-o-cresol	<15	<15	<15			
pentachlorophenol	<10	<10	<10			

Table B-4. Results of analysis for PCBs in extraction blanks

	1	2	3	4	5	6
SAMPLE DATE:	3/27/86	3/28/86	3/31/86	4/1/86	4/2/86	
ANALYSIS DATE:	4/24/86	4/24/86	4/18/86	4/23/86	4/13/86	
HHES SAMPLE ID:	EXT BLANK	EXT BLANK	EXT BLANK	EXT BLANK	EXT BLANK	
CLIENT SAMPLE ID:						
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
aroclor 1016	<0.5	<0.5	<0.5	<0.5	<0.5	
aroclor 1221	<0.5	<0.5	<0.5	<0.5	<0.5	
aroclor 1232	<0.5	<0.5	<0.5	<0.5	<0.5	
aroclor 1242	<0.5	<0.5	<0.5	<0.5	<0.5	
aroclor 1248	<0.5	<0.5	<0.5	<0.5	<0.5	
aroclor 1254	<1.0	<1.0	<1.0	<1.0	<1.0	
aroclor 1260	<1.0	<1.0	<1.0	<1.0	<1.0	

Table B-1. Results of analysis for volatile organic compounds in daily laboratory blanks – Resampling Data

CLIENT SAMPLE ID:	LAB BLANK	LAB BLANK	LAB BLANK
MMES SAMPLE ID:	2BLK0904	3BLK0904	3BLK905
SAMPLE DATE:	09/04/86	09/04/86	09/05/86
ANALYSIS DATE:	09/04/86	09/04/86	09/05/86
FILE NAME:	2VBLK0904	3VBLK0904	3VBLK0905
INSTRUMENT ID:	MS2	MS3	MS3
MATRIX:	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l
DILUTION FACTOR:	1	1	1
COMPOUNDS			
Acrolein	< 10	< 10	< 10
Acrylonitrile	< 10	< 10	< 10
Benzene	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5
2-Chloroethylvinylether	< 10	< 10	< 10
Chloroform	< 5	< 5	< 5
Chloromethane	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5
Methylene Chloride	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5
Toluene	< 5	< 5	< 5
Trans-1,3-Dichloropropene	< 5	< 5	< 5
1,1,1-Trichloroethane	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5
Vinyl Chloride	< 1	< 1	< 1
cis-1,2-Dichloroethene	< 5	< 5	< 5
trans-1,2-Dichloroethene	< 5	< 5	< 5

Resampling Data

Table B-2. Results of analysis for base/neutral acid extractable compounds in daily laboratory blanks

CLIENT SAMPLE ID:	LAB BLANK	LAB BLANK
MMES SAMPLE ID:	BLK909	BLK0911
SAMPLE DATE:	09/09/86	09/11/86
EXTRACTION DATE:	09/09/86	09/11/86
ANALYSIS DATE:	09/12/86	09/15/86
FILE NAME:	BLK909	BLK0911
INSTRUMENT ID:	MS1	MS1
MATRIX:	SOIL	SOIL
UNITS:	ug/kg	ug/kg
COMPOUNDS		
Acenaphthalene	< 1670	< 50000
Acenaphthene	< 1670	< 50000
Anthracene	< 1670	< 50000
Benzidine	< 3030	< 90900
Benzo(a)Anthracene	< 1670	< 50000
Benzo(a)Pyrene	< 1670	< 50000
Benzo(b+k)fluoranthenes	< 1670	< 50000
Benzo(g,h,i)Perylene	< 1670	< 50000
4-Bromophenyl-phenylether	< 1670	< 50000
Butylbenzylphthalate	< 1670	< 50000
4-Chloro-3-Methylphenol	< 1670	< 50000
bis(2-Chloroethoxy)Methane	< 1670	< 50000
bis(2-Chloroethyl)Ether	< 1670	< 50000
bis(2-Chloroisopropyl)Ether	< 1670	< 50000
2-Chloronaphthalene	< 1670	< 50000
2-Chlorophenol	< 1670	< 50000
4-Chlorophenyl-phenylether	< 1670	< 50000
Chrysene	< 1670	< 50000
Di-n-Butylphthalate	< 1670	< 50000
Di-n-Octyl Phthalate	< 1670	< 50000
Dibenz(a,h)Anthracene	< 1670	< 50000
1,2-Dichlorobenzene	< 1670	< 50000
1,4-Dichlorobenzene	< 1670	< 50000
1,3-Dichlorobenzene	< 1670	< 50000
3,3'-Dichlorobenzidine	< 3330	< 100000
2,4-Dichlorophenol	< 1670	< 50000
Diethylphthalate	< 1670	< 50000
Dimethyl Phthalate	< 1670	< 50000
2,4-Dimethylphenol	< 1670	< 50000
4,6-Dinitro-2-Methylphenol	< 8080	< 242000
2,4-Dinitrophenol	< 8080	< 242000
2,6-Dinitrotoluene	< 1670	< 50000
2,4-Dinitrotoluene	< 1670	< 50000
1,2-Diphenylhydrazine	< 1670	< 50000
bis(2-Ethylhexyl)Phthalate	< 1670	< 50000
Fluoranthene	< 1670	< 50000

Table B-2. Continued Resampling Data

CLIENT SAMPLE ID:	LAB BLANK	LAB BLANK
MMES SAMPLE ID:	BLK909	BLK0911
SAMPLE DATE:	09/09/86	09/11/86
EXTRACTION DATE:	09/09/86	09/11/86
ANALYSIS DATE:	09/12/86	09/15/86
FILE NAME:	BLK909	BLK0911
INSTRUMENT ID:	MS1	MS1
MATRIX:	SOIL	SOIL
UNITS:	ug/kg	ug/kg
COMPOUNDS		
Fluorene	< 1670	< 50000
Hexachlorobenzene	< 1670	< 50000
Hexachlorobutadiene	< 1670	< 50000
Hexachlorocyclopentadiene	< 1670	< 50000
Hexachloroethane	< 1670	< 50000
Indeno(1,2,3-cd)Pyrene	< 1670	< 50000
Isophorone	< 1670	< 50000
N-Nitroso-Di-n-Propylamine	< 1670	< 50000
N-Nitrosodimethylamine	< 1670	< 50000
N-Nitrosodiphenylamine	< 1670	< 50000
Naphthalene	< 1670	< 50000
Nitrobenzene	< 1670	< 50000
4-Nitrophenol	< 8080	< 242000
2-Nitrophenol	< 1670	< 50000
Pentachlorophenol	< 8080	< 242000
Phenanthrene	< 1670	< 50000
Phenol	< 1670	< 50000
Pyrene	< 1670	< 50000
1,2,4-Trichlorobenzene	< 1670	< 50000
2,4,6-Trichlorophenol	< 1670	< 50000

Table C-1. Results of analysis for volatile organic compounds in daily lab blanks consisting of pure water plus surrogate spike and internal standard compounds

	1	2	3	4	5	6
SAMPLE DATE:						
ANALYSIS DATE:						
HMES SAMPLE ID:	BLANK	BLANK				
CLIENT SAMPLE ID:	5-15-86	5-16-86				
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
acrolein	<10	<10				
acrylonitrile	<10	<10				
benzene	<5	<5				
bromodichloromethane	<5	<5				
bromoform	<5	<5				
bromomethane	<5	<5				
carbon tetrachloride	<5	<5				
chlorobenzene	<5	<5				
chloroethane	<5	<5				
chloroform	<5	<5				
chloromethane	<5	<5				
2-chloroethylvinyl ether	<10	<10				
cis-1,3-dichloropropene	<5	<5				
dibromochloromethane	<5	<5				
1,1-dichloroethane	<5	<5				
1,2-dichloroethane	<5	<5				
1,1-dichloroethylene	<5	<5				
1,2-dichloropropane	<5	<5				
ethylbenzene	<5	<5				
methylene chloride	<10	<10				
1,1,2,2-tetrachloroethane	<5	<5				
tetrachloroethylene	<5	<5				
toluene	<5	<5				
trans-1,2-dichloroethylene	<5	<5				
trans-1,3-dichloropropene	<5	<5				
1,1,1-trichloroethane	<5	<5				
1,1,2-trichloroethane	<5	<5				
trichloroethylene	<5	<5				
vinyl chloride	<5	<5				
cis-1,2-dichloroethylene	<5	<5				

Table C-2. Results of analysis for base/neutral extractable organic compounds in a daily lab blank consisting of pure water plus surrogate spike and internal standard compounds

	1	2	3	4	5	6
SAMPLE DATE:	5-15-86					
ANALYSIS DATE:	5-15-86					
MMES SAMPLE ID:	LAB BLANK					
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppm (ug/mL)					
N-nitroso-dimethylamine	<4.2					
bis (2-chloroethyl) ether	<4.2					
1,3-dichlorobenzene	<4.2					
1,4-dichlorobenzene	<4.2					
1,2-dichlorobenzene	<4.2					
bis(2-chloroisopropyl) ether	<4.2					
N-nitroso-di-N-propylamine	<4.2					
hexachloroethane	<8.4					
nitrobenzene	<8.4					
[illegible]phorone	<4.2					
[illegible]is (2-chloroethoxy) methane	<4.2					
1,2,4-trichlorobenzene	<4.2					
naphthalene	<4.2					
hexachlorobutadiene	<4.2					
hexachlorocyclopentadiene	<8.4					
2-chloronaphthalene	<4.2					
dimethylphthalate	<4.2					
acenaphthalene	<4.2					
2,6-dinitrotoluene	<8.4					
acenaphthene	<4.2					
2,4-dinitrotoluene	<8.4					
diethylphthalate	<8.4					
fluorene	<4.2					
4-chlorophenylphenyl ether	<4.2					
N-nitrosodiphenylamine	<8.4					
4-bromophenylphenyl ether	<4.2					
hexachlorobenzene	<4.2					
[illegible]henanthrene	<4.2					
[illegible]thracene	<4.2					

Table C-2. Continued

	1	2	3	4	5	6
SAMPLE DATE:	5-15-86					
ANALYSIS DATE:	5-15-86					
HMES SAMPLE ID:	LAB BLANK					
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppm (ug/mL)					
di-N-butylphthalate	<8.4					
fluoranthene	<4.2					
benzidine	<168					
pyrene	<4.2					
butylbenzylphthalate	<8.4					
3,3'-dichlorobenzidine	<8.4					
benzo (a) anthracene	<4.2					
chrysene	<4.2					
bis (2-ethylhexyl) phthalate	<8.4					
di-N-octylphthalate	<8.4					
benzo (b & k) fluoranthenes	<4.2					
benzo (a) pyrene	<4.2					
indeno-1,2,3 (c,d) pyrene	<8.4					
dibenzo (a,h) anthracene	<8.4					
benzo (g,h,i) perylene	<8.4					

Table C-3. Results of analysis for acid extractable organic compounds in a daily lab blank consisting of pure water plus surrogate spike and internal standard compounds

	1	2	3	4	5	6
SAMPLE DATE:	5-15-86					
ANALYSIS DATE:	5-15-86					
HMES SAMPLE ID:	LAB BLANK					
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppm (ug/mL)					
phenol	<4.2					
2-chlorophenol	<4.2					
2-nitrophenol	<4.2					
2,3-dimethylphenol	<4.2					
2,4-dichlorophenol	<4.2					
4-chloro-3-methylphenol	<4.2					
2,4,6-trichlorophenol	<4.2					
2,4-dinitrophenol	<12.6					
4-nitrophenol	<8.4					
4,6-dinitro-o-cresol	<12.6					
pentachlorophenol	<8.4					

SOIL/SEDIMENT/SURFACE WATER ANALYSIS

MARCH 1986

AND

DATA FROM RESAMPLING

AUGUST 1986

SURROGATE SPIKE RESULTS

Table B-5. Surrogate recoveries (%) for sediment samples collected from the Scrubber Sludge Ponds at Martin Marietta Reduction Facility, The Dalles, Oregon

	MMES ID	2804	2792	2793	2794	2795	2796	2798
	Client ID	SSPFBS	SSP1AS	SSP1BS	SSP1CS	SSP1DS	SSP2ES	SSP2FS
VOLATILES	Soil Acceptable Range							
Toluene-D8	81-117	101	104	99	100	103	101	100
4-Bromofluorobenzene	74-121	110	109	107	103	105	102	106
1,2-Dichloroethane-D4	70-121	86	89	83	77	91	78	76
BASE/NEUTRALS								
Nitrobenzene-D5	23-120	80	58	44	44	43	37	18*
2-Fluorobiphenyl	30-115	78	64	69	56	59	63	38
P-Terphenyl-D14	18-137	114	101	117	59	85	110	57
ACIDS/PHENOLS								
Phenol-D5	24-113	46	33	28	28	27	23*	16*
2-Fluorophenol	25-121	75	59	57	50	52	63	28
2,4,6-Tribromophenol	19-122	80	50	44	87	60	43	27

*One surrogate recovery per fraction may be outside the limits if > 10%.

Table B-5. Continued

	MMES ID	2799	2800	2801	2802			
	Client ID	SSP3GS	SSP3HS	SSP4IS	SSP4JS			
VOLATILES	Acceptable Range							
Toluene-D8	81-117	99	101	102	101			
4-Bromofluorobenzene	74-121	107	103	104	104			
1,2-Dichloroethane-D4	70-121	76	78	79	80			
BASE/NEUTRALS								
Nitrobenzene-D5	23-120	36	35	40	36			
2-Fluorobiphenyl	30-115	60	62	62	55			
P-Terphenyl-D14	18-137	85	72	89	78			
ACIDS/PHENOLS								
Phenol-D5	24-113	28	23*	29	24			
2-Fluorophenol	25-121	46	42	52	42			
2,4,6-Tribromophenol	19-122	58	55	41	42			

*One surrogate recovery per fraction may be outside the limits if > 10%.

Table B-11. Surrogate recoveries (%) for sediment samples collected from the Recycle Pond at Martin Marietta Reduction Facility, The Dalles, Oregon

	MMES ID	2604	2605	2606	2610	2609	2605-9	
	Client ID	RPFBS	RPAS	RPBS	RPCS	RPDS	COMPOSITE	
VOLATILES	Soil Acceptable Range							
Toluene-D8	81-117	91	90	99	93	97		
4-Bromofluorobenzene	74-121	103	98	97	100	104		
1,2-Dichloroethane-D4	70-121	79	78	87	77	77		
BASE/NEUTRALS					2608			
Nitrobenzene-D5	23-120	46	69	66	80	60		
2-Fluorobiphenyl	30-115	41*	79	72	78	75		
P-Terphenyl-D14	18-137	37	137	119	122	141*		
ACIDS/PHENOLS								
Phenol-D5	24-113	25	46	42	53	40		
2-Fluorophenol	25-121	46	71	70	72	65		
2,4,6-Tribromophenol	19-122	19	92	50	62	47		
PCBs								
HCB	30-130	15**					133	
Mirex	22-138	15					91	

*One surrogate recovery per fraction may be outside the limits if > 10%.

**Insufficient sample to repeat analysis.

Table B-13. Surrogate recoveries (%) for ~~sediment~~ surface water samples collected from the Recycle Pond at Martin Marietta Reduction Facility, The Dalles, Oregon

	MMES ID	2603	2588	2589	2591	2592	2616	2617
	Client ID	RPFBW	RPAW	RPBW	RPCW	RPCW	RPEW	RPFW
VOLATILES	Water Acceptable Range							
Toluene-D8	88-110	103	98	97	99	98	60	92
4-Bromofluorobenzene	86-115	99	69	98	97	99	102	102
1,2-Dichloroethane-D4	76-114	106	105	106	85	89	85	80
BASE/NEUTRALS								
Nitrobenzene-D5	35-114	69						
2-Fluorobiphenyl	43-116	63						
P-Terphenyl-D14	33-141	89						
ACIDS/PHENOLS								
Phenol-D5	10-94	81						
2-Fluorophenol	21-100	106						
2,4,6-Tribromophenol	10-123	118						
PCBs								
HCB	30-130	88						
Mirex	22-138	89						

Table B-13. Continued

	MMES ID	2594	2595	2626	2627	2643	2644	
	Client ID	RPGW	RPHW	RPIW	RRJW	RPW (comp)	RPW (comp)	
VOLATILES	Water Acceptable Range							
Toluene-D8	88-110	103	102	100	101			
4-Bromofluorobenzene	86-115	100	101	96	98			
1,2-Dichloroethane-D4	76-114	101	105	86	83			
BASE/NEUTRALS								
Nitrobenzene-D5	35-114					79	97	
2-Fluorobiphenyl	43-116					57	77	
P-Terphenyl-D14	33-141					101	83	
ACIDS/PHENOLS								
Phenol-D5	10-94					44	62	
2-Fluorophenol	21-100					62	67	
2,4,6-Tribromophenol	10-123					75	94	
PCBs								
HCB	30-130					72	76	
Mirex	22-138					78	93	

Table B-15. Surrogate recoveries (%) for surface water samples collected from Lined Pond at Martin Marietta Reduction Facility, The Dalles, Oregon

	MMES ID	2500	2480	2555	2498	2481	2534	2531
	Client ID	LPFBW	LPAW	LPBW	LPCW	LPDW	LPEW	LPFW
VOLATILES	Water Acceptable Range							
Toluene-D8	88-110	96	99	99	100	99	99	101
4-Bromofluorobenzene	86-115	99	101	99	106	99	105	107
1,2-Dichloroethane-D4	76-114	100	94	103	103	106	97	108
		2499						
BASE/NEUTRALS								
Nitrobenzene-D5	35-114	102						
2-Fluorobiphenyl	43-116	79						
P-Terphenyl-D14	33-141	71						
ACIDS/PHENOLS								
Phenol-D5	10-94	77						
2-Fluorophenol	21-100	77						
2,4,6-Tribromophenol	10-123	80						
PCBs								
HCB	30-130	77						
Mirex	22-138	84						

Table B-15. Continued

	MMES ID	2553	2529	2536	2562			
	Client ID	LPGW	LPHW	LPIW	LPW			
VOLATILES	Water Acceptable Range							
Toluene-D8	88-110	98	101	100				
4-Bromofluorobenzene	86-115	107	105	100				
1,2-Dichloroethane-D4	76-114	90	103	90				
BASE/NEUTRALS								
Nitrobenzene-D5	35-114				76			
2-Fluorobiphenyl	43-116				66			
P-Terphenyl-D14	33-141				64			
ACIDS/PHENOLS								
Phenol-D5	10-94				46			
2-Fluorophenol	21-100				68			
2,4,6-Tribromophenol	10-123				85			
PCBs								
HCB	30-130				96			
Mirex	22-138				102			

Table B-19. Surrogate recoveries (%) for surface water samples collected from Lined Pond at Martin Marietta Reduction Facility, The Dalles, Oregon

	Soil Acceptable Range							
MMES ID		2473 -surface water Bk	2503 -sediment sample					
Client ID		LPFB	LPS					
VOLATILES								
Toluene-D8	81-117		93					
4-Bromofluorobenzene	74-121		98					
1,2-Dichloroethane-D4	70-121		73					
		2472	2502					
BASE/NEUTRALS								
Nitrobenzene-D5	23-120	38	76					
2-Fluorobiphenyl	30-115	29**	95					
P-Terphenyl-D14	18-137	25**	138*					
ACIDS/PHENOLS								
Phenol-D5	24-113	22	43					
2-Fluorophenol	25-121	41	70					
2,4,6-Tribromophenol	19-122	22	123*					
PCBs								
HCB	30-130		96					
Mirex	22-138		137					

*One surrogate recovery per fraction may be outside the limits if > 10%.

* Insufficient sample to repeat extraction

Table B-22. Surrogate recoveries (%) for surface water samples collected from North Drainage Ditch at Martin Marietta Reduction Facility, The Dalles, Oregon

	MMES ID	2729	2723	2724	2710	2711	2728	
	Client ID	NDFBW	NDAW	NDBW	NDCW	NDDW	NDEW	
VOLATILES	Acceptable Range							
Toluene-D8	88-110	101	102	99	98	94	97	
4-Bromofluorobenzene	86-115	97	105	103	95	94	102	
1,2-Dichloroethane-D4	76-114	102	94	93	96	96	89	
BASE/NEUTRALS								
Nitrobenzene-D5	35-114	93	90	88	99	109	98	
2-Fluorobiphenyl	43-116	84	84	76	89	97	92	
P-Terphenyl-D14	33-141	107	80	70	96	90	108	
ACIDS/PHENOLS								
Phenol-D5	10-94	49	40	28	48	53	47	
2-Fluorophenol	21-100	92	31	11*	87	92	76	
2,4,6-Tribromophenol	10-123	79	89	86	94	118	112	
PCBs								
HCB	30-130	74	89	61	64	64	91	
Mirex	22-138	75	79	67	61	62	94	

*One surrogate recovery per fraction may be outside the limits if > 10%.

Table B-27. Surrogate recoveries (%) for sediment samples collected from the Discharge Channel at Martin Marietta Reduction Facility, The Dalles, Oregon

MMES ID		2475	2476	2477	2478	2537	2538
Client ID		DCFBS	DCAG	DCBG	DCCG	DCDG	DCEG
VOLATILES	Acceptable Range						
Toluene-D8	87-117	98	101	94	93	99	98
4-Bromofluorobenzene	74-121	104	99	103	100	105	104
1,2-Dichloroethane-D4	70-121	88	86	98	80	98	102
		2474	2504	2505	2506	2507	2508
BASE/NEUTRALS							
Nitrobenzene-D5	23-120	91	22*	34	42	34	25
2-Fluorobiphenyl	30-115	73	66	52	40	52	53
P-Terphenyl-D14	18-137	70	115	79	93	79	73
ACIDS/PHENOLS							
Phenol-D5	24-113	94	27	25	27	25	24
2-Fluorophenol	25-121	109*	54	50	32	50	42
2,4,6-Tribromophenol	19-122	112	81	39	40	39	42

* One surrogate recovery per fraction may be outside the limits of >10%.

Table B-31. Surrogate recoveries (%) for surface water samples collected from the Discharge Channel at Martin Marietta Reduction Facility, The Dalles, Oregon

	MMES ID	2708	2707					
	Client ID	DCFBW	DCAW					
VOLATILES	Acceptable Range							
Toluene-D8	88-110	100	100					
4-Bromofluorobenzene	86-115	104	104					
1,2-Dichloroethane-D4	76-114	84	86					
BASE/NEUTRALS								
Nitrobenzene-D5	35-114	83	97					
2-Fluorobiphenyl	43-116	81	89					
P-Terphenyl-D14	33-141	90	84					
ACIDS/PHENOLS								
Phenol-D5	10-94	54	44					
2-Fluorophenol	21-100	98	75					
2,4,6-Tribromophenol	10-123	103	101					
PCBs								
HCB	30-130	80	90					
Mirex	22-138	80	102					

Table B-32. Surrogate recoveries (%) for surface water samples collected from the Duck Pond at Martin Marietta Reduction Facility, The Dalles, Oregon

	MMES ID	2614	2600	2602	2612	2613	2624	2625
	Client ID	DPFBW	DPAW	DPBW	DPCW	DPDW	DPEW	DPFW
VOLATILES	Acceptable Range							
Toluene-D8	88-110	98	102	102	99	98	99	100
4-Bromofluorobenzene	86-115	100	101	101	99	96	96	98
1,2-Dichloroethane-D4	76-114	88	103	103	84	87	77	86
BASE/NEUTRALS								
Nitrobenzene-D5	35-114	85	74	77	67	82	95	107
2-Fluorobiphenyl	43-116	80	70	61	68	79	73	85
P-Terphenyl-D14	33-141	79	56	69	59	58	65	83
ACIDS/PHENOLS								
Phenol-D5	10-94	67	69	76	76	77	68	71
2-Fluorophenol	21-100	79	84	96	100	92	77	75
2,4,6-Tribromophenol	10-123	107	111	129*	126*	122	98	88
PCBs								
HCB	30-130	75	61	87	76	78	68	63
Mirex	22-138	71	62	99	83	89	54	61

*One surrogate recovery per fraction may be outside the limits of >10%.

Ta[illegible] B-32. Continued

MMES ID		2598	2599	2620				
Client ID		DPGW	DPHW	DPIW				
VOLATILES	Water Acceptable Range							
Toluene-D8	88-110	104	102	103				
4-Bromofluorobenzene	86-115	99	98	98				
1,2-Dichloroethane-D4	76-114	104	103	95				
BASE/NEUTRALS								
Nitrobenzene-D5	35-114	83	89	71				
2-Fluorobiphenyl	43-116	74	72	64				
P-Terphenyl-D14	33-141	70	59	87				
ACIDS/PHENOLS								
Phenol-D5	10-94	82	79	65				
2-Fluorophenol	21-100	99	92	75				
2,4,6-Tribromophenol	10-123	110	97	98				
PCBs								
HCB	30-130	97	75	86				
Mirex	22-138	66	77	84				

* One surrogate recovery per fraction may be outside the limits of >10%.

Table B-37. Surrogate recoveries (%) for surface water samples collected from the Landfill Leachate at Martin Marietta Reduction Facility, The Dalles, Oregon

	MMES ID	2716	2701	2702	2704	2705		
	Client ID	LLFB	LLAW	LLBW	LLCW	LLDW		
VOLATILES	Acceptable Range							
Toluene-D8	88-110	97	100	100	95	97		
4-Bromofluorobenzene	86-115	96	104	103	97	96		
1,2-Dichloroethane-D4	76-114	91	89	91	90	93		
BASE/NEUTRALS								
Nitrobenzene-D5	35-114	84	99	92	90	86		
2-Fluorobiphenyl	43-116	81	79	69	79	76		
P-Terphenyl-D14	33-141	96	58	48	64	51		
ACIDS/PHENOLS								
Phenol-D5	10-94	51	41	40	47	46		
2-Fluorophenol	21-100	99	40	33	42	44		
2,4,6-Tribromophenol	10-123	93	89	62	60	73		
PCBs								
HCB	30-130	80	71	53	81	71		
Mirex	22-138	72	47	47	85	85		

Table B-40. Surrogate recoveries (%) for sediment samples collected from the Surface Drainage Ditch at Martin Marietta Reduction Facility, The Dalles, Oregon

MMES ID		2717	2720			
Client ID		SDFBS	SDAS			
VOLATILES	Acceptable Range					
Toluene-D8	81-117	100	93			
4-Bromofluorobenzene	74-121	102	93			
1,2-Dichloroethane-D4	70-121	95	96			
BASE/NEUTRALS						
Nitrobenzene-D5	23-120	87	68			
2-Fluorobiphenyl	30-115	80	68			
P-Terphenyl-D14	18-137	81	93			
ACIDS/PHENOLS						
Phenol-D5	24-113	51	32			
2-Fluorophenol	25-121	77	45			
2,4,6-Tribromophenol	19-122	101	34			

Table B-44. Surrogate recoveries (%) for trip blanks collected from Martin Marietta Reduction Facility, The Dalles, Oregon

MMES ID		2615				2532	2470	
Client ID		T.B.1 S.W				T.B.2 S.W + SED	T.B.2.7 SED	
VOLATILES	Acceptable Range							
Toluene-D8	88-110	93				99	101	
4-Bromofluorobenzene	86-115	97				97	107	
1,2-Dichloroethane-D4	76-114	89				101	100	
		2615 1.1				2469 2.1		
BASE/NEUTRALS								
Nitrobenzene-D5	35-114	72				92		
2-Fluorobiphenyl	43-116	76				72		
P-Terphenyl-D14	33-141	59				78		
ACIDS/PHENOLS								
Phenol-D5	10-94	87				72		
2-Fluorophenol	21-100	112*				80		
2,4,6-Tribromophenol	10-123	112				89		
PCBs								
HCB	30-130	54						
Mirex	22-138	58						

* One surrogate recovery per fraction may be outside the limits if >10%

Table B-44. Continued

	MMES ID	2797	2590	2628	2607		2479	2596
	Client ID	T.B.3 -SED	T.B.4 SN	T.B.5 SN	T.B.6 SED		T.B.8 -SN	T.B.9 SN
VOLATILES	Acceptable Range							
Toluene-D8	88-110	104	95	101	102		97	103
4-Bromofluorobenzene	86-115	109	92	98	98		100	101
1,2-Dichloroethane-D4	76-114	94	112	85	103		106	96

6 VOC water

Table B-44. Continued

MMES ID		2618	2468	2496	2551	2700	2527	2703
Client ID		T.B.10 SW	T.B.11 SED	T.B.12 SW	T.B.13 SW	T.B.14 SW	T.B.15 SW	T.B.16 SW
VOLATILES	Water Acceptable Range							
Toluene-D8	88-110	93	102	100	100	100	96	98
4-Bromofluorobenzene	86-115	99	106	100	95	104	107	102
1,2-Dichloroethane-D4	76-114	78	95	105	101	90	100	84

Table B-44. Continued

VOLATILES	Water Acceptable Range	MMES ID 2501 Client ID T.B.17	2706 T.B.18	2619 T.B.19	2597 T.B.20	2611 T.B.21	2601 T.B.22	2623 T.B.23
Toluene-D8	88-110	99	100	102	103	102	104	101
4-Bromofluorobenzene	86-115	101	103	96	98	100	99	98
1,2-Dichloroethane-D4	76-114	95	79	97	103	108	105	81

7 voc water

Table B-44. Continued

	MMES ID	2715	2709		2722	2721	2803
	Client ID	T.B.24	T.B.25		T.B.27	T.B.28	T.B.29
VOLATILES	Water Acceptable Range						
Toluene-D8	88-110	98	100		93	97	103
4-Bromofluorobenzene	86-115	93	104		99	96	105
1,2-Dichloroethane-D4	76-114	91	84		86	96	91

Resampling Data

Table B-3. Surrogate spike recoveries (%) for soil samples collected from the Martin Marietta Reduction Facility, The Dalles, Oregon

	MMES ID	0877	0892	0893				
	Client ID	DCDG	DCEG	SR-3				
VOLATILES	Soil Acceptable Range							
Toluene-D8	81-117	100	97	99				
4-Bromofluorobenzene	74-121	99	100	103				
1,2-Dichloroethane-D4	70-121	80	90	98				

Table B-3. Continued Resampling Data

MMES ID		0870	0871	0872	0923	0924	0925	0926
Client ID		SSD-1	SSD-2	SSD-3	RPS-1	RPS-2	RPS-3	RPS-4
BASE/NEUTRALS	Acceptable Range							
Nitrobenzene-D5	23-120	90	70	74	66	60	70	70
2-Fluorobiphenyl	30-115	84	70	72	74	72	82	82
P-Terphenyl-D14	18-137	88	84	82	84	80	84	80
ACIDS/PHENOLS								
Phenol-D5	24-113	66	53	61	59	55	62	63
2-Fluorophenol	25-121	76	57	70	63	56	62	63
2,4,6-Tribromophenol	19-122	99	89	91	61	62	72	66

Table B-3. Continued Resampling Data

	MMES ID	0927	0928					
	Client ID	RPS-5	RPS-6					
BASE/NEUTRALS	Acceptable Range							
Nitrobenzene-D5	23-120	94	74					
2-Fluorobiphenyl	30-115	86	78					
P-Terphenyl-D14	18-137	92	88					
ACIDS/PHENOLS								
Phenol-D5	24-113	74	62					
2-Fluorophenol	25-121	82	65					
2,4,6-Tribromophenol	19-122	100	70					

Resampling Data

Table B-4. Surrogate spike recoveries (%) for aqueous trip blanks accompanying samples collected from the Martin Marietta Reduction Facility, The Dalles, Oregon

MMES ID		878	884	894				
		Trip Blank	Trip Blank	Trip Blank				
Client ID		46	48	1A				
VOLATILES	Water Acceptable Range							
Toluene-D8	88-110	101	96	98				
4-Bromofluorobenzene	86-115	102	95	100				
1,2-Dichloroethane-D4	76-114	105	77	97				

Resampling Data

Table B-11. Surrogate spike recoveries (%) for matrix spike (MS) and matrix spike duplicate (MSD) analyses of soil samples collected from the Martin Marietta Reduction Facility, The Dalles, Oregon

MMES ID		0871MS	0871MSD	0877MS	0877MSD	0892MS	0892MSD	
Client ID		SSD-2	SSD-2	DCDG	DCDG	DCEG	DCEG	
VOLATILES	Soil Acceptable Range							
Toluene-D8	81-117			102	101	97	98	
4-Bromofluorobenzene	74-121			102	101	100	101	
1,2-Dichloroethane-D4	70-121			87	85	102	97	
BASE/NEUTRALS								
Nitrobenzene-D5	23-120	84	84					
2-Fluorobiphenyl	30-115	76	76					
P-Terphenyl-D14	18-137	82	86					
ACIDS/PHENOLS								
Phenol-D5	24-113	68	66					
2-Fluorophenol	25-121	72	68					
2,4,6-Tribromophenol	19-122	92	94					

Table B-11. Continued Resampling Data

MMES ID		0926MS	0926MSD					
Client ID		RPS-4	RPS-4					
BASE/NEUTRALS	Acceptable Range							
Nitrobenzene-D5	23-120	84	74					
2-Fluorobiphenyl	30-115	90	78					
P-Terphenyl-D14	18-137	100	108					
ACIDS/PHENOLS								
Phenol-D5	24-113	75	68					
2-Fluorophenol	25-121	74	64					
2,4,6-Tribromophenol	19-122	77	65					

ble C-6. Surrogate spike recoveries (% or aqueous blanks associated with soil samples collected on 10 May 1986 from the Landfill at the Martin Marietta Reduction Facility, The Dalles, Oregon

	MMES ID	3297	3293	3299	3302	3303		
	Client ID	LFFBS	Trip Blank	Trip Blank	Trip Blank	Trip Blank		
VOLATILES	Acceptable Range							
Toluene-D8	88-110	99	99	98		99		
4-Bromofluorobenzene	86-115	103	101	102		100		
1,2-Dichloroethane-D4	76-114	99	99	98		100		
BASE/NEUTRALS								
Nitrobenzene-D5	35-114	29*			52			
2-Fluorobiphenyl	43-116	49			73			
P-Terphenyl-D14	33-141	90			87			
ACIDS/PHENOLS								
Phenol-D5	10-94	33			56			
2-Fluorophenol	21-100	55			58			
2,4,6-Tribromophenol	10-123	45			50			

*One surrogate recovery per fraction may be outside the limits if > 10%

Table C-4. Surrogate spike recoveries (%) for daily lab blanks

MMES ID		Blank	Blank	Blank				
Client ID		5-15-86	5-16-86	5-14-86				
VOLATILES	Acceptable Range							
Toluene-D8	88-110	100	101					
4-Bromofluorobenzene	86-115	100	100					
1,2-Dichloroethane-D4	76-114	96	97					
BASE/NEUTRALS								
Nitrobenzene-D5	35-114			62				
2-Fluorobiphenyl	43-116			84				
P-Terphenyl-D14	33-141			92				
ACIDS/PHENOLS								
Phenol-D5	10-94			33				
2-Fluorophenol	21-100			38				
2,4,6-Tribromophenol	10-123			22				

Table C-5. Surrogate spike recoveries (%) for soil samples collected on 10 May 1986 from the Landfill at the Martin Marietta Reduction Facility, The Dalles, Oregon

	MMES ID	3290	3291	3292	3294	3295		
	Client ID	LFAS	LFBS	LFCS	LFDS	LFES		
VOLATILES	Acceptable Range							
Toluene-D8	81-117	98	99	98	99	100		
4-Bromofluorobenzene	74-121	100	100	101	99	99		
1,2-Dichloroethane-D4	70-121	99	97	97	98	102		
BASE/NEUTRALS								
Nitrobenzene-D5	23-120	53	54	52	58	42		
2-Fluorobiphenyl	30-115	83	79	81	88	80		
P-Terphenyl-D14	18-137	83	111	109	103	96		
ACIDS/PHENOLS								
Phenol-D5	24-113	55	52	67	65	52		
2-Fluorophenol	25-121	55	70	78	75	68		
2,4,6-Tribromophenol	19-122	69	71	69	78	55		

SOIL/SEDIMENT/SURFACE WATER ANALYSIS

MARCH 1986

AND

DATA FROM RESAMPLING

AUGUST 1986

MATRIX SPIKE/MATRIX SPIKE DUPLICATES

Table B-6. Matrix spike recovery: Volatiles in soil matrix. Sediment samples collected from the Scrubber Sludge Ponds at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2795 Client ID: SSP1DS Units: ppm

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)] Recovery	RPD
1,1-Dichloroethylene	ND	50	29	59	30	61	3	59-172	22
Trichloroethylene	ND	50	42	84	37	75	11	62-137	24
Chlorobenzene	ND	50	36	72	37	74	3	60-133	21
Toluene	ND	50	39	78	41	81	4	59-139	21
Benzene	ND	50	41	83	39	78	6	66-142	21

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-7. Matrix spike recovery: Base/neutral extractables in soil matrix. Sediment samples collected from the Scrubber Sludge Ponds at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2795 Client ID: SSP1DS Units: ppm

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)]	
								Recovery	RPD
1,2,4-Dichloroethylene	ND	50	33	66	32	64	2	38-107	23
Acenaphthene	ND	50	38	76	33	66	14	31-137	19
2,4-Dinitrotoluene	ND	50	33	66	27	54	20	28-89	47
Pyrene	1330	50	1490	320	1060	0	200	35-142	36 ✓
N-Nitrosodi-n-Propylamine	ND	50	25	50	22	44	13	41-126	38
1,4-Dichlorobenzene	ND	50	21	42	21	42	0	28-104	27

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-8. Matrix spike recovery: Base/neutral extractables in soil matrix. Sediment samples collected from the Scrubber Sludge Ponds at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2800 Client ID: SSP3HS Units: ppm

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)] Recovery	Acceptable Limits[(c)] RPD
1,2,4-Dichloroethylene	ND	50	32	64	28	56	13	38-107	23
Acenaphthene	2	50	40	76	37	70	8	31-137	19
2,4-Dinitrotoluene	ND	50	10	20	9	18	11	28-89	47
Pyrene	56	50	79	46	107	102	76	35-142	36
N-Nitrosodi-n-Propylamine	ND	50	22	44	24	48	9	41-126	38
1,4-Dichlorobenzene	ND	50	25	50	0	0	200	28-104	27

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1} \times 100$ where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-10. Matrix spike recovery: Acid extractables in soil matrix. Sediment samples collected from the Scrubber Sludge Ponds at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2800 Client ID: SSP3HS Units: ppm

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
Pentachlorophenol	ND	100	31	31	23	23	30	17-109	47
Phenol	ND	100	39	39	40	40	3	26-90	35
2-Chlorophenol	ND	100	49	49	52	52	6	25-102	50
4-Chloro-3-Methylphenol	ND	100	78	78	69	69	12	26-103	33
4-Nitrophenol	ND	100	0	0	0	0	0	11-114	50

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1} \times 100$ where x and x^1 = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-12. Matrix spike recovery: Volatiles in soil matrix. Sediment samples collected from the Recycle Pond at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2606 Client ID: RPBS Units: ppm

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)] Recovery	RPD	
1,1-Dichloroethylene	ND	50	19	39	35	71	58	59-172	22	✓
Trichloroethylene	ND	50	49	97	65	129	28	62-137	24	
Chlorobenzene	ND	50	21	42	25	49	15	60-133	21	
Toluene	ND	50	28	56	33	66	16	59-139	21	✓
Benzene	ND	50	79	159	93	187	16	66-142	21	✓

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-14. Matrix spike recovery: Volatiles in water matrix. Surface water samples collected from the Recycle Pond at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2617 Client ID: RPFW Units: ppb

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)]	
								Recovery	RPD
1,1-Dichloroethylene	ND	50	48	95	47	94	1	61-145	14
Trichloroethylene	ND	50	39	78	41	81	4	71-120	14
Chlorobenzene	ND	50	60	121	59	118	3	75-130	13
Toluene	ND	50	61	122	60	120	2	76-125	13
Benzene	ND	50	38	76	38	77	1	76-127	11

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-16. Matrix spike recovery: Volatiles in water matrix. Surface water samples collected from the Lined Pond at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2498 Client ID: LPCW Units: ppb

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)]	
								Recovery	RPD
1,1-Dichloroethylene	ND	50	55	111	58	116	4	61-145	14
Trichloroethylene	ND	50	58	116	65	130	11	71-120	14
Chlorobenzene	ND	50	45	89	48	96	8	75-130	13
Toluene	ND	50	48	96	52	104	8	76-125	13
Benzene	ND	50	58	115	64	127	10	76-127	11

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-17. Matrix spike recovery: Base/neutral extractables in water matrix. Surface water samples collected from the Lined Pond at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2562 Client ID: LPW Units: ppb

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,2,4-Dichloroethylene	ND	100	70	70	66	66	6	39-98	28
Acenaphthene	ND	100	62	62	70	70	12	46-118	31
2,4-Dinitrotoluene	ND	100	79	79	86	86	8	24-96	38
Pyrene	ND	100	80	80	101	101	23	26-127	31
N-Nitrosodi-n-Propylamine	ND	100	72	72	74	74	3	41-116	38
1,4-Dichlorobenzene	ND	100	61	61	58	58	5	36-97	28

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100) where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-18. Matrix spike recovery: Acid extractables in water matrix. Surface water samples collected from the Lined Pond at Martin Marietta Reduction Facility, The Dalles, Oregon

Sample Lab ID: 2562 ✓ Client ID: LPW Units: ppb

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]		
								Recovery	RPD	
Pentachlorophenol	ND	200	348	174	350	175	1	9-103	50	✓
Phenol	ND	200	146	73	142	71	3	12-89	42	
2-Chlorophenol	ND	200	176	88	178	89	1	27-123	40	
4-Chloro-3-Methylphenol	ND	200	122	61	124	62	2	23-97	42	
4-Nitrophenol	ND	200	222	111	242	121	9	10-80	50	✓

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1} \times 100$ where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-20. Matrix spike recovery: Base/neutral extractables in soil matrix. Sediment samples collected from the Lined Pond at Martin Marietta Reduction Facility, The Dalles, Oregon

---

Sample Lab ID: 2502 Client ID: LPS Units: ppm

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,2,4-Dichloroethylene	ND	50	34	68	40	80	16	38-107	23
Acenaphthene	ND	50	35	70	39	78	11	31-137	19
2,4-Dinitrotoluene	ND	50	34	68	38	76	11	28-89	47
Pyrene	256	50	286	60	271	30	67	35-142	36
N-Nitrosodi-n-Propylamine	ND	50	34	68	39	78	14	41-126	38
1,4-Dichlorobenzene	ND	50	23	46	26	52	12	28-104	27

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1} \times 100$ where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-21. Matrix spike recovery: Acid extractables in soil matrix. Sediment samples collected from the Lined Pond at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2502 ✓ Client ID: LPS Units: ppm

Spike Compound	Conc. in Sample(a)	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD(b)	Acceptable Limits(c)	
								Recovery	RPD
Pentachlorophenol	ND	100	41	41	48	48	16	17-109	47
Phenol	ND	100	80	80	93	93	15	26-90	35 ✓
2-Chlorophenol	ND	100	107	107	126	126	16	25-102	50 ✓
4-Chloro-3-Methylphenol	ND	100	37	37	40	40	8	26-103	33
4-Nitrophenol	ND	100	0	0	0	0	0	11-114	50 ✓

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-23. Matrix spike recovery: Volatiles in water matrix. Surface water samples collected from the North Drainage Ditch at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2711 /   Client ID: NDDW   Units: ppb

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,1-Dichloroethylene	ND	50	44	89	36	73	20	61-145	14
Trichloroethylene	ND	50	54	109	56	112	3	71-120	14
Chlorobenzene	ND	50	51	101	52	104	3	75-130	13
Toluene	ND	50	52	105	52	103	2	76-125	13
Benzene	ND	50	53	106	54	108	2	76-127	11

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-24. Matrix spike recovery: Volatiles in water matrix. Surface water samples collected from the North Drainage Ditch at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2728 ✓ Client ID: NDEW Units: ppb

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,1-Dichloroethylene	ND	50	40	80	52	104	26	61-145	14
Trichloroethylene	ND	50	74	149	50	101	55	71-120	14 ✓
Chlorobenzene	ND	50	56	112	54	109	3	75-130	13
Toluene	ND	50	55	111	57	115	4	76-125	13
Benzene	ND	50	78	156	54	107	37	76-127	11 ✓

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-25. Matrix spike recovery: Base/neutral extractables in water matrix. Surface water samples collected from the North Drainage Ditch at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2728 Client ID: NDEW Units: ppb

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)]	
								Recovery	RPD
1,2,4-Dichloroethylene	ND	100	72	72	74	74	3	39-98	28
Acenaphthene	ND	100	70	70	66	66	6	46-118	31
2,4-Dinitrotoluene	ND	100	78	78	70	70	11	24-96	38
Pyrene	ND	100	102	102	72	72	34	26-127	31
N-Nitrosodi-n-Propylamine	ND	100	76	76	70	70	8	41-116	38
1,4-Dichlorobenzene	ND	100	56	86	56	56	0	36-97	28

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-26. Matrix spike recovery: Acid extractables in water matrix. Surface water samples collected from the North Drainage Ditch at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2728 ✓ Client ID: NDEW Units: ppb

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)] Recovery	Acceptable Limits[(c)] RPD	
Pentachlorophenol	ND	200	296	148	284	142	4	9-103	50	✓
Phenol	ND	200	154	77	156	78	1	12-89	42	
2-Chlorophenol	ND	200	206	103	210	105	2	27-123	40	
4-Chloro-3-Methylphenol	ND	200	200	100	218	109	9	23-97	42	✓
4-Nitrophenol	ND	200	174	87	164	82	6	10-80	50	✓

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-28. Matrix spike recovery: Volatiles in soil matrix. Sediment samples collected from the Discharge Channel at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2476 ✓ Client ID: DCAG Units: ppm

Spike Compound	Conc. in Sample(a)	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD(b)	Acceptable Limits(c)		
								Recovery	RPD	
1,1-Dichloroethylene	ND	50	27	53	43	85	46	59-172	22	✓
Trichloroethylene	ND	50	40	81	103	205	87	62-137	24	✓
Chlorobenzene	ND	50	42	83	47	94	12	60-133	21	
Toluene	ND	50	41	81	52	103	24	59-139	21	
Benzene	1.1*	50	45	87	118	236	92	66-142	21	✓

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-29. Matrix spike recovery: Base/neutral extractables in soil matrix. Sediment samples collected from the Discharge Channel at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2504 Client ID: DCAG Units: ppm

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]		
								Recovery	RPD	
1,2,4-Trichlorobenzene	ND	50	56	112	57	114	2	38-107	23	✓
Acenaphthene	1.5	50	42	81	60	117	36	31-137	19	
2,4-Dinitrotoluene	ND	50	29	58	55	110	62	28-89	47	✓
Pyrene	32	50	0	0	0	0	0	35-142	36	✓
N-Nitrosodi-n-Propylamine	ND	50	39	78	52	104	29	41-126	38	
1,4-Dichlorobenzene	ND	50	47	94	49	98	4	28-104	27	

[a] Values reported as not detected (ND) are treated as zero for purposes of calculation.

[b] RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

[c] Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-30. Matrix spike recovery: Acid extractables in soil matrix. Sediment samples collected from the Discharge Channel at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2504 Client ID: DCAG Units: ppm

Spike Compound	Conc. in Sample(a)	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD(b)	Acceptable Limits(c)	
								Recovery	RPD
Pentachlorophenol	ND	100	39	39	28	28	25	17-109	47
Phenol	ND	100	71	71	87	87	20	26-90	35
2-Chlorophenol	ND	100	92	92	99	99	7	25-102	50
4-Chloro-3-Methylphenol	ND	100	140	140	157	157	11	26-103	33 ✓
4-Nitrophenol	ND	100	0	0	0	0	0	11-114	50 ✓

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-33. Matrix spike recovery: Volatiles in water matrix. Surface water samples collected from the Duck Pond at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2600 Client ID: DPAW Units: ppb

Spike Compound	Conc. in Sample(a)	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD(b)	Acceptable Limits(c) Recovery	Acceptable Limits(c) RPD	
1,1-Dichloroethylene	ND	50	42	84	43	86	2	61-145	14	
Trichloroethylene	ND	50	23	47	23	47	0	71-120	14	✓
Chlorobenzene	ND	50	47	93	48	95	2	75-130	13	
Toluene	ND	50	50	100	51	102	2	76-125	13	
Benzene	ND	50	28.	57.	48	96	51	76-127	11	✓

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-34. Matrix spike recovery: Volatiles in water matrix. Surface water samples collected from the Duck Pond at Martin Marietta Reduction Facility, The Dalles, Oregon

Sample Lab ID: 2620✓ Client ID: DPIW Units: ppb

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)]		
								Recovery	RPD	
1,1-Dichloroethylene	ND	50	44	88	40	79	11	61-145	14	
Trichloroethylene	ND	50	78	156	94	189	19	71-120	14	✓
Chlorobenzene	ND	50	49	99	46	92	7	75-130	13	
Toluene	ND	50	53	107	48	96	11	76-125	13	
Benzene	ND	50	114	227	105	210	8	76-127	11	✓

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-35. Matrix spike recovery: Base/neutral extractables in water matrix. Surface water samples collected from the Duck Pond at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2612 Client ID: DPCW Units: ppb

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,2,4-Trichlorobenzene	ND	100	62	62	52	52	18	39-98	28
Acenaphthene	ND	100	74	74	64	64	14	46-118	31
2,4-Dinitrotoluene	ND	100	84	84	66	66	24	24-96	38
Pyrene	ND	100	94	94	84	84	11	26-127	31
N-Nitrosodi-n-Propylamine	ND	100	80	80	64	64	22	41-116	38
1,4-Dichlorobenzene	ND	100	56	56	48	48	15	36-97	28

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-36. Matrix spike recovery: Acid extractables in water matrix. Surface water samples collected from the Duck Pond at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2612 Client ID: DPCW Units: ppb

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)] Recovery	Acceptable Limits[(c)] RPD	
Pentachlorophenol	ND	200	340	170	348	174	2	9-103	50	✓
Phenol	ND	200	170	85	166	83	2	12-89	42	
2-Chlorophenol	ND	200	208	104	206	103	1	27-123	40	
4-Chloro-3-Methylpenol	ND	200	246	123	222	111	10	23-97	42	✓
4-Nitrophenol	ND	200	262	131	238	119	10	10-80	50	✓

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1} \times 100$ where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-38. Matrix spike recovery: Base/neutral extractables in water matrix. Surface water samples collected from the Landfill Leachate at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2705 Client ID: LLDW Units: ppb

Spike Compound	Conc. in Sample(a)	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD(b)	Acceptable Limits(c)	
								Recovery	RPD
1,2-4-Trichlorobenzene	ND	100	56	56	62	62	10	39-98	28
Acenaphthene	ND	100	62	62	66	66	6	46-118	31
2,4-Dinitrotoluene	ND	100	70	70	90	90	25	24-96	38
Pyrene	ND	100	82	82	80	80	2	26-127	31
N-Nitrosodi-n-Propylamine	ND	100	80	80	76	76	5	41-116	38
1,4-Dichlorobezene	ND	100	46	46	54	54	16	36-97	28

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-39. Matrix spike recovery: Acid extractables in water matrix. Surface water samples collected from the Landfill Leachate at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2705 Client ID: LLDW Units: ppb

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)]		
								Recovery	RPD	
Pentachlorophenol	ND	200	234	117	264	132	12	9-103	50	✓
Phenol	ND	200	128	64	128	64	0	12-89	42	
2-Chlorophenol	ND	200	154	77	172	86	11	27-123	40	
4-Chloro-3-Methylphenol	ND	200	212	106	218	109	3	23-97	42	✓
4-Nitrophenol	ND	200	140	70	192	96	31	10-80	50	✓

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-41. Matrix spike recovery: Volatiles in soil matrix. Sediment samples collected from the Surface Drainage Ditch at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2720 Client ID: SDAS Units: ppm

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)]		
								Recovery	RPD	
1,1-Dichloroethylene	ND	50	40	81	41	81	0	59-172	22	
Trichloroethylene	ND	50	59	117	105	209	56	62-137	24	✓
Chlorobenzene	ND	50	46	91	45	89	2	60-133	21	
Toluene	ND	50	47	95	46	93	2	59-139	21	
Benzene	ND	50	79	159	108	215	30	66-142	21	✓

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-42. Matrix spike recovery: Base/neutral extractables in soil matrix. Sediment samples collected from the Surface Drainage Ditch at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2720 Client ID: SDAS Units: ppm

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,2-4-Trichlorobenzene	ND	50	36	72	39	78	8	38-107	23
Acenaphthene	ND	50	36	72	37	74	3	31-137	19
2,4-Dinitrotoluene	ND	50	42	84	41	82	2	28-89	47
Pyrene	.28	50	64	127	52	103	21	35-142	36
N-Nitrosodi-n-Propylamine	.32	50	31	61	28	55	10	41-126	38
1,4-Dichlorobezene	ND	50	30	60	29	58	3	28-104	27

[a] Values reported as not detected (ND) are treated as zero for purposes of calculation.

[b] RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1} \times 100$ where x and x^1 = % spike recovery and duplicate % spike recovery

[c] Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-43. Matrix spike recovery: Acid extractables in soil matrix. Sediment samples collected from the Surface Drainage Ditch at Martin Marietta Reduction Facility, The Dalles, Oregon.

Sample Lab ID: 2720 Client ID: SDAS Units: ppm

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)]		
								Recovery	RPD	
Pentachlorophenol	ND	100	145	145	154	154	6	17-109	47	✓
Phenol	ND	100	62	62	68	68	9	26-90	35	
2-Chlorophenol	ND	100	73	73	82	82	12	25-102	50	
4-Chloro-3-Methylphenol	ND	100	42	42	61	61	37	26-103	33	
4-Nitrophenol	ND	100	83	83	76	76	9	11-114	50	

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1} \times 100$ where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Resampling Data

Table B-5. Matrix spike and matrix spike duplicate recoveries: base/neutral extractables in soil matrix

LAB ID: 0871 SAMPLE ID: SSD #2 UNITS: µg/kg

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,2,4-Trichlorobenzene	ND	50	39.5	79	37.2	74	6	38-107	23
Acenaphthene	ND	50	38.4	77	37.9	76	1	31-137	19
2,4-Dinitrotoluene	ND	50	46.2	92	47.6	95	3	28-89	47 ✓
Pyrene	ND	50	46.8	94	49.2	98	5	35-142	36
N-Nitrosodi-n-Propylamine	ND	50	43.0	86	40.3	81	6	41-126	38
1,4-Dichlorobenzene	ND	50	35.5	71	33.0	66	7	28-104	27

[a] Values reported as not detected (ND) are treated as zero for purposes of calculation.

[b] RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

[c] Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Resampling Data

Table B-6. Matrix spike and matrix spike duplicate recoveries: acid extractables in soil matrix

LAB ID: 0871 SAMPLE ID: SSD #2 UNITS: µg/kg

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)] Recovery	Acceptable Limits[(c)] RPD
Pentachlorophenol	ND	100	76.3	76	72.2	72	6	17-109	47
Phenol	ND	100	59.0	59	51.9	52	13	26-90	35
2-Chlorophenol	ND	100	66.0	66	61.5	62	7	25-102	50
4-Chloro-3-Methylphenol	ND	100	69.6	70	64.3	64	8	26-103	33
4-Nitrophenol	ND	100	70.7	71	81.9	82	15	11-114	50

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Resampling Data

Table B-7. Matrix spike and matrix spike duplicate recoveries: volatiles in soil matrix

LAB ID: 0877 SAMPLE ID: DCDG UNITS: µg/kg

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,1-Dichloroethylene	ND	50	48.1	96	49.3	99	2	59-172	22
Trichloroethylene	ND	50	50.9	102	51.4	103	1	62-137	24
Chlorobenzene	ND	50	49.7	99	50.9	102	2	60-133	21
Toluene	ND	50	52.5	105	54.0	108	3	59-139	21
Benzene	ND	50	51.8	104	53.1	106	2	66-142	21

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Resampling Data

Table B-8. Matrix spike and matrix spike duplicate recoveries: volatiles in soil matrix

LAB ID: 0892 SAMPLE ID: DCEG UNITS: µg/kg

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)]	
								Recovery	RPD
1,1-Dichloroethylene	ND	50	50.2	100	43.9	88	13	59-172	22
Trichloroethylene	ND	50	48.1	96	43.8	88	9	62-137	24
Chlorobenzene	ND	50	46.7	93	44.0	88	6	60-133	21
Toluene	ND	50	49.5	99	45.5	91	8	59-139	21
Benzene	ND	50	51.4	103	47.4	95	8	66-142	21

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Resampling Data

Table B-9. Matrix spike and matrix spike duplicate recoveries: base/neutral extractables in matrix

LAB ID: 0926 SAMPLE ID: RPS-4 UNITS: µg/kg

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,2,4-Trichlorobenzene	ND	50	41.1	82	40.8	82	1	38-107	23
Acenaphthene	ND	50	43.9	88	43.7	87	0	31-137	19
2,4-Dinitrotoluene	ND	50	40.7	81	39.4	79	3	28-89	47
Pyrene	ND	50	116	112	120	120	7	35-142	36
N-Nitrosodi-n-Propylamine	59.9	50	37.8	76	39.1	78	3	41-126	38
1,4-Dichlorobenzene	ND	50	40.6	81	39.9	80	2	28-104	27

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table B-10. Resampling Data Matrix spike and matrix spike duplicate recoveries: acid extractables in soil matrix

LAB ID: 0926 SAMPLE ID: RPS-4 UNITS: µg/kg

Spike Compound	Conc. in Sample(a)	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD(b)	Acceptable Limits(c)	
								Recovery	RPD
Pentachlorophenol	ND	100	79.3	79	94.1	94	17	17-109	47
Phenol	ND	100	71.5	72	71.6	72	0	26-90	35
2-Chlorophenol	ND	100	72.2	72	71.6	72	1	25-102	50
4-Chloro-3-Methylphenol	ND	100	69.5	70	69.1	69	1	26-103	33
4-Nitrophenol	ND	100	60.9	61	62.8	63	3	11-114	50

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-7. Matrix spike and matrix spike duplicate recovery: volatiles in soil matrix -- Landfill

MMES ID: 3294

Client ID: LFDS

Units: ppm

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)]	
								Recovery	RPD
1,1-Dichloroethylene	ND	50	32	64	30	60	6	59-172	22
Trichloroethylene	ND	50	32	64	28	56	13	62-137	24
Chlorobenzene	ND	50	43	86	38	76	12	60-133	21
Toluene	ND	50	45	90	41	82	9	59-139	21
Benzene	ND	50	34	68	32	64	6	66-142	21

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ where x and x^1 = % spike recovery and duplicate % spike recovery.

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (July 1985) are advisory levels

Table C-8. Matrix spike and matrix spike duplicate recovery: base/neutral extractables in soil matrix -- Landfill

MMES ID: 3294

Client ID: LFDS

Units: ppm

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,2,4-Trichlorobenzene	ND	50	33	66	33	66	0	38-107	23
Acenaphthene	11	50	61	100	64	107	7	31-137	19
2,4-Dinitrotoluene	ND	50	23	46	39	78	52	28-89	47
Pyrene	120	50	349	458	327	414	10	35-142	36
N-Nitrosodi-n-Propylamine	ND	50	36	72	40	80	11	41-126	38
1,4-Dichlorobenzene	ND	50	40	80	44	88	10	28-104	27

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ where x and x^1 = % spike recovery and duplicate % spike recovery.

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (July 1985) are advisory levels

Table C-9. Matrix spike and matrix spike duplicate recovery: acid extractables in soil matrix -- Landfill

MMES ID: 3294

Client ID: LFDS

Units: ppm

Spike Compound	Conc. in Sample(a)	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD(b)	Acceptable Limits (c)	
								Recovery	RPD
Pentachlorophenol	ND	100	79	79	89	89	12	17-109	47
Phenol	ND	100	70	70	75	75	7	26-90	35
2-Chlorophenol	ND	100	81	81	84	84	4	25-102	50
4-Chloro-3-Methylphenol	ND	100	71	71	76	76	7	26-103	33
4-Nitrophenol	ND	100	47	47	58	58	21	11-114	50

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ where x and x^1 = % spike recovery and duplicate % spike recovery.

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (July 1985) are advisory levels

SOIL/SEDIMENT/SURFACE WATER ANALYSIS

MARCH 1986

TRIP BLANKS

Table XIV-2. Results of analysis for chemical parameters in trip blanks received from the Martin Marietta Reduction Facility, The Dalles, Oregon

	1	2	3	4	5	6
SAMPLE DATE:	3/24/86	3/20/86	3/20/86	3/20/86		
HMES SAMPLE ID:	2615	2464	2465	2463		
CLIENT SAMPLE ID:	TRP BLNK 1	TR BLK 2.3	TR BLK 2.4	TR BLK 2.5		
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppm (mg/L)					
total cyanide	<.017	NR (a)	NR	<.010		
free cyanide	<.017	NR	<.01	NR		
fluoride	<1.0	NR	<0.5	NR		
arsenic	<.010	<.010	NR	NR		
sodium	0.28	0.5	NR	NR		
sulfate	<0.5	NR	<1.0	NR		

(a)NR = not requested.

Table XIV-3. Results of analysis for EP toxicity metals in trip blanks received from Martin Marietta Reduction Facility, The Dalles, Oregon

Reported as total metals from EP TOX extract Units: ppb (µg/L)

MMES ID		2615	(a) 2615	2645	Prep(b) Blank	Ext(c) Blank
Client ID		TB 1.3	TB 1.3	TB 2.4		
Sample Date		3/24/86	3/24/86	3/20/86		
Metal	Analysis Date					
Arsenic	4/5-8/86	<200	--(d)	<200	<200	<200
Barium	4/5-8/86	<200	--	<200	<200	<200
Cadmium	4/5-8/86	<50	--	<50	<50	<50
Chromium	4/5-8/86	<50	--	<50	<50	<50
Lead	4/5-8/86	<200	--	<200	<200	<200
Mercury	4/2-4/86	0.57	0.62	<0.30	<0.30	<0.30
Selenium	4/5-8/86	<200	--	<200	<200	<200
Silver	4/5-8/86	<50	--	<50	<50	<50

(a)Digestion duplicate analysis.

(b)Preparation blank = solution produced by performing the analytical preparation method on pure water, thus containing all reagents plus any impurities derived from the preparation process.

(c)Extraction blank = pure water carried through the extraction process, then treated as a preparation blank.

(d)Sample not analyzed for this parameter.

Table XIV-4. Results of analysis for volatile organic compounds in trip blanks received from Martin Marietta Reduction Facility, The Dalles, Oregon

	1	2	3	4	5	6
SAMPLE DATE:	3/24/86	3/20/86	3/20/86			
ANALYSIS DATE:	4/5/86	3/24/86	4/22/86			
MMES SAMPLE ID:	2615	2532	2470			
CLIENT SAMPLE ID:	TRP BLNK 1	TR BLK 2	TR BLK 2.7			
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
acrolein	<10	<10	<10			
acrylonitrile	<10	<10	<10			
benzene	<5	<5	<5			
bromodichloromethane	<5	<5	<5			
bromoform	<5	<5	<5			
bromomethane	<5	<5	<5			
carbon tetrachloride	<5	<5	<5			
chlorobenzene	<5	<5	<5			
chloroethane	<5	<5	<5			
chloroform	<5	<5	<5			
chloromethane	<5	<5	<5			
2-chloroethylvinyl ether	<10	<10	<10			
cis-1,3-dichloropropene	<5	<5	<5			
dibromochloromethane	<5	<5	<5			
1,1-dichloroethane	<5	<5	<5			
1,2-dichloroethane	<5	<5	<5			
1,1-dichloroethylene	<5	<5	<5			
1,2-dichloropropane	<5	<5	<5			
ethylbenzene	<5	<5	<5			
methylene chloride	<10	<10	<10			
1,1,2,2-tetrachloroethane	<5	<5	<5			
tetrachloroethylene	<5	<5	<5			
toluene	<5	<5	<5			
trans-1,2-dichloroethylene	<5	<5	<5			
trans-1,3-dichloropropene	<5	<5	<5			
1,1,1-trichloroethane	<5	<5	<5			
1,1,2-trichloroethane	<5	<5	<5			
trichloroethylene	<5	<5	<5			
vinyl chloride	<5	<5	<5			
cis-1,2-dichloroethylene	<5	<5	<5			

Table XIV-4. Continued

	1	2	3	4	5	6
SAMPLE DATE:		3/28/86	3/22/86	3/22/86	3/22/86	3/22/86
ANALYSIS DATE:		4/9/86	4/4/86	4/5/86	4/4/86	4/4/86
MMES SAMPLE ID:		2797	2590	2628	2607	2593
CLIENT SAMPLE ID:		TRP BLNK 3	TRP BLNK 4	TRP BLNK 5	TRP BLNK 6	TRP BLNK 7
NOTE:						
COMPOUNDS		FINAL CONCENTRATION = ppb (ng/ml)				
acrolein		<10	<10	<10	<10	<10
acrylonitrile		<10	<10	<10	<10	<10
benzene		<5	<5	<5	<5	<5
bromodichloromethane		<5	<5	<5	<5	<5
bromoform		<5	<5	<5	<5	<5
bromomethane		<5	<5	<5	<5	<5
carbon tetrachloride		<5	<5	<5	<5	<5
chlorobenzene		<5	<5	<5	<5	<5
chloroethane		<5	<5	<5	<5	<5
chloroform		<5	<5	<5	<5	<5
chloromethane		<5	<5	<5	<5	<5
2-chloroethylvinyl ether		<10	<10	<10	<10	<10
cis-1,3-dichloropropene		<5	<5	<5	<5	<5
dibromochloromethane		<5	<5	<5	<5	<5
1,1-dichloroethane		<5	<5	<5	<5	<5
1,2-dichloroethane		<5	<5	<5	<5	<5
1,1-dichloroethylene		<5	<5	<5	<5	<5
1,2-dichloropropane		<5	<5	<5	<5	<5
ethylbenzene		<5	<5	<5	<5	<5
methylene chloride		<10	<10	<10	<10	<10
1,1,2,2-tetrachloroethane		<5	<5	<5	<5	<5
tetrachloroethylene		<5	<5	<5	<5	<5
toluene		<5	<5	<5	<5	<5
trans-1,2-dichloroethylene		<5	<5	<5	<5	<5
trans-1,3-dichloropropene		<5	<5	<5	<5	<5
1,1,1-trichloroethane		<5	<5	<5	<5	<5
1,1,2-trichloroethane		<5	<5	<5	<5	<5
trichloroethylene		<5	<5	<5	<5	<5
vinyl chloride		<5	<5	<5	<5	<5
cis-1,2-dichloroethylene		<5	<5	<5	<5	<5

Table XIV-4. Continued

	1	2	3	4	5	6
SAMPLE DATE:	3/20/86	3/22/86	3/22/86	3/20/86	3/20/86	3/20/86
ANALYSIS DATE:	3/25/86	4/4/86	4/5/86	3/24/86	3/25/86	3/25/86
MHES SAMPLE ID:	2479	2596	2618	2468	2496	2551
CLIENT SAMPLE ID:	TRP BLNK 8	TRP BLNK 9	TRP BLK 10	TRP BLK 11	TRP BLK 12	TRP BLK 13
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
acrolein	<10	<10	<10	<10	<10	<10
acrylonitrile	<10	<10	<10	<10	<10	<10
benzene	<5	<5	<5	<5	<5	<5
bromodichloromethane	<5	<5	<5	<5	<5	<5
bromoform	<5	<5	<5	<5	<5	<5
bromomethane	<5	<5	<5	<5	<5	<5
carbon tetrachloride	<5	<5	<5	<5	<5	<5
chlorobenzene	<5	<5	<5	<5	<5	<5
chloroethane	<5	<5	<5	<5	<5	<5
chloroform	7	<5	<5	<5	<5	<5
chloromethane	<5	<5	<5	<5	<5	<5
2-chloroethylvinyl ether	<10	<10	<10	<10	<10	<10
cis-1,3-dichloropropene	<5	<5	<5	<5	<5	<5
dibromochloromethane	<5	<5	<5	<5	<5	<5
1,1-dichloroethane	<5	<5	<5	<5	<5	<5
1,2-dichloroethane	<5	<5	<5	<5	<5	<5
1,1-dichloroethylene	<5	<5	<5	<5	<5	<5
1,2-dichloropropane	<5	<5	<5	<5	<5	<5
ethylbenzene	<5	<5	<5	<5	<5	<5
methylene chloride	<10	<10	<10	<10	<10	<10
1,1,2,2-tetrachloroethane	<5	<5	<5	<5	<5	<5
tetrachloroethylene	<5	<5	<5	<5	<5	<5
toluene	<5	<5	<5	<5	<5	<5
trans-1,2-dichloroethylene	<5	<5	<5	<5	<5	<5
trans-1,3-dichloropropene	<5	<5	<5	<5	<5	<5
1,1,1-trichloroethane	<5	<5	<5	<5	<5	<5
1,1,2-trichloroethane	<5	<5	<5	<5	<5	<5
trichloroethylene	<5	<5	<5	<5	<5	<5
vinyl chloride	<5	<5	<5	<5	<5	<5
cis-1,2-dichloroethylene	<5	<5	<5	<5	<5	<5

Table XIV-4. Continued

	1	2	3	4	5	6
SAMPLE DATE:	3/26/86	3/20/86	3/26/86	3/20/86	3/26/86	3/24/86
ANALYSIS DATE:	4/6/86	3/24/86	4/6/86	3/25/86	4/6/86	4/5/86
MMES SAMPLE ID:	2700	2527	2703	2501	2706	2619
CLIENT SAMPLE ID:	TRP BLK 14	TRP BLK 15	TRP BLK 16	TRP BLK 17	TRP BLK 18	TRP BLK 19
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
acrolein	<10	<10	<10	<10	<10	<10
acrylonitrile	<10	<10	<10	<10	<10	<10
benzene	<5	<5	<5	<5	<5	<5
bromodichloromethane	<5	<5	<5	<5	<5	<5
bromoform	<5	<5	<5	<5	<5	<5
bromomethane	<5	<5	<5	<5	<5	<5
carbon tetrachloride	<5	<5	<5	<5	<5	<5
chlorobenzene	<5	<5	<5	<5	<5	<5
chloroethane	<5	<5	<5	<5	<5	<5
chloroform	<5	<5	<5	<5	<5	<5
chloromethane	<5	<5	<5	<5	<5	<5
2-chloroethylvinyl ether	<10	<10	<10	<10	<10	<10
cis-1,3-dichloropropene	<5	<5	<5	<5	<5	<5
dibromochloromethane	<5	<5	<5	<5	<5	<5
1,1-dichloroethane	<5	<5	<5	<5	<5	<5
1,2-dichloroethane	<5	<5	<5	<5	<5	<5
1,1-dichloroethylene	<5	<5	<5	<5	<5	<5
1,2-dichloropropane	<5	<5	<5	<5	<5	<5
ethylbenzene	<5	<5	<5	<5	<5	<5
methylene chloride	<10	<10	<10	<10	<10	<10
1,1,2,2-tetrachloroethane	<5	<5	<5	<5	<5	<5
tetrachloroethylene	<5	<5	<5	<5	<5	<5
toluene	<5	<5	<5	<5	<5	<5
trans-1,2-dichloroethylene	<5	<5	<5	<5	<5	<5
trans-1,3-dichloropropene	<5	<5	<5	<5	<5	<5
1,1,1-trichloroethane	<5	<5	<5	<5	<5	<5
1,1,2-trichloroethane	<5	<5	<5	<5	<5	<5
trichloroethylene	<5	<5	<5	<5	<5	<5
vinyl chloride	<5	<5	<5	<5	<5	<5
cis-1,2-dichloroethylene	<5	<5	<5	<5	<5	<5

Table XIV-4. Continued

	1	2	3	4	5	6
SAMPLE DATE:	3/24/86	3/24/86	3/24/86	3/24/86	3/26/86	3/25/86
ANALYSIS DATE:	4/4/86	4/5/86	4/4/86	4/5/86	4/8/86	4/6/86
MMES SAMPLE ID:	2597	2611	2601	2623	2715	2709
CLIENT SAMPLE ID:	TRP BLK 20	TRP BLK 21	TRP BLK 22	TRP BLK 23	TRP BLK 24	TRP BLK 25
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
acrolein	<10	<10	<10	<10	<10	<10
acrylonitrile	<10	<10	<10	<10	<10	<10
benzene	<5	<5	<5	<5	<5	<5
bromodichloromethane	<5	<5	<5	<5	<5	<5
bromoform	<5	<5	<5	<5	<5	<5
bromomethane	<5	<5	<5	<5	<5	<5
carbon tetrachloride	<5	<5	<5	<5	<5	<5
chlorobenzene	<5	<5	<5	<5	<5	<5
chloroethane	<5	<5	<5	<5	<5	<5
chloroform	<5	<5	<5	<5	<5	<5
chloromethane	<5	<5	<5	<5	<5	<5
2-chloroethylvinyl ether	<10	<10	<10	<10	<10	<10
cis-1,3-dichloropropene	<5	<5	<5	<5	<5	<5
dibromochloromethane	<5	<5	<5	<5	<5	<5
1,1-dichloroethane	<5	<5	<5	<5	<5	<5
1,2-dichloroethane	<5	<5	<5	<5	<5	<5
1,1-dichloroethylene	<5	<5	<5	<5	<5	<5
1,2-dichloropropane	<5	<5	<5	<5	<5	<5
ethylbenzene	<5	<5	<5	<5	<5	<5
methylene chloride	<10	<10	<10	<10	<10	<10
1,1,2,2-tetrachloroethane	<5	<5	<5	<5	<5	<5
tetrachloroethylene	<5	<5	<5	<5	<5	<5
toluene	<5	<5	<5	<5	<5	<5
trans-1,2-dichloroethylene	<5	<5	<5	<5	<5	<5
trans-1,3-dichloropropene	<5	<5	<5	<5	<5	<5
1,1,1-trichloroethane	<5	<5	<5	<5	<5	<5
1,1,2-trichloroethane	<5	<5	<5	<5	<5	<5
trichloroethylene	<5	<5	<5	<5	<5	<5
vinyl chloride	<5	<5	<5	<5	<5	<5
cis-1,2-dichloroethylene	<5	<5	<5	<5	<5	<5

Table XIV-4. Continued

	1	2	3	4	5	6
SAMPLE DATE:	3/25/86	3/25/86	3/28/86			
ANALYSIS DATE:	4/8/86	4/8/86	4/9/86			
MMES SAMPLE ID:	2722	2721	2803			
CLIENT SAMPLE ID:	TRP BLK 27	TRP BLK 28	TRP BLK 29			
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
acrolein	<10	<10	<10			
acrylonitrile	<10	<10	<10			
benzene	<5	<5	<5			
bromodichloromethane	<5	<5	<5			
bromoform	<5	<5	<5			
bromomethane	<5	<5	<5			
carbon tetrachloride	<5	<5	<5			
chlorobenzene	<5	<5	<5			
chloroethane	<5	<5	<5			
chloroform	<5	<5	<5			
chloromethane	<5	<5	<5			
2-chloroethylvinyl ether	<10	<10	<10			
cis-1,3-dichloropropene	<5	<5	<5			
dibromochloromethane	<5	<5	<5			
1,1-dichloroethane	<5	<5	<5			
1,2-dichloroethane	<5	<5	<5			
1,1-dichloroethylene	<5	<5	<5			
1,2-dichloropropane	<5	<5	<5			
ethylbenzene	<5	<5	<5			
methylene chloride	<10	<10	<10			
1,1,2,2-tetrachloroethane	<5	<5	<5			
tetrachloroethylene	<5	<5	<5			
toluene	<5	<5	<5			
trans-1,2-dichloroethylene	<5	<5	<5			
trans-1,3-dichloropropene	<5	<5	<5			
1,1,1-trichloroethane	<5	<5	<5			
1,1,2-trichloroethane	<5	<5	<5			
trichloroethylene	<5	<5	<5			
vinyl chloride	<5	<5	<5			
cis-1,2-dichloroethylene	<5	<5	<5			

Table XIV-5. Results of analysis for base/neutral extractable compounds in Trip Blanks collected 20 and 24 March 1986 at Martin Marietta Reduction Facility, The Dalles, Oregon

	1	2	3	4	5	6
SAMPLE DATE:	3/20/86	3/24/86				
ANALYSIS DATE:	4/15/86	4/16/86				
MMES SAMPLE ID:	2469	2615				
CLIENT SAMPLE ID:	TR BLK 2.7	TR BLK 1.1				
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
N-nitroso-dimethylamine	<5	<5				
bis (2-chloroethyl) ether	<5	<5				
1,3-dichlorobenzene	<5	<5				
1,4-dichlorobenzene	<5	<5				
1,2-dichlorobenzene	<5	<5				
bis(2-chloroisopropyl) ether	<5	<5				
N-nitroso-di-N-propylamine	<5	<5				
hexachloroethane	<10	<10				
nitrobenzene	<10	<10				
isophorone	<5	<5				
bis (2-chloroethoxy) methane	<5	<5				
1,2,4-trichlorobenzene	<5	<5				
naphthalene	<5	<5				
hexachlorobutadiene	<5	<5				
hexachlorocyclopentadiene	<10	<10				
2-chloronaphthalene	<5	<5				
dimethylphthalate	<5	<5				
acenaphthalene	<5	<5				
2,6-dinitrotoluene	<10	<10				
acenaphthene	<5	<5				
2,4-dinitrotoluene	<10	<10				
diethylphthalate	<10	<10				
fluorene	<5	<5				
4-chlorophenylphenyl ether	<5	<5				
N-nitrosodiphenylamine	<10	<10				
4-bromophenylphenyl ether	<5	<5				
hexachlorobenzene	<5	<5				
phenanthrene	<5	<5				
anthracene	<5	<5				

Table XIV-5. Continued

	1	2	3	4	5	6
SAMPLE DATE:	3/20/86	3/24/86				
ANALYSIS DATE:	4/15/86	4/16/86				
HMES SAMPLE ID:	2469	2615				
CLIENT SAMPLE ID:	TR BLK 2.7	TR BLK 1.1				
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
di-N-butylphthalate	<10	<10				
fluoranthene	<5	<5				
benzidine	<200	<200				
pyrene	<5	<5				
butylbenzylphthalate	<10	<10				
3,3'-dichlorobenzidine	<10	<10				
benzo (a) anthracene	<5	<5				
chrysene	<5	<5				
bis (2-ethylhexyl) phthalate	<10	<10				
di-N-octylphthalate	<10	<10				
benzo (b & k) fluoranthenes	<5	<5				
benzo (a) pyrene	<5	<5				
indeno-1,2,3 (c,d) pyrene	<10	<10				
dibenzo (a,h) anthracene	<10	<10				
benzo (g,h,i) perylene	<10	<10				

Table XIV-6. Results of analysis for acid extractable compounds in Trip Blanks collected 20 and 24 March 1986 at Martin Marietta Reduction Facility, The Dalles, Oregon

	1	2	3	4	5	6
SAMPLE DATE:	3/20/86	3/24/86				
ANALYSIS DATE:	4/15/86	4/16/86				
MMES SAMPLE ID:	2469	2615				
CLIENT SAMPLE ID:	TR BLK 2.7	TR BLK 1.1				
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
phenol	<10	<10				
2-chlorophenol	<5	<5				
2-nitrophenol	<5	<5				
2,3-dimethylphenol	<5	<5				
2,4-dichlorophenol	<5	<5				
4-chloro-3-methylphenol	<5	<5				
2,4,6-trichlorophenol	<5	<5				
2,4-dinitrophenol	<15	<15				
4-nitrophenol	<10	<10				
4,6-dinitro-o-cresol	<15	<15				
pentachlorophenol	<10	<10				

Table XIV-7. Results of analysis for PCBs in trip blanks received from the Martin Marietta Reduction Facility, The Dalles, Oregon

	1	2	3	4	5	6
SAMPLE DATE:	3/24/86					
ANALYSIS DATE:	4/15/86					
MMES SAMPLE ID:	2615					
CLIENT SAMPLE ID:	T.B. 1.1					
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)					
aroclor 1016	<0.5					
aroclor 1221	<0.5					
aroclor 1232	<0.5					
aroclor 1242	<0.5					
aroclor 1248	<0.5					
aroclor 1254	<1.0					
aroclor 1260	<1.0					

SOIL/SEDIMENT/SURFACE WATER ANALYSIS

MARCH 1986

AND

DATA FROM RESAMPLING

AUGUST 1986

LABORATORY DUPLICATES - INORGANICS

Table I-2. QC Summary Sample Duplicates

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

MMES ID # 2720

Analysis Type EP Toxicity Leachate Units µg/l

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD[a]
Arsenic	2720	200	<200	<200	NC[b]
Barium	2720	200	<200	<200	NC[b]
Cadmium	2720	50	<50	<50	NC[b]
Chromium	2720	50	<40	<50	NC[b]
Lead	2720	200	<200	<200	NC[b]
Mercury	2720	0.3	<0.3	<0.3	NC[b]
Selenium	2720	200	<200	<200	NC[b]
Silver	2720	50	<50	<50	NC[b]

[a] RPD = [(S-D)/(S+D)/2] x 100

[b] RPD not calculated (NC), result < DL

Table I-3. QC Summary Sample Duplicates

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

MMES ID # 2509

Analysis Type EP Toxicity Leachate

Units µg/l

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD (a)
Arsenic	2509	200	280	270	<1%
Barium	2509	200	<200	<200	NC (b)
Cadmium	2509	50	81	81	(c)
Chromium	2509	50	<50	<50	NC (b)
Lead	2509	200	<200	<200	NC (b)
Mercury	2509	0.3	<0.3	<0.3	NC (b)
Selenium	2509	200	<200	<200	NC (b)
Silver	2509	50	<50	<50	NC (b)

(a) RPD = [(S-D)/(S+D)/2] x 100
(b) RPD not calculated (NC), result < DL
(c) For results <5x DL, values must agree within ± DL

Table I-4. QC Summary Sample Duplicates

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

MMES ID # 2701-2729

Analysis Type EP Toxicity Leachate Units µg/l

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD(a)
Arsenic	2701	200	261	230	13%
Barium	2701	200	<200	<200	(b) NC
Cadmium	2701	50	<50	<50	(b) NC
Chromium	2701	50	161	164	1%
Lead	2701	200	<200	<200	(b) NC
Mercury	2704	0.3	0.55	0.42	(c)
Selenium	2701	200	<200	<200	(b) NC
Silver	2701	50	<50	<50	(b) NC

(a) RPD = [(S-D)/(S+D)/2] x 100
(b) RPD not calculated (NC), result < DL
(c) For results <5x DL, values must agree within ± DL

Table I-5. QC Summary Sample Duplicates

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

MMES ID # 3290-3294

Analysis Type EP Toxicity Leachate Units ug/l

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD(a)
Arsenic	3294	200	<200	<200	NC (b)
Barium	3294	200	<200	<200	NC (b)
Cadmium	3294	50	<50	<50	NC (b)
Chromium	3294	50	<50	<50	NC (b)
Lead	3294	200	<200	<200	NC (b)
Mercury	3294	0.3	<0.3	<0.3	NC (b)
Selenium	3294	200	<200	<200	NC (b)
Silver	3294	50	<50	<50	NC (b)

(a) RPD = [(S-D)/(S+D)/2] x 100
(b) RPD not calculated (NC), result < DL

Table II-2. QC Summary -- Sample Duplicates

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

Analysis Type Total

Units µg/l

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD[(a)]
Arsenic	2598	10	<10	<10	NC[(b)]
Arsenic	2602	10	<10	<10	NC[(b)]
Arsenic	2613	10	<10	<10	NC[(b)]
Arsenic	2647	10	<10	<10	NC[(b)]
Arsenic	2561	10	41	43	5%
Arsenic	2716	10	<10	<10	NC[(b)]

(a) RPD = [(S-D)/(S+D)/2] x 100
(b) RPD not calculated (NC), result < DL

Note: One blank was analyzed with every batch of samples analyzed. All blanks were free of contamination.

Table II-3. QC Summary -- Sample Duplicates

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

Analysis Type Total

Units mg/l

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD(a)
Sodium	2602	0.30	29	30	<1%
Sodium	2613	0.30	28	29	<1%
Sodium	2647	0.30	100	100	0%
Sodium	2716	0.30	0.3	0.3	0%
Sodium	2561	0.30	867	862	<1%
Sodium	2560	0.30	896	867	3%

(a) $RPD = [(S-D)/(S+D)/2] \times 100$

Note: No spikes required (EPA-CLP Statement of Work July 1985). One blank was run with each batch of samples analyzed, all blanks were free of contamination.

Table III-2. Non-Metals QC Summary -- Sample Duplicates

One sample per batch received was analyzed as a laboratory duplicate. Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

Analysis Type Dissolved Matrix Water Units mg/l

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD[a]
Fluoride	2713	10	110	120	10%[b]

[a] RPD = [(S-D0/(S+D)/2] x 100

[b] Martin Marietta Environmental Systems RPD control limit is 20%

Table III-3. Non-Metals QC Summary -- Sample Duplicates

One sample per batch received was analyzed as a laboratory duplicate. Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

Analysis Type Dissolved Matrix Leachate from Solid Samples Units mg/l

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD(a) (b)
Fluoride	2609	10	1022	1024	<1%
Fluoride	2730	10	250	230	8%
Fluoride	2792	10	204	208	2%
Fluoride	2796	10	263	239	9%

(a) RPD = [(S-D0/(S+D)/2] x 100

(b) Martin Marietta Environmental Systems RPD control limit is 20%

Table III-6. Non-Metals QC Summary -- Sample Duplicates

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

Analysis Type Free Cyanide

Units mg/kg

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD$^{(a)}$
Free Cyanide	2798	0.50	<0.83	<0.83	NC$^{(b)}$
Free Cyanide	2720	0.50	<0.62	<0.62	NC

$^{(a)}$RPD = [(S-D)/(S+D)/2] x 100
$^{(b)}$RPD not calculated (NC), result < DL

Note: Varying detection limit due to correciton for percent solids.

Table III-7. Non-Metals QC Summary -- Sample Duplicates

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

Analysis Type Cyanides

Units mg/l

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD(a)
Total Cyanide	2646	0.017	0.191	0.188	2%
Total Cyanide	2557	0.017	0.037	0.020	(b)
Total Cyanide	2728	0.017	<0.025	<0.025	NC(c)
Free Cyanide	2705	0.017	1.0	1.2	18%
Free Cyanide	2728	0.017	<0.017	<0.017	NC(c)
Free Cyanide	2612	0.017	<0.025	<0.025	NC(c)
Free Cyanide	2649	0.017	<0.017	<0.017	NC(c)

(a) RPD = [(S-D)/(S+D)/2] x 100
(b) For results <5x DL, values must agree within ± DL
(c) RPD not calculated (NC), result < DL

Resampling Data

Table C-1. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

Matrix Water Analysis Type Total Cyanide Units mg/L

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD[a]
Total Cyanide	0825	0.010	<0.010	<0.010	NC[b]
Total Cyanide	0833	0.010	<0.010	<0.010	NC
Total Cyanide	0885	0.010	1.55	1.79	14%
Total Cyanide	0980	0.010	29.0	29.2	1%

(a) $RPD = [(S-D)/(S+D)/2] \times 100$

(b) RPD not calculated (NC), result < DL

Resampling Data

Table C-1. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

Matrix Water   Analysis Type Total Cyanide   Units mg/L

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD(a)
Total Cyanide	0825	0.010	<0.010	<0.010	NC(b)
Total Cyanide	0833	0.010	<0.010	<0.010	NC
Total Cyanide	0885	0.010	1.55	1.79	14%
Total Cyanide	0980	0.010	29.0	29.2	1%

(a) RPD = [(S-D)/(S+D)/2] x 100

(b) RPD not calculated (NC), result < DL

Resampling

Table C-2. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

Matrix Water Analysis Type Free Cyanide Units mg/L

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD(a)
Free Cyanide	0825	0.010	<0.010	<0.010	NC(b)
Free Cyanide	0833	0.010	<0.010	<0.010	NC
Free Cyanide	0885	0.010	0.053	0.066	22%
Free Cyanide	0980	0.010	4.73	4.93	4%

(a) RPD = [(S-D)/(S+D)/2] x 100
(b) RPD not calculated (NC), result < DL

SOIL/SEDIMENT/SURFACE WATER ANALYSIS

MARCH 1986

AND

DATA FROM RESAMPLING

MATRIX SPIKES - INORGANICS

Table I-6. EP Toxicity QC Summary -- Leachate Spiked Sample Analysis

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spike sample result (SSR), sample result (SR), spike added (SA), and the percent recovery (%R) are also listed in the table below.

Matrix Leachate Analysis Type EP Toxicity Units µg/l

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R(a)
Arsenic	3292	75-125	563	0	500	113
Barium	3292	75-125	772	234	500	108
Cadmium	3292	75-125	103	0	100	103
Chromium	3292	75-125	92	0	100	92
Lead	3292	75-125	528	0	500	106
Mercury	3295	75-125	51	0	50	102
Selenium	3292	75-125	538	0	500	108
Silver	3292	75-125	96	0	100	96

(a) %R = [(SSR-SR) SA] x 100

Table I-7. EP Toxicity QC Summary -- Leachate Spiked Sample Analysis

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spike sample result (SSR), sample result (SR), spike added (SA), and the percent recovery (%R) are also listed in the table below.

Matrix Leachate Analysis Type EP Toxicity Units μg/l

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R (a)
Arsenic	2707	75-125	18.4	0	20	92
Barium	2710	75-125	110	18	100	92
Cadmium	2710	75-125	474	0	500	95
Chromium	2710	75-125	527	0	500	106
Lead	2710	75-125	874	0	1000	87
Mercury	2705	75-125	63.2	12.5	50	101
Selenium	2710	75-125	1062	0	1000	106
Silver	2710	75-125	465	0	500	93

(a) %R = [(SSR-SR) SA] x 100

Table I-8. EP Toxicity QC Summary -- Leachate Spiked Sample Analysis

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spike sample result (SSR), sample result (SR), spike added (SA), and the percent recovery (%R) are also listed in the table below.

Matrix Leachate Analysis Type EP Toxicity Units μg/l

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R(a)
Arsenic	2606	75-125	62	0	50	124
Barium	2606	75-125	334	132	200	100
Cadmium	2606	75-125	56	0	50	112
Chromium	2606	75-125	188	0	200	94
Lead	2606	75-125	49	0	50	98
Mercury	2608	75-125	46	0	50	92
Selenium	2606	75-125	55	0	50	110
Silver	2606	75-125	90	0	100	90

(a) %R = [(SSR-SR) SA] x 100

Table I-9. EP Toxicity QC Summary -- Leachate Spiked Sample Analysis

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spike sample result (SSR), sample result (SR), spike added (SA), and the percent recovery (%R) are also listed in the table below.

Matrix Leachate

Analysis Type EP Toxicity

Units µg/l

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R(a)
Arsenic	2513	75-125	617	98	500	104
Barium	2513	75-125	378	174	200	102
Cadmium	2513	75-125	62	14	50	96
Chromium	2513	75-125	196	0	200	98
Lead	2513	75-125	490	72	500	84
Mercury	2517	75-125	56	0	50	112
Selenium	2513	75-125	567	51	500	103
Silver	2513	75-125	40	0	50	80

(a) $\%R = [(SSR-SR)\ SA] \times 100$

Table II-1. QC Summary -- Spiked Sample Analysis

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spike sample result (SSR), sample result (SR), spike added (SA), and the percent recovery (%R) are also listed in the table below.

Matrix Water Analysis Type Total Units µg/l

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R(a)
Arsenic	2600	75-125	19.4	1.2	20	91
Arsenic	2615	75-125	19.1	0	20	95
Arsenic	2624	75-125	14.3	0	20	71(b)
Arsenic	2719	75-125	16.0	0	20	80

(a) %R = [(SSR-SR) SA] x 100
(b) Low spike recovery due to matrix interferences

Table III-4. Non-metals QC Summary -- Spiked Sample Analyses

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spike sample result (SSR), sample result (SR), spike added (SA), and the percent recovery (%R) are also listed in the table below.

Matrix Water Analysis Type Cyanides Units µg/l

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R(a)
Total Cyanide	2645	75-125	45.7	0	50	91
Total Cyanide	2557	75-125	18.6	0	20	93
Free Cyanide	2707	75-125	115	60	50	110
Free Cyanide	2729	75-125	51	0	50	102

(a)%R = [(SSR-SR) SA] x 100

Resampling Data

Table C-3. QC Summary -- Spiked Sample Analyses

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spike sample result (SSR), sample result (SR), spike added (SA), and the percent recovery (%R) are also listed in the table below.

Matrix Water Analysis Type Total Cyanide Units µg/L

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R(*)
Total Cyanide	0823	75-125	90	0	100	90
Total Cyanide	0827	75-125	99	2	100	97
Total Cyanide	0882	75-125	108	12.7	100	95

(*) %R = [(SSR-SR)/SA] x 100

Resampling Data

Table C-4. QC Summary -- Spiked Sample Analyses

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spike sample result (SSR), sample result (SR), spike added (SA), and the percent recovery (%R) are also listed in the table below.

Matrix Water

Analysis Type Free Cyanide

Units µg/L

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R(a)
Free Cyanide	0830	75-125	85	0	100	85
Free Cyanide	0882	75-125	95	0	100	95
Free Cyanide	0983	75-125	(b)	(b)	(b)	(b)

(a) %R = [(SSR-SR)/SA] x 100

(b) Sample concentration >4x SA, %R not calculated

Table III-1. Non-metals QC Summary -- Spiked Sample Analyses

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spike sample result (SSR), sample result (SR), spike added (SA), and the percent recovery (%R) are also listed in the table below.

Matrix Leachate from Solid Sample   Analysis Type Dissolved   Units mg/l

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R(a)
Fluoride	2621	75-125	11.6	1.3	10	103
Fluoride	2633	75-125	6.3	1.3	50	100
Fluoride	2714	75-125	29.8	21.1	10	87
Fluoride	2733	75-125	56.2	39	20	86
Fluoride	2795	75-125	20.9	11.1	10	98
Fluoride	2796	75-125	19.0	10	10	90
Fluoride	3295	75-125	80	58	25	88

(a)%R = [(SSR-SR) SA] x 100

Table III-5. Non-metals QC Summary -- Spiked Sample Analyses

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spike sample result (SSR), sample result (SR), spike added (SA), and the percent recovery (%R) are also listed in the table below.

Matrix Solid

Units ppb

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R(a)
Total Cyanide	2622	75-125	3.8	0	5.0	76
Free Cyanide	2620	75-125	0	0	10	0%(b)
Free Cyanide	2632	75-125	12	0	50	24(b)
Free Cyanide	2733	75-125	0	0	50	0%(b)
Free Cyanide	2806	75-125	0	0	50	0%(b)
Free Cyanide	2291	75-125	40.4	0	50	8%(b)

(a)%R = [(SSR-SR) SA] x 100

(b)Low spike recoveries due to matrix interferences.

LABORATORY DATA VALIDATION OF RESULTS OF CHEMICAL ANALYSIS OF GROUND WATER SAMPLES COLLECTED DURING 26 AUGUST TO 4 SEPTEMBER 1986 ACCORDING TO THE WORK PLAN OF THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY AT THE MARTIN MARIETTA REDUCTION FACILITY THE DALLES, OREGON

REPORT SUMMARY

Between 27 August and 8 September 1986, Martin Marietta Environmental Systems received 60 groundwater samples, 6 aqueous field blanks, and 43 aqueous trip blanks collected during 26 August to 4 September 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon.

Samples were analyzed according to methods specified in the Quality Assurance Project Plan of the Remedial Investigation and Feasibility Study. All samples collected for cyanide analysis were tested for the presence of sulfide according to procedures approved by the EPA site manager.* Data are reported by sample location. Minimum reported concentration levels are based on the contract required detection limits found in the EPA Contract Laboratory Program statements of work for organics and inorganics (July 1985).

Geraghty & Miller's memo describing the sampling and analytical program is attached.

QUALITY CONTROL/QUALITY ASSURANCE SUMMARY

All samples were extracted (base/neutral acids and PCB's) and analyzed within required hold times. All samples tested for cyanides (total and free) were prescreened for sulfides.

---

* See letter from Norma Lewis, Superfund Site Manager, to Jose R. Bou, Vice President, Martin Marietta Aluminum Properties, Inc., dated 14 August 1986.

Table Summary of Methods and Holding Times

Parameter	Container	Preservative	Holding Time	Method
pH	P,G	None Required	Analyze Immediately	150.1
conductance	P,G	Cool, 4°c	28 days	120.1
VOC's	G	Cool, 4°c	14 days	624/CLP
BN/AE's	G	Cool, 4°c	Extracted within 7 days*	625/CLP
PCB	G, Teflon-lined cap	Cool, 4°c	7 days until extraction, 40 days after extraction	608
Free CN	P	Cool, 4°c	Distillation within 14 days	412
Total CN	P	Cool, 4°c NaOH to pH<12	14 days,[+] 24 hours in presence of sulfides	335.2
Flouride	P	Cool, 4°c	28 days	300.0
Sulfate	P,G	Cool, 4° c	28 days	300.0
Sodium	P,G	Cool, 4°c NHO_3 to pH<2	6 months from sampling date	200.7/273.2
Metals (As, Ag, Ba, Cd, Total Cr, Pb, Hg, Se)	P,G	Cool, 4°c HNO_3 to pH <2, filter	28 days - Hg 6 months - As, Ag, Ba, Total Cr, Cd, Pb, Se	CLP 200

Notes:

* Samples must be completely analyzed within 40 days of extraction.

[+] EPA Methods allow removal of sulfides with cadmium nitrate. Sampling protocol is described in detail in a letter from Joe Arlauskas to David Smith dated August 11, 1986.

MEMORANDUM

TO: J. Bou, L. Bongers, L. Grabowski, J. Arlauskas, J. Kubal

FROM: Peter J. Reinhart and Richard C. Smalley

DATE: August 1, 1986

RE: Sampling Schedule for the Martin Marietta Reduction Facility (MMRF) and Surrounding one Mile Radius Area.

A comprehensive water-sampling round is scheduled beginning the week of August 18, 1986. The sampling will include all monitor wells at the facility, all operational production wells, and six drinking-water and/or production wells within a one mile radius of the plant. This round of sampling is part of the on-going Remedial Investigation at the MMRF.

The sampling program will begin with the measurement of water levels in all wells. Sample collection will begin following the completion of these measurements.

SAMPLING

Details of the sampling schedules are outlined below:

Ground-Water Sampling-Plant Site

Sampling at the plant site will consist of collecting water samples at the following monitor and production wells:

Monitor Wells

1. MW-1A
2. MW-1B
3. MW-1C
4. MW-2A
5. MW-2B
6. MW-3A
7. MW-3B
8. MW-3C
9. MW-4S
10. MW-4A
11. MW-5A
12. MW-6A
13. MW-6AA
14. MW-6B
15. MW-7A
16. MW-7B
17. MW-8A
18. MW-8B
19. MW-9A
20. MW-9B
21. MW-10A
22. MW-11D
23. MW-12A
24. MW-12B
25. MW-13A
26. MW-13B
27. MW-14A
28. MW-14B
29. MW-15S
30. MW-15A
31. MW-15B
32. MW-16A
33. MW-16B
34. MW-16D
35. MW-17S
36. MW-18S
37. MW-19S
38. MW-20S
39. MW-20A
40. MW-21S

Production Wells

1. PW-1
2. PW-3
3. PW-4

In accordance with Martin Marietta Environmental System's (MMES) QA/QC, two sets of replicate samples will be collected. Each set of replicates will comprise approximately 20 percent of the total number of samples (resulting in 9 replicates per set). One blind replicate set will be analyzed by MMES and the other replicate set will be analyzed by Laucks Laboratories of Seattle, Washington. In addition, the EPA will split an undetermined number of samples for separate analysis. Therefore, a total of 61 sets of ground-water samples will be collected by Geraghty & Miller, Inc., from 40 monitor wells and three production wells at the plant site.

All ground-water samples obtained from the MMRF's monitor and production wells will be analyzed for those parameters listed in Table 1.

Table 1. Laboratory Analytical Methods for Ground-Water Samples from the On-Site Wells

Parameter	MMES Analytical Method
pH	150.1 (field measurement)
Temperature	(field measurement)
Specific Conductivity	120.1 (field measurement)
Total CN	Mod. 335.2/CLP /
Free CN	S.M. 412 ✓
Fluoride	300.0
Sulfate	300.0
Sodium	200.7/273.2
All Priority Pollutant Metals (As, Ba, Cd, Cr (Total), Pb, Hg, Se)	CLP 200 Series
Purgeable organics	Mod. 624/CLP
Base/Neutral Extractables	Mod. 625/CLP
Acid Extractables	Mod. 625/CLP
PCB's	Mod. 608/CLP

Ground-Water Sampling
Off-Plant Wells - 1 Mile Radius

Sampling adjacent to the plant site will consist of collecting water samples at the following drinking-water and/or production wells:

1) Animal Shelter Well
2) Chenowith Irrigation #1
3) Chenowith Irrigation #2
4) Chenowith Irrigation #3
5) Klindt
6) Rockline
7) Martin Marietta well #5 (Recreation Area)

G&M will make every effort to sample these wells. However, G&M does not guarantee that circumstances beyond their control will not preclude sampling of off-plant wells (i.e. no access port and/or drop-pipe, well shut-in or abandoned, access not granted for sampling purposes by custodian of well).

In accordance with MMES's QA/QC, two sets of replicate samples will be collected. Each set will comprise approximately 20 percent of the total number of samples (resulting in two replicates per set). One blind replicate set will be analyzed by MMES and the other replicate set will be analyzed by Laucks Laboratories of Seattle, Washington. In addition, the EPA will split an undetermined number of samples for separate analysis. Therefore, a total of eleven sets of ground-water samples will be collected by Geraghty & Miller, Inc., from seven drinking-water and/or production wells.

All ground-water samples obtained from the off-site drinking-water and/or production wells will be analyzed for the parameters listed in Table 2.

Table 2. Laboratory Analytical Methods for the Off-Site Wells.

Parameter	MMES Analytical Method
Total CN	Mod. 335.2/CLP
Free CN	S.M. 412
Fluoride	300.0

In addition to the well water final rinsate water will be sampled for bailers used in more than one well. Rinsate will be collected for the first bailer reused and for 10% of all subsequent bailers washed for reuse. This will entail 5 rinsate sample sets (this allows one set for off-site wells if sampled by bailer). Rinsate will be analyzed for the complete list of parameters listed in Table 1 to ensure that no cross contamination has occurred. It should be noted that these samples are part of an independent QA/QC procedure and should not be included when calculating number of splits and replicates for the QA/QC program.

Analytical Program

Table 3 identifies the analytical program proposed for the ground-water samples, as well as their respective preservation methods and holding times.

General Procedures For All Areas

A summary of the total number of sample sets, replicates, field blanks and trip blanks to be collected at all areas is presented in Table 4. Field blanks will be collected for analysis of the sample parameters as analyzed in ground-water samples. Approximately 11 field blanks will be collected during the sampling round. In addition, one trip blank will accompany each sample cooler from the time the coolers leave the laboratory (on their way to the site) until their return to the laboratory. All trip blanks will be analyzed for priority pollutant volatile organic compounds.

Table 4. Summary of the Number and Types of Water and Sediment Samples to be Collected in August of 1986

MMRF

On-site ground-water samples	43 sets
Replicates to MMES	9 sets
Replicates to Laucks	9 sets
Equipment final rinsate samples	4 sets
Off-site ground-water samples	7 sets
Replicates to MMES	2 sets
Replicates to Laucks	2 sets
Equipment final rinsate samples	1 set

Total: 77 sets
plus VOC Trip Blanks
11 Field Blanks

Ground-water samples will be analyzed at the following laboratories:

Laboratory	Constituents to be Analyzed
1. Martin Marietta Environmental Systems, Columbia, Maryland	A. Ground-water samples B. Sediment samples C. First replicate set D. All rinsate samples
2. Laucks Laboratory	A. Second replicate set

Due to the complexity of this sampling round, it is essential that this program be well organized. In order to facilitate sampling, we are requesting that the laboratories send sample bottles organized in sample coolers. Each cooler should consist of the appropriate number and types of bottles to create complete sample sets. All samples will be collected in accordance with the protocols presented in the RI/FS work plan.

Recent discussions with EPA concerning the preferred procedure for the sampling of Total CN, have resulted in the implementation of a number of preliminary field tests to check for the presence of sulfides and residual chlorine. As a result of this, the following test reagents and preservatives will be needed during this phase of sampling: cadmium nitrate powder, ascorbic acid crystals, lead acetate paper, acetic acid buffer, and potassium-iodide starch paper.

Different staging areas will be utilized during the sampling. Samples collected at each monitoring well will be brought directly to the staging area where a member of the sampling team will be stationed with the appropriate equipment to receive and if necessary filter the collected samples, perform field measurements of pH, temperature and conductivity and record the number and type of samples on Chain of Custody forms.

In view of the comprehensive nature of this sampling effort and the need to conform to schedules outlined in the Work Plan for the Remedial Investigation/Feasibility Study, it is imperative that this sampling begin no later than the week of August 21, 1986.

If you have questions or comments regarding this sampling schedule, please respond to Mr. David Smith in writing by August 18, 1986.

T0487P03
41/1.2
dot

LABORATORY DATA VALIDATION

LABORATORY DATA VALIDATION SUMMARY
MARTIN MARIETTA - THE DALLES
QUALITY ASSURANCE REVIEW
GROUNDWATER
SAMPLES COLLECTED AUGUST - SEPTEMBER 1986

Holding Times

Parameters:
VOCs A B/N A Acids A PCBs A
Antimony A Arsenic A Barium A
Beryllium A Cadmium A Chromium A
Copper A Lead A Mercury A Nickel A
Selenium A Silver A Thallium A Zinc A
Fluoride A Sulfate A Sodium A
T. Cyanide A F. Cyanide A

Criteria:

A - Acceptable: All QAPP and 40 CFR 136 specified holding times, met;

P - Provisional: Some QAPP and 40 CFR 136 specified holding times met;

U - Unacceptable: All holding times exceeded.

Remarks:

All samples prepared/extracted and analyzed within required holding times.

Ground Water Anlaysis
September 1986

GC/MS Tuning and Performance

Parameters: VOCs (BFB) A B/N/A (DFTPP) A

Criteria:

A -	Acceptable:	All criteria met, spectra of good quality;
P -	Provisional:	All criteria not met, spectra of reasonable quality, data useable;
U -	Unacceptable:	Criteria not met, spectra of poor quality, data unuseable.

Remarks:

A review of 10% of the data during an on-site audit of MMES conducted in December 1986 by G&M did not reveal any tuning discrepancies with either BFB or DFTPP.

Ground Water Analysis
September 1986

Initial and Continuing Calibration Checks - Organics

Parameters: VOCs A B/N A Acids A

Criteria:

A - Acceptable: All criteria met;

P - Provisional: Some criteria met, data useable;

U - Unacceptable: Criteria not met, data unuseable;

N - Not applicable.

Remarks:

A review of 10% of the data during an on-site audit of MMES conducted in December 1986 by G&M did not reveal any calibration discrepancies with either system performance check compounds (SPCC) or Calibration Check Compounds (CCC).

Ground Water Analysis
September 1986

Laboratory Blanks - Organics Analysis

Parameter: VOCs A B/N A Acid A

Criteria:

A -	Acceptable:	No contaminants above minimum detection limit, no interference with sample results, appropriate blank used for each GC/MS system and extraction method;
P -	Provisional:	Contaminants present but minimal interference with sample results;
U -	Unacceptable:	Gross contamination, too much interference to use data for certain components or the entire fraction; appropriate blanks not analyzed;
N -	Not applicable.	

Remarks:

None.

Ground Water Analysis
September 1986

Surrogate Spike Results

Parameters: VOCs A B/N A Acids A PCBs A

Judging Criteria:

Evaluation of surrogate data and application to individual samples is complex. The basic criteria for evaluating surrogate compound recoveries is as follows:

Valid performance:	All surrogate recoveries within QC limits (VOCs, BNAs, PCBs) or one surrogate out of QC limits per fraction but % recovery >10% (BNAs, PCBs only);
Invalid performance:	VOC - one or more surrogates out of QC limits; BNA or PCBs - two or more surrogates out of QC limits per fraction or one surrogate out of QC limits but % R <10%.

A. Individual Sample Flagging Criteria:

Analysis acceptable:	All surrogate recoveries within criteria;
Analysis Suspect:	Any surrogate recoveries outside criteria and/or recoveries of <10% substantiated as a matrix effect by repurge, reinject, or re-extract and reanalyze;
Invalid analysis:	Any compound recoveries of <10% that are unsubstantiated as a matrix effect by repurge, reinject, or re-extract and reanalyze.

Parameters	No. Samples	No. Suspect	No. Invalid
VOC	86	0	0
B/N	41	5	0
Acid	41	0	0
PCBs	9	0	0

B. Summary of Surrogates:

A -	Acceptable:	<10% of samples reported as suspect;
P -	Provisional:	>10% but <50% of smaples reported as suspect;
U -	Unacceptable:	>50% of samples reported as suspect and/or >10% samples reported as invalid.

Ground Water Anaysis
September 1986

Matrix Spike/Matrix Duplicate - Organics

A. Matrix Spikes:

Parameters: VOCs A B/N A Acid A

Note: No action is taken on organic matrix spikes alone.

Criteria:

A - Acceptable: <10% of compounds outside criteria;

P - Provisional: >10% but <50% of compounds outside criteria;

U - Unacceptable: >50% of compounds outside criteria and/or >10% of compounds with recoveries of <10

Performance:

Parameter	No. Compounds	No. Outside Criteria	No. <10% R
VOCs	5 x 6 = 30	0	0
B/N	6 x 5 = 30	4	0
Acid	5 x 5 = 25	0	0

Remarks:

None.

B. Matrix Spike Duplicates:

Parameter: VOC A B/N A Acids A

Performance	No. Compounds	No. Outside Criteria	No. <10% R
VOCs	6 x 5 = 30	0	0
B/N	5 x 6 = 30	0	0
Acids	5 x 5 = 25	0	0

Remarks:

None.

Ground Water Analysis
September 1986

Trip Blanks

Water VOCs A B/N A Acids A PCBs A Metals A
Fluoride A Sulfate A F. Cyanide A
T. Cyanide A Sodium A

Criteria:

A -	Acceptable:	No evidence of contamination above minimum detection limits;
P -	Provisional:	Contaminants present but minimal or no evidence of interference with sample results;
U -	Unacceptable:	Gross contamination resulting in definite compromise to the sample data integrity.

Remarks:

All acceptable.

Ground Water Analysis
September 1986

Concentration of Calibration Curve Standards - Inorganics

Parameters:

T. Cyanide A F. Cyanide A Fluoride A
Sulfate A Antimony (I) A Arsenic (F) P
Barium (I) A Beryllium (I) A Cadmium (I) A
Chromium (I) A Copper (I) A Lead (F) A
Mercury (CV) A Nickel (I) A Selenium (F) A
Silver (I) A Thallium (I) A Zinc (I) A

Criteria:

A -	Acceptable:	All curves five-point curves with lowest standard at the LOQ; ICP - one point;
P -	Provisional:	Three-point curve with lowest standard at the LOQ;
U -	Unacceptable:	Less than three-point curve, and/or lowest standard at the LOQ.

Remarks:

An audit review of 10% of the data verified that curves employed acceptable standard concentrations. Only a three-point curve is used for arsenic; however, other QC was acceptable - data is not affected and is acceptable. One-point verification was done for ICP as required.

Note: I = ICP
F = Furance AA
CV = Cold vapor

Ground Water Analysis
September 1986

Laboratory Blanks - Inorganics

Parameters: T. Cyanide A F. Cyanide A Fluoride A
Sulfate A Metals A Sodium A

Criteria:

A -	Acceptable:	No contaminants above LOQ, no interference with sample results;
P -	Provisional:	Contaminants present but minimal interference with sample results;
U -	Unacceptable:	Gross contamination, too much interference to use data or appropriate blanks not analyzed.

Remarks:

Only some of the laboratory blanks data for inorganics analyses was submitted with the report; an audit review of 10% of the data at MMES verified that laboratory blanks were acceptable. Blank type included: digestion blanks and distillation blanks. Blanks were run at proper frequencies of 1 per 20 samples per matrix.

574/3

Ground Water Analysis
September 1986

Initial and Continuing Calibration Verification - Inorganics

Parameters:
T. Cyanide A F. Cyanide A Fluoride A
Sodium A Sulfate A Antimony A
Arsenic A Barium A Beryllium A
Cadmium A Chromium A Copper A Lead A
Mercury A Nickel A Selenium A
Silver A Sodium A Thallium A Zinc A

Criteria:

A - Acceptable - %R of ICVS and CCVS inside QC limits;

P - Provisional: Either ICVS or CCVS outside %R QC limits but not less than 50% or not greater than 150%;

U - Unacceptable: Either ICVS or CCVS outside %R QC limits but less than 50% or greater than 150%;

N - Not applicable.

Remarks:

Acceptable results verified by audit review at the laboratory.

Ground Water Analyses
September 1986

Laboratory Duplicates - Inorganics

Parameters:

T. Cyanide	A	F. Cyanide	A	Fluoride	A		
Sulfate	A	Antimony	A	Arsenic	A		
Barium	A	Beryllium	A	Cadmium	A		
Chromium	A	Copper	A	Lead	A		
Mercury	A	Nickel	A	Selenium	A		
Silver	A	Sodium	A	Thallium	A	Zinc	A

Criteria:

A - Acceptable: All Relative Percent Differences (RPDs) are within QC limits;

P - Provisional: Some RPDs outside QC limits but less than 35%;

U - Unaccepted: All RPDs outside QC limits and >35%.

Remarks:

All duplicates submitted are within QC limits for RPDs. Precision is adequate.

574/3

Ground Water Analysis
September 1986

Matrix Spikes - Inorganics

Parameters:	T. Cyanide	A	F. Cyanide	A	Fluoride	A		
	Sulfate	A	Antimony	A	Arsenic	A		
	Barium	A	Beryllium	A	Cadmium	A		
	Chromium	A	Copper	A	Lead	A	Mercury	A
	Nickel	A	Selenium	P_1	Silver	A		
	Sodium	A	Thallium	A	Zinc	A		

Criteria:

A - Acceptable: All %R within QC limits or meet CLP criteria;

P_1 - Provisional: Some %R not within QC limits but are not <30%; or are >125% and analyte is >IDL - flag J;

P_2 - Provisional: Some %R not within QC limits but are not <30% and analyte was reported < IDL - flag UJ;

P_3 - Provisional: %R are less than 30% and analyte was detected at <LOQ - flag J;

U - Unacceptable: %R <30% and sample results are reported as < IDL - flag R.

Remarks:

P_1 - Selenium - Sample 0776/0839 - low %R but >30% - flagged as J.

574/3

Ground Water Analysis
September 1986

Laboratory Control Sample (LCS) - Inorganics

Parameters:

T. Cyanide A F. Cyanide A Sodium A
Antimony A Arsenic A Barium A
Beryllium A Cadmium A Chromium A
Copper A Lead A Mercury A Nickel A
Selenium A Silver A Thallium A
Zinc A

Criteria:

A - Acceptable: All %R within QC limits;

P - Provisional: %R outside QC limits but not <30%; or is >120% - flag J;

U - Unacceptable: If LCS recovery falls less than 30%, this is indicative of severe laboratory or method deficiencies and the data should be reported as unuseable - flag R.

Remarks:

Audit review of 10% of the data revealed that all LCSs were within acceptable QC limits.

LCS analysis was performed on all inorganic parameters covered by CLP. These included total and free cyanide and all metals that were analyzed. It should be noted that free cyanide is not covered by CLP, but an LCS was analyzed for this parameter anyway. Fluoride and sulfate are not included under the CLP protocol. Therefore, an LCS was not analyzed for these parameters.

The sources used for the LCS included aqueous LCS solution from EPA when available or the Initial Calibration Verification Standard (ICVS) when LCS solution was not available. For cyanide, the distilled mid-range calibration standard was used as the LCS when a formal LCS solution was not available.

Ground Water Analysis
September 1986

Field Blanks

Parameters:

VOC A   B/N A   Acids A   PCBs A
Antimony A   Arsenic A   Barium A
Beryllium A   Cadmium A   Chromium A
Copper A   Lead A   Mercury A   Nickel A
Selenium A   Silver A   Thallium A
Zinc A   Fluoride A   Sulfate A
F. Cyanide A   T. Cyanide A   Sodium A

Criteria:

A - Acceptable: No contamination in any blank;

P - Provisional: Some blanks contaminated, no apparent interference with any sample results;

U - Unacceptable: Gross contamination in blanks indicating poor sampling technique, bottle contamination, airborne contamination, preservative contamination, or improper handling. Data for batch invalid or suspect.

Ground Water Analysis
August - September 1986

Field Replicates

Parameters:
VOC A B/N A Acids A PCBs A
Priority Pollutant Metals P Fluoride A
Sulfate A F. Cyanide A T. Cyanide A
Sodium A

Criteria:

A - Acceptable: All RPDs are within QC limits;

P - Provisional: Some RPDs are outside QC limits;

U - Unacceptable: All RPDs are outside QC limits.

Remarks:

Priority Pollutant Metals - P: The work plan did not specify analysis of ground water for metals. However, while ground-water samples were being collected, the need to analyze ground water for metals was raised by the EPA. In order to prevent delay in implementation of the work plan, the site manager instructed the sampling team to collect ground-water samples for metals analysis, including replicates, and instructed the laboratory to hold the samples until resolution of this issue. The EPA ultimately decided that metals analyses was not required. The laboratory was so instructed and did not analyze the ground-water samples for metals. However, the laboratory inadvertantly analyzed the replicate samples for metals. No comparison of data for RPD calculation was possible.

DATA CLASSIFICATION

GROUND WATER

AUGUST - SEPTEMBER 1986

DATA CLASSIFICATION

Sampling and Analysis March - September 1986

Samples collected and analyzed during this time period included soil, sediment, surface water, groundwater and air. The data generated by the analysis of these samples has previously been validated (i.e., qualified) and data flags have been applied as required. In order to determine the data usefulness and applicability, the data must also be classified as required by the QAPP in accordance with procedures described in the introduction of this report.

Classification Process

As with the laboratory data validation, the classification of data is based on specifically defined criteria. Samples are evaluated by matrix against the criteria and judged as acceptable, provisional, or unacceptable. The explanation of the criteria is as follows:

A - Acceptable: All criteria have been successfully met for all samples.

P - Provisional: Some samples have not fully met the criteria but the information is obtainable.

U - Unacceptable: The criteria has not been met with any samples and is not obtainable. This data may not be classified for use unless sufficient other data criteria have been met and scientific judgement indicate the data may be useful if classified.

N - Not Applicable.

Ground-Water

Between August 27 and September 8, 1986, MMES received 50 ground-water samples, 10 field replicate ground-water samples, 6 aqueous field blanks, and 43 aqueous trip blanks collected during August 26 to September 4, 1986. These samples were submitted for analysis of total cyanide, free cyanide, fluoride, sodium, sulfate, EP toxicity metals, VOCs, B/N/As, and PCBs. The results of the analyses of these samples are presented in a report entitled, "Results of Chemical Analysis of Ground-Water Samples Collected During 26 August to 4 September, 1986 According to the Work Plan of the Remedial Investigation and Feasibility Study at the Martin Marietta Reduction Facility, The Dalles, Oregon."

DATA CLASSIFICATION SUMMARY CHECKLIST

Level A Criteria

Matrix: Ground Water - 1986

To be classified for Level A use, the data must meet the following criteria:

	Criteria	Evaluation Result
1.	Sampling dates were recorded;	A
2.	Signatures of Sampling Team on each water sample log or soil sample log;	P
3.	Sampling locations were clearly designated and described;	A
4.	Sampling depth increment for soils was recorded;	N
5.	Sample collection technique was described on water sample logs or soil sample logs;	A
6.	Field preparation techniques were clearly described where applicable;	A
7.	Sample preservation techniques were clearly described, consistent, and adequate for the parameters to be analyzed and the sample matrix;	A
8.	Shipping bill of lading or constant surveillance documentation is available;	A
9.	The laboratory sample preparation or extraction date is recorded and available;	A
10.	The laboratory sample analysis date is recorded and available;	A

Level A Criteria - Ground Water (Continued)

Criteria	Evaluation Result
11. The laboratory sample preparation technique is recorded and available either in the laboratory report or in the laboratories approved SOP;	A
12. The methods of analysis are listed in the laboratory reports and are consistent with the methods specified in the QAPP and laboratory contract;	A
13. The laboratory analytical detection limits or limits of quantitation (LOQ) are given in lab reports and are adequate for project objectives;	A
14. Field records include:	
o Soil/sediment log sheets	N
o Water sampling log sheets	A
o QC field checklist	N
o Field instrument calibration logs	A
o Master bound log book with sequentially numbered pages	A
o Daily log book	A
o Chain-of-Custody forms	A
15. All applicable records described above were properly created and are on file;	A
16. Samples passed laboratory data validation without any R flags (samples with J flags may be accepted at this level)	P

Remarks:

2. Signatures of sampling team pesonnel were occasionally overlooked. However, the identity of the sampling team personnel is easily obtainable from records.

Conclusion:

All ground water data obtained during this sampling period is classified at Level A. No samples were flagged with J, U, or R codes during data validation; all data may be considered for Level B.

DATA CLASSIFICATION SUMMARY CHECKLIST

Level B Criteria

Matrix: Ground Water - 1986

To be classified for Level B use, the data must meet the following criteria:

Criteria	Evaluation Result
A. Data Validation Result	
1. Samples of this matrix have not been flagged J or R during data validation;	A
2. All samples of this matrix have been classified as Level A data;	A
B. Quantitative Statistical Significance	
1. Laboratory and field instruments were properly standardized (calibrated) employing proper methods and records are available;	A
2. Sample bottle preparation was proper and appropriate for the parameters measured and the sample matrix;	A
3. All laboratory procedures were referenced to approved EPA methods and were contained in an approved SOP manual;	A
4. Analytical QC data was available to demonstrate proper instrument calibration;	A
5. Laboratory QC check sample standards are EPA and NBS traceable and were used at least once each three months;	A

Criteria	Evaluation Result
6. Laboratory reagent (method) blanks were analyzed at a frequency of at least 1 per 20 samples;	A
7. Laboratory duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
8. Laboratory matrix spikes and matrix spike duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
9. Field replicates were analyzed at a frequency of at least 1 per 20 samples;	A
10. Field blanks were submitted at a frequency of at least 1 per 20 samples;	A
11. One trip blank was submitted for VOCs analysis with each cooler;	A
12. Field split samples were analyzed at a frequency of at least 1 per 20 samples per matrix;	P
13. Appropriate and sufficient QC data with acceptance criteria were presented to allow data validation by the project QA officer;	A
14. The laboratories used were approved by the EPA for participation in the Contract Laboratory Program (CLP);	A
15. The laboratories participated in round-robin testing program by EPA or other accrediting agency;	A
16. Quality control limits were consistent with the limits established for EPA's CLP;	A
17. All samples submitted were analyzed for the requested parameters.	A

Level B Criteria - Ground Water (Continued)

	Criteria	Evaluation Result
C.	<u>Custody and Document Control</u>	
1.	Field custody of all samples was noted in a bound field log book;	A
2.	Transfer of custody documentation (chain-of-custody form) signed by field and laboratory sample custodians is available and properly completed;	A
3.	Laboratory custody is documented by a designated lab sample custodian in a master log and a secured sample storage area;	A
4.	Sample identification and assigned laboratory tracking numbers are traceable through the entire monitoring system;	A
5.	Field notebooks, log sheets, log books, checklists, reports, data validations, and all custody documents are stored in a secure repository or under the control of a document custodian;	A
6.	All records, forms, log books, etc., are filled out completely in indelible ink without alterations except as initialed;	A
7.	All sample log sheets have been signed by the sample collector;	A
8.	Field log book sheets signed by the field sample custodian.	A
D.	<u>Sample Representativeness</u>	
1.	Compatibility exists between field and laboratory measurements where applicable or incompatibilities have been suitably explained;	A

Level B Criteria - Ground Water (Continued)

Criteria	Evaluation Result
2. Laboratory analysis and/or sample preparation or extraction were within allowable holding times established for the sample preservation and methods used;	A
3. Sample storage was maintained within suitable temperature, light and moisture conditions to guarantee sample integrity;	A
4. Proper sample containers were used for the parameters analyzed;	A
5. Proper sample collection equipment was used such that the equipment would neither contribute nor remove any substance to or from the sample;	A
6. The sample site selection criteria are consistent with the ojbectives of the investigation and will provide the required data.	A

Remarks:

Section B.12 Field splits were collected at a frequency of 1 per 10 samples as required by the QAPP. These samples were collected for all parameters and submitted with approved chain-of-custody forms to Laucks Testing Laboratory in Seattle, Washington. The results of the Laucks analysis and a comparison to MMES data are provided in the Field Splits section for ground-water samples collected during August - September 1986. The majority of the Laucks data is invalid because of holding time violations and the use of non-approved analytical methods. However, the split data compares qualitatively to the MMES data and may be used to support conclusions about presence or absence of measured compounds.

Conclusion:

The ground-water data collected during the period August - September 1986 is acceptable for both qualitative and quantitative purposes. The data is classified to Level B.

QC SUPPORT DATA

FOR

GROUND WATER ANALYSIS

AUGUST - SEPTEMBER 1986

GROUND-WATER ANALYSIS

SEPTEMBER 1986

LABORATORY BLANKS - ORGANICS

Table C-1. Results of analysis for volatile organic compounds in daily laboratory blanks

CLIENT SAMPLE ID:	LAB BLANK	LAB BLANK	LAB BLANK	LAB BLANK	LAB BLANK
MMES SAMPLE ID:	2BLK0828	3BLK0828	3BLK0901	2BLK0902	3BLK0902
SAMPLE DATE:	08/28/86	08/28/86	09/01/86	09/02/86	09/02/86
ANALYSIS DATE:	08/28/86	08/28/86	09/01/86	09/02/86	09/02/86
FILE NAME:	2VBLK0828	3VBLK0828	3VBLK0901	2VBLK0902	3VBLK0902
INSTRUMENT ID:	MS2	MS3	MS3	MS3	MS3
MATRIX:	WATER	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l	ug/l
COMPOUNDS					
Acrolein	< 10	< 10	< 10	< 10	< 10
Acrylonitrile	< 10	< 10	< 10	< 10	< 10
Benzene	< 5	< 5	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5	< 5	< 5
2-Chloroethylvinylether	< 10	< 10	< 10	< 10	< 10
Chloroform	< 5	< 5	< 5	< 5	< 5
Chloromethane	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5
Methylene Chloride	< 5	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5
Trans-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
1,1,1-Trichloroethane	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5	< 5	< 5
Vinyl Chloride *	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5
trans-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5

---

*Any value reported between the instrument detection limit (IDL = 1 ppb) and the level of quantitation (LOQ = 5 ppb) is marked with an * and should be considered qualitative.

Table C-1. Continued

CLIENT SAMPLE ID:	LAB BLANK	LAB BLANK	LAB BLANK	LAB BLANK	LAB BLANK
MMES SAMPLE ID:	2BLK0903	3BLK0903	3BLK0904	2BLK905	3BLK905
SAMPLE DATE:	09/03/86	09/03/86	09/04/86	09/05/86	09/05/86
ANALYSIS DATE:	09/03/86	09/03/86	09/04/86	09/05/86	09/05/86
FILE NAME:	2VBLK0903	3VBLK0903	3VBLK0904	2VBLK0905	3VBLK0905
INSTRUMENT ID:	MS2	MS3	MS3	MS2	MS3
MATRIX:	WATER	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l	ug/l
COMPOUNDS					
Acrolein	< 10	< 10	< 10	< 10	< 10
Acrylonitrile	< 10	< 10	< 10	< 10	< 10
Benzene	< 5	< 5	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5	< 5	< 5
2-Chloroethylvinylether	< 10	< 10	< 10	< 10	< 10
Chloroform	< 5	< 5	< 5	< 5	< 5
Chloromethane	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5
Methylene Chloride	< 5	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5
Trans-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
1,1,1-Trichloroethane	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5	< 5	< 5
Vinyl Chloride *	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5
trans-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5

Table C-1. Continued

CLIENT SAMPLE ID:	LAB BLANK
MMES SAMPLE ID:	3BLK0910
SAMPLE DATE:	09/10/86
ANALYSIS DATE:	09/10/86
FILE NAME:	3VBLK0910
INSTRUMENT ID:	MS3
MATRIX:	WATER
UNITS:	ug/l

COMPOUNDS	
Acrolein	< 10
Acrylonitrile	< 10
Benzene	< 5
Bromodichloromethane	< 5
Bromoform	< 5
Bromomethane	< 5
Carbon Tetrachloride	< 5
Chlorobenzene	< 5
Chloroethane	< 5
2-Chloroethylvinylether	< 10
Chloroform	< 5
Chloromethane	< 5
Dibromochloromethane	< 5
1,1-Dichloroethane	< 5
1,2-Dichloroethane	< 5
1,1-Dichloroethene	< 5
1,2-Dichloropropane	< 5
cis-1,3-Dichloropropene	< 5
Ethylbenzene	< 5
Methylene Chloride	< 5
1,1,2,2-Tetrachloroethane	< 5
Tetrachloroethene	< 5
Toluene	< 5
Trans-1,3-Dichloropropene	< 5
1,1,1-Trichloroethane	< 5
1,1,2-Trichloroethane	< 5
Trichloroethene	< 5
Trichlorofluoromethane	< 5
Vinyl Chloride*	< 1
cis-1,2-Dichloroethene	< 5
trans-1,2-Dichloroethene	< 5

Table C-3. Results of analysis for base/neutral acid extractable compounds in laboratory extraction blanks

CLIENT SAMPLE ID:	LAB BLANK	LAB BLANK	LAB BLANK	LAB BLANK
MMES SAMPLE ID:	BLK0829	BLK903	BLK905	BLK0909
SAMPLE DATE:	08/29/86	09/03/86	09/05/86	09/09/86
EXTRACTION DATE:	08/29/86	09/03/86	09/05/86	09/09/86
ANALYSIS DATE:	09/04/86	09/06/86	09/12/86	09/16/86
FILE NAME:	BLK0829	BLK0903	BLK905	BLK0909
INSTRUMENT ID:	MS1	MS1	MS1	MS1
MATRIX:	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l
COMPOUNDS				
Acenaphthalene	< 10	< 10	< 10	< 10
Acenaphthene	< 10	< 10	< 10	< 10
Anthracene	< 10	< 10	< 10	< 10
Benzidine	< 80	< 80	< 80	< 80
Benzo(a)Anthracene	< 10	< 10	< 10	< 10
Benzo(a)Pyrene	< 10	< 10	< 10	< 10
Benzo(b+k)fluoranthenes	< 10	< 10	< 10	< 10
Benzo(g,h,i)Perylene	< 10	< 10	< 10	< 10
4-Bromophenyl-phenylether	< 10	< 10	< 10	< 10
Butylbenzylphthalate	< 10	< 10	< 10	< 10
4-Chloro-3-Methylphenol	< 10	< 10	< 10	< 10
bis(2-Chloroethoxy)Methane	< 10	< 10	< 10	< 10
bis(2-Chloroethyl)Ether	< 10	< 10	< 10	< 10
bis(2-Chloroisopropyl)Ether	< 10	< 10	< 10	< 10
2-Chloronaphthalene	< 10	< 10	< 10	< 10
2-Chlorophenol	< 10	< 10	< 10	< 10
4-Chlorophenyl-phenylether	< 10	< 10	< 10	< 10
Chrysene	< 10	< 10	< 10	< 10
Di-n-Butylphthalate	< 10	< 10	< 10	< 10
Di-n-Octyl Phthalate	< 10	< 10	< 10	< 10
Dibenz(a,h)Anthracene	< 10	< 10	< 10	< 10
1,2-Dichlorobenzene	< 10	< 10	< 10	< 10
1,4-Dichlorobenzene	< 10	< 10	< 10	< 10
1,3-Dichlorobenzene	< 10	< 10	< 10	< 10
3,3'-Dichlorobenzidine	< 20	< 20	< 20	< 20
2,4-Dichlorophenol	< 10	< 10	< 10	< 10
Diethylphthalate	< 10	< 10	< 10	< 10
Dimethyl Phthalate	< 10	< 10	< 10	< 10
2,4-Dimethylphenol	< 10	< 10	< 10	< 10
4,6-Dinitro-2-Methylphenol	< 50	< 50	< 50	< 50
2,4-Dinitrophenol	< 50	< 50	< 50	< 50
2,6-Dinitrotoluene	< 10	< 10	< 10	< 10
2,4-Dinitrotoluene	< 10	< 10	< 10	< 10
1,2-Diphenylhydrazine	< 10	< 10	< 10	< 10
bis(2-Ethylhexyl)Phthalate	< 10	< 10	< 10	< 10

Table C-3. Continued

CLIENT SAMPLE ID:	LAB BLANK	LAB BLANK	LAB BLANK	LAB BLANK
MMES SAMPLE ID:	BLK0829	BLK903	BLK905	BLK0909
SAMPLE DATE:	08/29/86	09/03/86	09/05/86	09/09/86
EXTRACTION DATE:	08/29/86	09/03/86	09/05/86	09/09/86
ANALYSIS DATE:	09/04/86	09/06/86	09/12/86	09/16/86
FILE NAME:	BLK0829	BLK0903	BLK905	BLK0909
INSTRUMENT ID:	MS1	MS1	MS1	MS1
MATRIX:	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l
COMPOUNDS				
Fluoranthene	< 10	< 10	< 10	< 10
Fluorene	< 10	< 10	< 10	< 10
Hexachlorobenzene	< 10	< 10	< 10	< 10
Hexachlorobutadiene	< 10	< 10	< 10	< 10
Hexachlorocyclopentadiene	< 10	< 10	< 10	< 10
Hexachloroethane	< 10	< 10	< 10	< 10
Indeno(1,2,3-cd)Pyrene	< 10	< 10	< 10	< 10
Isophorone	< 10	< 10	< 10	< 10
N-Nitroso-Di-n-Propylamine	< 10	< 10	< 10	< 10
N-Nitrosodimethylamine	< 5	< 5	< 5	< 5
N-Nitrosodiphenylamine	< 10	< 10	< 10	< 10
Naphthalene	< 10	< 10	< 10	< 10
Nitrobenzene	< 10	< 10	< 10	< 10
4-Nitrophenol	< 50	< 50	< 50	< 50
2-Nitrophenol	< 10	< 10	< 10	< 10
Pentachlorophenol	< 50	< 50	< 50	< 50
Phenanthrene	< 10	< 10	< 10	< 10
Phenol	< 10	< 10	< 10	< 10
Pyrene	< 10	< 10	< 10	< 10
1,2,4-Trichlorobenzene	< 10	< 10	< 10	< 10
2,4,6-Trichlorophenol	< 10	< 10	< 10	< 10

GROUND-WATER ANALYSIS

SEPTEMBER 1986

SURROGATE SPIKE RESULTS

Table C-2. Surrogate spike recoveries (%) for daily laboratory blanks

LAB ID		Blank	Blank	Blank	Blank	Blank	Blank	Blank
DATE		8/28/86	8/28/86	9/1/86	9/1/86	9/2/86	9/2/86	9/3/86
VOLATILES	Acceptable Range							
Toluene-D8	88-110	99	102	99	92	94	101	99
4-Bromofluorobenzene	86-115	97	100	98	101	102	95	99
1,2-Dichloroethane-D4	76-114	90	99	85	100	93	90	92

LAB ID		Blank	Blank	Blank	Blank	Blank	Blank	
DATE		9/3/86	8/4/86 ? typo	9/4/86	9/5/86	9/5/86	9/10/86	
VOLATILES	Acceptable Range							
Toluene-D8	88-110	101	104	102	99	95	102	
4-Bromofluorobenzene	86-115	103	102	99	99	98	92	
1,2-Dichloroethane-D4	76-114	94	84	106	92	89	92	

Table C-4. Surrogate spike recoveries (%) for laboratory extraction blanks

	LAB ID	Blank	Blank	Blank	Blank			
	DATE	8/29/86	9/3/86	9/5/86	9/9/86			
BASE/NEUTRALS	Acceptable Range							
Nitrobenzene-D5	35-114	78	62	85	74			
2-Fluorobiphenyl	43-116	56	40*	72	64			
P-Terphenyl-D14	33-141	90	71	83	92			
ACIDS/PHENOLS								
Phenol-D5	10-94	64	55	58	71			
2-Fluorophenol	21-100	80	72	66	72			
2,4,6-Tribromophenol	10-123	67	57	75	70			

*One recovery per fraction may be outside limits if the recovery is >10% (CLP Statement of Work 7/85).

Table C-5. Surrogate spike recoveries (%) for aqueous samples collected during 26 August to 4 September 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon

MMES ID		0730	0761	0762	0766	0769	0770	0773
Client ID		MW-14A	MW-18S	MW-19S	MW-21S	MW-13A	REP-5	MW-12A
VOLATILES	Acceptable Range							
Toluene-D8	88-110	99	102	96	93	95	96	
4-Bromofluorobenzene	86-115	99	93	104	100	103	102	
1,2-Dichloroethane-D4	76-114	88	83	91	89	96	94	
BASE/NEUTRALS								
Nitrobenzene-D5	35-114	79	76	55	73	64	81	
2-Fluorobiphenyl	43-116	80	60	65	71	56	72	
P-Terphenyl-D14	33-141	91	29*	75	81	49	77	
ACIDS/PHENOLS								
Phenol-D5	10-94	32	62	50	40	58	69	
2-Fluorophenol	21-100	39	66	58	40	78	89	
2,4,6-Tribromophenol	10-123	60	58	52	21	51	69	
PCBs								
DBC	48-136							97

*One recovery per fraction may be outside limits if the recovery is >10% (CLP Statement of Work 7/85).

Table C-5. Continued

MMES ID		0779	0781	0790	0794	0797	0802	0806
Client ID		MW-16D	Rep-7	MW-11D	Rep-4	MW-1B	MW-1C	MW-16A
VOLATILES	Acceptable Range							
Toluene-D8	88-110	97	96	100	99	103	104	102
4-Bromofluorobenzene	86-115	101	100	98	95	96	97	102
1,2-Dichloroethane-D4	76-114	96	96	97	106	95	96	103
BASE/NEUTRALS								
Nitrobenzene-D5	35-114	70	68	73	88	78	69	86
2-Fluorobiphenyl	43-116	65	63	78	77	59	71	79
P-Terphenyl-D14	33-141	89	88	83	86	83	73	88
ACIDS/PHENOLS								
Phenol-D5	10-94	65	66	69	65	62	68	66
2-Fluorophenol	21-100	76	75	80	63	67	72	68
2,4,6-Tribromophenol	10-123	74	75	72	77	87	64	85
PCBs								
DBC	48-136					75	99	

Table C-5. Continued

	MMES ID	0807	0810	0811	0814	0827	0828	0839
	Client ID	MW-16B	MW-4A	MW-4S	MW-1A	MW-20S	Rep-8	PW-1
VOLATILES	Acceptable Range							
Toluene-D8	88-110	102	102	102	104	102	104	
4-Bromofluorobenzene	86-115	100	100	101	104	104	102	
1,2-Dichloroethane-D4	76-114	101	104	101	103	104	112	
BASE/NEUTRALS								
Nitrobenzene-D5	35-114	72	82	91	86	83	80	
2-Fluorobiphenyl	43-116	65	74	80	76	76	79	
P-Terphenyl-D14	33-141	74	76	89	88	93	89	
ACIDS/PHENOLS								
Phenol-D5	10-94	53	68	58	66	71	77	
2-Fluorophenol	21-100	58	74	64	72	73	78	
2,4,6-Tribromophenol	10-123	85	85	85	89	79	69	
PCBs								
DBC	48-136				106			101

Table C-5. Continued

	MMES ID	0840	0885	0897	0900	0901		
	Client ID	Rep-9	MW-9A	Rep-3	MW-8A	Rep-2		
VOLATILES	Acceptable Range							
Toluene-D8	88-110		98	97	97	99		
4-Bromofluorobenzene	86-115		96	102	96	101		
1,2-Dichloroethane-D4	76-114		94	97	97	101		
BASE/NEUTRALS								
Nitrobenzene-D5	35-114		82	70	78	87		
2-Fluorobiphenyl	43-116		82	68	79	93		
P-Terphenyl-D14	33-141		103	88	94	90		
ACIDS/PHENOLS								
Phenol-D5	10-94		93	64	65	69		
2-Fluorophenol	21-100		90	66	65	66		
2,4,6-Tribromophenol	10-123		95	75	71	63		
PCBs								
DBC	48-136	88						

Table C-6. Surrogate spike recoveries (%) for aqueous Trip Blk blanks associated with samples collected during 26 August to 4 September 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon

MMES ID		0728	0729	0731	0755	0756	0759	0760
Client ID		TB37A	TB38A	TB25A	TB29A	TB30A	TB9	TB10A
VOLATILES	Acceptable Range							
Toluene-D8	88-110	95	104	99	99	102	104	103
4-Bromofluorobenzene	86-115	105	103	99	99	100	97	99
1,2-Dichloroethane-D4	76-114	103	103	91	91	105	105	106

MMES ID		0763	0764	0767	0768	0771	0772	0774
Client ID		TB23A	TB24B	TB7A	TB8A	TB19A	TB20A	Field Blank 2
VOLATILES	Acceptable Range							
Toluene-D8	88-110	102	94	103	103	104	94	
4-Bromofluorobenzene	86-115	101	100	104	101	102	100	
1,2-Dichloroethane-D4	76-114	105	91	107	113	113	86	
PCBs								
DBC	48-136							108

Table C-6. Continued

	MMES ID	0778	0780	0782	0783	0784	0788	0791
	Client ID	TB15A	TB30A	Field Blank 3	TB39A	TB40A	TB49	TB3A
VOLATILES	Acceptable Range							
Toluene-D8	88-110	102	96	93	95	104	104	101
4-Bromofluorobenzene	86-115	103	103	104	101	97	93	98
1,2-Dichloroethane-D4	76-114	98	96	103	97	96	92	97
BASE/NEUTRALS								
Nitrobenzene-D5	35-114			85				76
2-Fluorobiphenyl	43-116			73				79
P-Terphenyl-D14	33-141			90				87
ACIDS/PHENOLS								
Phenol-D5	10-94			62				65
2-Fluorophenol	21-100			74				73
2,4,6-Tribromophenol	10-123			73				63

Table C-6. Continued

	MMES ID	0795	0798	0804	0808	0812	0816	0818
	Client ID	TB36	TB57A	TB5A	TB21A	TB18	TB16	TB41
VOLATILES	Acceptable Range							
Toluene-D8	88-110	103	103	102	102	103	99	101
4-Bromofluorobenzene	86-115	103	105	97	97	105	101	105
1,2-Dichloroethane-D4	76-114	106	108	95	104	109	90	109
BASE/NEUTRALS								
Nitrobenzene-D5	35-114							81
2-Fluorobiphenyl	43-116							84
P-Terphenyl-D14	33-141							95
ACIDS/PHENOLS								
Phenol-D5	10-94							71
2-Fluorophenol	21-100							75
2,4,6-Tribromophenol	10-123							68
PCBs								
DBC	48-136							77

Table C-6. Continued

MMES ID		0819	0829	0841	0842	0875	0878	0884
Client ID		TB42	TB56	TB64	TB3	TB47	TB46	TB48
VOLATILES	Acceptable Range							
Toluene-D8	88-110	102	103	97		102	101	96
4-Bromofluorobenzene	86-115	104	105	99		103	102	95
1,2-Dichloroethane-D4	76-114	105	105	104		106	105	77
PCBs								
DBC	48-136				103			

Table C-6. Continued

MMES ID		0886	0887	0894	0898	0902	0903	
Client ID		TB2A	TB1	TB1A	TB17A	TB63A	TB65A	
VOLATILES	Acceptable Range							
Toluene-D8	88-110	97		98	97	99	101	
4-Bromofluorobenzene	86-115	95		100	103	98	101	
1,2-Dichloroethane-D4	76-114	91		97	93	99	100	
BASE/NEUTRALS								
Nitrobenzene-D5	35-114		70					
2-Fluorobiphenyl	43-116		63					
P-Terphenyl-D14	33-141		87					
ACIDS/PHENOLS								
Phenol-D5	10-94		74					
2-Fluorophenol	21-100		77					
2,4,6-Tribromophenol	10-123		82					

Table C-7. Surrogate spike recoveries (%) for matrix spike (MS) and matrix spike duplicate (MSD) analysis of aqueous samples collected during 26 August to 4 September 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon

MMES ID		0730MS	0730MSD	0761MS	0761MSD	0770MS	0770MSD	
Client ID		MW-14A	MW-14A	MW-18S	MW-18S	Rep-5	Rep-5	
VOLATILES	Acceptable Range							
Toluene-D8	88-110	102	98	102	101	96	96	
4-Bromofluorobenzene	86-115	87	96	97	91	103	100	
1,2-Dichloroethane-D4	76-114	84	89	95	94	95	96	
BASE/NEUTRALS								
Nitrobenzene-D5	35-114			84	92	35	72	
2-Fluorobiphenyl	43-116			76	70	32*	74	
P-Terphenyl-D14	33-141			31*	24*	43	68	
ACIDS/PHENOLS								
Phenol-D5	10-94			73	78	75	68	
2-Fluorophenol	21-100			78	87	81	67	
2,4,6-Tribromophenol	10-123			69	53	67	59	

*One recovery per fraction may be outside limits if the recovery is >10% (CLP Statement of Work 7/85).

Martin Marietta Environmental Systems

Table C-7. Continued

MMES ID		0797MS	0797MSD	0806MS	0806MSD	0807MS	0807MSD	
Client ID		MW-1B	MW-1B	MW-16A	MW-16A	MW-16B	MW-16B	
VOLATILES	Acceptable Range							
Toluene-D8	88-110	102	103					
4-Bromofluorobenzene	86-115	97	97					
1,2-Dichloroethane-D4	76-114	103	98					
BASE/NEUTRALS								
Nitrobenzene-D5	35-114			82	78	80	76	
2-Fluorobiphenyl	43-116			81	80	69	65	
P-Terphenyl-D14	33-141			78	76	79	83	
ACIDS/PHENOLS								
Phenol-D5	10-94			73	82	71	58	
2-Fluorophenol	21-100			77	86	73	52	
2,4,6-Tribromophenol	10-123			73	78	94	81	

Table C-7. Continued

	MMES ID	0827MS	0827MSD	0885MS	0885MSD	0900MS	0900MSD	
	Client ID	MW-20S	MW-20S	MW-9A	MW-9A	MW-8A	MW-8A	
VOLATILES	Acceptable Range							
Toluene-D8	88-110	104	103	100	97			
4-Bromofluorobenzene	86-115	104	101	101	94			
1,2-Dichloroethane-D4	76-114	110	112	101	96			
BASE/NEUTRALS								
Nitrobenzene-D5	35-114					88	79	
2-Fluorobiphenyl	43-116					81	92	
P-Terphenyl-D14	33-141					104	92	
ACIDS/PHENOLS								
Phenol-D5	10-94					70	72	
2-Fluorophenol	21-100					68	67	
2,4,6-Tribromophenol	10-123					89	60	

GROUND-WATER ANALYSIS

SEPTEMBER 1986

MATRIX SPIKE/MATRIX DUPLICATE

Table C-8. Matrix spike and matrix spike duplicate recoveries: volatiles in water matrix

Lab ID: 0730 Sample ID: MW-14A Units: μg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,1-Dichloroethylene	ND	50	59.9	120	38.0	76	45	61-145	14
Trichloroethylene	ND	50	56.7	113	52.1	104	8	71-120	14
Chlorobenzene	ND	50	51.3	103	48.3	97	6	75-130	13
Toluene	ND	50	55.4	111	49.1	98	12	76-125	13
Benzene	ND	50	55.1	110	51.7	103	6	76-127	11

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-9. Matrix spike and matrix spike duplicate recoveries: volatiles in water matrix

Lab ID: 0761 Sample ID: MW-18S Units: µg/L

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)]	
								Recovery	RPD
1,1-Dichloroethylene	ND	50	45.5	91	46.9	94	3	61-145	14
Trichloroethylene	ND	50	43.1	86	44.0	88	2	71-120	14
Chlorobenzene	ND	50	46.1	92	47.9	96	4	75-130	13
Toluene	ND	50	48.0	96	49.9	100	4	76-125	13
Benzene	ND	50	43.8	88	46.0	92	5	76-127	11

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-10. Matrix spike and matrix spike duplicate recoveries: base/neutral extractables in water matrix

Lab ID: 0761 Sample ID: MW-18S Units: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,2,4-Trichlorobenzene	ND	50	31.1	62	31.9	64	3	39-98	28
Acenaphthene	ND	50	40.3	81	37.0	74	9	46-118	31
2,4-Dinitrotoluene	ND	50	46.8	94	39.9	80	16	24-96	38
Pyrene	ND	50	35.8	72	27.9	56	25	26-127	31
N-Nitrosodi-n-Propylamine	ND	50	41.7	83	41.9	84	0	41-116	38
1,4-Dichlorobenzene	ND	50	32.0	64	33.0	66	3	36-97	28

[a] Values reported as not detected (ND) are treated as zero for purposes of calculation.

[b] RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

[c] Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-11. Matrix spike and matrix spike duplicate recoveries: acid extractables in water matrix

Lab ID: 0761 Sample ID: MW-18S Units: μg/L

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)]	
								Recovery	RPD
Pentachlorophenol	ND	100	55.8	56	45.1	45	21	9-103	50
Phenol	ND	100	68.6	69	73.4	73	7	12-89	42
2-Chlorophenol	ND	100	73.1	73	75.1	75	3	27-123	40
4-Chloro-3-Methylphenol	ND	100	70.2	70	76.4	76	8	23-97	42
4-Nitrophenol	ND	100	83.3	83	86.7	87	4	10-80	50

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-12. Matrix spike and matrix spike duplicate recoveries: volatiles in water matrix

Lab ID: 0770 Sample ID: Rep-5 Units: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,1-Dichloroethylene	ND	50	44.0	88	45.0	90	2	61-145	14
Trichloroethylene	ND	50	48.7	97	49.5	99	2	71-120	14
Chlorobenzene	ND	50	50.3	101	50.9	102	1	75-130	13
Toluene	ND	50	50.6	101	51.3	103	1	76-125	13
Benzene	ND	50	52.6	105	54.1	108	3	76-127	11

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-13. Matrix spike and matrix spike duplicate recoveries: base/neutral extractables in water matrix

Lab ID: 0770 Sample ID: Rep-5 Units: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,2,4-Trichlorobenzene	ND	50	11.7	23	28.9	58	85	39-98	28
Acenaphthene	ND	50	16.3	33	39.2	78	83	46-118	31
2,4-Dinitrotoluene	ND	50	13.3	27	26.4	53	66	24-96	38
Pyrene	ND	50	18.4	37	40.5	81	75	26-127	31
N-Nitrosodi-n-Propylamine	ND	50	15.7	31	29.7	59	62	41-116	38
1,4-Dichlorobenzene	ND	50	11.8	24	27.3	55	79	36-97	28

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-14. Matrix spike and matrix spike duplicate recoveries: acid extractables in water matrix

Lab ID: 0770 Sample ID: Rep-5 Units: μg/L

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)]	
								Recovery	RPD
Pentachlorophenol	ND	100	80.1	80	64.8	65	21	9-103	50
Phenol	ND	100	67.5	68	66.4	66	2	12-89	42
2-Chlorophenol	ND	100	73.3	73	71.0	71	3	27-123	40
4-Chloro-3-Methylphenol	ND	100	52.7	53	68.7	69	26	23-97	42
4-Nitrophenol	ND	100	70.4	70	64.1	64	9	10-80	50

(a) Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b) RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c) Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-15. Matrix spike and matrix spike duplicate recoveries: volatiles in water matrix

Lab ID: 0797 Sample ID: MW-1B Units: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,1-Dichloroethylene	ND	50	49.7	99	50.9	102	2	61-145	14
Trichloroethylene	ND	50	44.8	90	45.1	90	1	71-120	14
Chlorobenzene	ND	50	49.0	98	49.4	99	1	75-130	13
Toluene	ND	50	51.0	102	52.5	105	3	76-125	13
Benzene	ND	50	46.9	94	47.6	95	1	76-127	11

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^{1})}{x+x^{1}}$ x 100 where x and x^{1} = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-16. Matrix spike and matrix spike duplicate recoveries: base/neutral extractables in water matrix

Lab ID: 0806 Sample ID: MW-16A Units: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,2,4-Trichlorobenzene	ND	50	36.9	74	35.9	72	3	39-98	28
Acenaphthene	ND	50	44.0	88	43.5	87	1	46-118	31
2,4-Dinitrotoluene	ND	50	40.7	81	38.6	77	5	24-96	38
Pyrene	ND	50	53.7	107	60.5	121	12	26-127	31
N-Nitrosodi-n-Propylamine	ND	50	37.9	76	37.0	74	2	41-116	38
1,4-Dichlorobenzene	ND	50	37.2	74	37.4	75	1	36-97	28

[a] Values reported as not detected (ND) are treated as zero for purposes of calculation.

[b] RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

[c] Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-17. Matrix spike and matrix spike duplicate recoveries: acid extractables in water matrix

Lab ID: 0806 Sample ID: MW-16A Units: µg/L

Spike Compound	Conc. in Sample[(a)]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[(b)]	Acceptable Limits[(c)]	
								Recovery	RPD
Pentachlorophenol	ND	100	68.8	69	82.3	82	18	9-103	50
Phenol	ND	100	67.4	67	76.5	77	13	12-89	42
2-Chlorophenol	ND	100	73.7	74	81.9	82	11	27-123	40
4-Chloro-3-Methylphenol	ND	100	62.2	62	64.9	65	4	23-97	42
4-Nitrophenol	ND	100	45.4	45	78.8	79	54	10-80	50

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-18. Matrix spike and matrix spike duplicate recoveries: base/neutral extractables in water matrix

Lab ID: 0807 Sample ID: MW-16B Units: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,2,4-Trichlorobenzene	ND	50	34.5	69	33.4	67	3	39-98	28
Acenaphthene	ND	50	38.0	76	37.2	74	2	46-118	31
2,4-Dinitrotoluene	ND	50	43.5	87	45.0	90	3	24-96	38
Pyrene	ND	50	49.6	99	53.6	107	8	26-127	31
N-Nitrosodi-n-Propylamine	ND	50	42.2	84	40.4	81	4	41-116	38
1,4-Dichlorobenzene	ND	50	32.4	65	29.7	59	9	36-97	28

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-19. Matrix spike and matrix spike duplicate recoveries: acid extractables in water matrix

Lab ID: 0807 Sample ID: MW-16B Units: µg/L

Spike Compound	Conc. in Sample(a)	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD(b)	Acceptable Limits(c)	
								Recovery	RPD
Pentachlorophenol	ND	100	83.8	84	74.3	74	12	9-103	50
Phenol	ND	100	62.7	63	51.9	52	19	12-89	42
2-Chlorophenol	ND	100	70.0	70	53.5	54	27	27-123	40
4-Chloro-3-Methylphenol	ND	100	66.4	66	64.1	64	4	23-97	42
4-Nitrophenol	ND	100	82.1	82	70.5	71	15	10-80	50

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-20. Matrix spike and matrix spike duplicate recoveries: volatiles in water matrix

Lab ID: 0827 Sample ID: MW-20S Units: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,1-Dichloroethylene	ND	50	47.7	95	49.6	99	4	61-145	14
Trichloroethylene	ND	50	44.3	89	45.2	90	2	71-120	14
Chlorobenzene	ND	50	44.9	90	45.7	91	2	75-130	13
Toluene	ND	50	48.5	97	48.8	98	1	76-125	13
Benzene	ND	50	47.5	95	48.1	96	1	76-127	11

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-21. Matrix spike and matrix spike duplicate recoveries: volatiles in water matrix

Lab ID: 0885   Sample ID: MW-9A   Units: µg/L

Spike Compound	Conc. in Sample(a)	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD(b)	Acceptable Limits(c)	
								Recovery	RPD
1,1-Dichloroethylene	ND	50	51.9	104	50.3	101	3	61-145	14
Trichloroethylene	ND	50	54.3	109	55.0	110	1	71-120	14
Chlorobenzene	ND	50	49.9	100	47.6	95	5	75-130	13
Toluene	ND	50	50.7	101	49.8	100	2	76-125	13
Benzene	ND	50	51.7	103	51.7	103	0	76-127	11

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and $x^{1'}$ = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-22. Matrix spike and matrix spike duplicate recoveries: base/neutral extractables in water matrix

Lab ID: 0900 Sample ID: MW-8A Units: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,2,4-Trichlorobenzene	ND	50	31.0	62	36.3	73	16	39-98	28
Acenaphthene	ND	50	40.0	80	45.0	90	12	46-118	31
2,4-Dinitrotoluene	ND	50	52.4	105	38.2	76	31	24-96	38
Pyrene	ND	50	42.3	85	42.8	86	1	26-127	31
N-Nitrosodi-n-Propylamine	ND	50	40.5	81	32.5	65	22	41-116	38
1,4-Dichlorobenzene	ND	50	30.9	62	36.1	72	16	36-97	28

(a)Values reported as not detected (ND) are treated as zero for purposes of calculation.

(b)RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery

(c)Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

Table C-23. Matrix spike and matrix spike duplicate recoveries: acid extractables in water matrix

Lab ID: 0900 Sample ID: MW-8A Units: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
Pentachlorophenol	ND	100	91.2	91	67.0	67	31	9-103	50
Phenol	ND	100	61.8	62	73.4	73	17	12-89	42
2-Chlorophenol	ND	100	64.9	65	73.0	73	12	27-123	40
4-Chloro-3-Methylphenol	ND	100	65.8	66	68.1	68	3	23-97	42
4-Nitrophenol	ND	100	109	109	53.6	54	68	10-80	50

[a] Values reported as not detected (ND) are treated as zero for purposes of calculation.

[b] RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1}$ x 100 where x and x^1 = % spike recovery and duplicate % spike recovery.

[c] Limits prescribed by EPA in Contract Lab Program Statement of Work (7/85) are advisory levels.

GROUND-WATER ANALYSIS

SEPTEMBER 1986

TRIP BLANKS

Table VII-1. List of trip blanks received from The Dalles Reduction Facility and corresponding laboratory tracking numbers

Martin Marietta Reduction Facility Sample ID	Martin Marietta Environmental Systems Lab ID
Trip Blank 1A -	0887
Trip Blank 1A	0894
Trip Blank 2A	0886
Trip Blank 3A	0791/0842
Trip Blank 4A	0792
Trip Blank 5A	0804
Trip Blank 6A	0805
Trip Blank 7A	0767
Trip Blank 8A	0768
Trip Blank 9A	0759
Trip Blank 10A	0760
Trip Blank 15A	0778
Trip Blank 17A	0898
Trip Blank 18A	0812
Trip Blank 19A	0771
Trip Blank 20A	0772
Trip Blank 21A	0808
Trip Blank 22A	0809
Trip Blank 23A	0763
Trip Blank 24A	0764
Trip Blank 25A	0731
Trip Blank 26A	0796
Trip Blank 29A	0755
Trip Blank 30A	0756
Trip Blank 34A	0780
Trip Blank 35A	0813
Trip Blank 36A	0795
Trip Blank 37A	0729
Trip Blank 38A	0728
Trip Blank 39A	0783
Trip Blank 40A	0784
Trip Blank 41A	0818
Trip Blank 42A	0819
Trip Blank 46A	0878
Trip Blank 47A	0875
Trip Blank 48A	0884
Trip Blank 49A	0788
Trip Blank 50A	0789
Trip Blank 51A	0890
Trip Blank 56A	0829
Trip Blank 57A	0798
Trip Blank 62A	0816
Trip Blank 63A	0821

Table VII-1. Continued

Martin Marietta Reduction Facility Sample ID	Martin Marietta Environmental Systems Lab ID
Trip Blank 63A	0902
Trip Blank 64A	0841
Trip Blank 65A	0903

Table VII-2. Results of analysis for volatile organic compounds in aqueous trip blanks accompanying samples collected during 26 August to 4 September 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon

CLIENT SAMPLE ID:	TRIP BLK-1A	TRIP BLK-2A	TRIP BLANK3A	TRIP BLANK5A	TRIP BLANK7A
MMES SAMPLE ID:	00894	00886	00791	00804	00767
SAMPLE DATE:	08/20/86	08/20/86	08/20/86	08/20/86	08/20/86
ANALYSIS DATE:	09/05/86	09/05/86	09/02/86	09/03/86	09/01/86
FILE NAME:	2V894	2V886	3V791	3V804	3V767
INSTRUMENT ID:	MS2	MS2	MS3	MS3	MS3
MATRIX:	WATER	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l	ug/l
COMPOUNDS					
Acrolein	< 10	< 10	< 10	< 10	< 10
Acrylonitrile	< 10	< 10	< 10	< 10	< 10
Benzene	< 5	< 5	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5	< 5	< 5
2-Chloroethylvinylether	< 10	< 10	< 10	< 10	< 10
Chloroform	< 5	< 5	< 5	< 5	< 5
Chloromethane	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5
Methylene Chloride	< 5	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5
Trans-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
1,1,1-Trichloroethane	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5	< 5	< 5
Vinyl Chloride*	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5
trans-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5

*Any value reported between the instrument detection limit (IDL = 1 ppb) and the level of quantitation (LOQ = 5 ppb) is marked with an * and should be considered qualitative.

Table VII-2. Continued

CLIENT SAMPLE ID:	TRIP BLANK8A	TRIP BLANK9A	TRIP BLANK10A	TRIP BLANK15A	TRIP BLK-17A
MMES SAMPLE ID:	00768	00759	00760	00778	00898
SAMPLE DATE:	08/20/86	08/20/86	08/20/86	08/20/86	08/20/86
ANALYSIS DATE:	09/01/86	09/01/86	09/01/86	09/01/86	09/05/86
FILE NAME:	3V768	3V759	3V760	2V778	3V898
INSTRUMENT ID:	MS3	MS3	MS3	MS3	MS3
MATRIX:	WATER	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l	ug/l
COMPOUNDS					
Acrolein	< 10	< 10	< 10	< 10	< 10
Acrylonitrile	< 10	< 10	< 10	< 10	< 10
Benzene	< 5	< 5	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5	< 5	< 5
2-Chloroethylvinylether	< 10	< 10	< 10	< 10	< 10
Chloroform	< 5	< 5	< 5	< 5	< 5
Chloromethane	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5
Methylene Chloride	< 5	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5
Trans-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
1,1,1-Trichloroethane	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5	< 5	< 5
Vinyl Chloride*	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5
trans-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5

Table VII-2. Continued

CLIENT SAMPLE ID:	TRIP BLANK18A	TRIP BLANK19A	TRIP BLANK20A	TRIP BLANK21A	TRIP BLANK23A
MMES SAMPLE ID:	00812	00771	00772	00808	00763
SAMPLE DATE:	08/20/86	08/20/86	08/20/86	08/20/86	08/20/86
ANALYSIS DATE:	09/03/86	09/01/86	09/02/86	09/03/86	09/01/86
FILE NAME:	3V812	3V771	2V772	3V808	3V763
INSTRUMENT ID:	MS3	MS3	MS3	MS3	MS3
MATRIX:	WATER	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l	ug/l
COMPOUNDS					
Acrolein	< 10	< 10	< 10	< 10	< 10
Acrylonitrile	< 10	< 10	< 10	< 10	< 10
Benzene	< 5	< 5	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5	< 5	< 5
2-Chloroethylvinylether	< 10	< 10	< 10	< 10	< 10
Chloroform	< 5	< 5	< 5	< 5	< 5
Chloromethane	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5
Methylene Chloride	< 5	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5
Trans-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
1,1,1-Trichloroethane	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5	< 5	< 5
Vinyl Chloride *	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5
trans-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5

Table VII-2. Continued

CLIENT SAMPLE ID:	TRIP BLANK24A	TRIP BLANK25A	TRIP BLANK29A	TRIP BLANK30A	TRIP BLANK34A
MMES SAMPLE ID:	00764	00731	00755	00756	00780
SAMPLE DATE:	08/20/86	08/20/86	08/20/86	08/20/86	08/20/86
ANALYSIS DATE:	09/02/86	08/28/86	09/01/86	09/01/86	09/02/86
FILE NAME:	2V764	2V731	3V755	3V756	2V780
INSTRUMENT ID:	MS3	MS2	MS3	MS3	MS3
MATRIX:	WATER	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l	ug/l
COMPOUNDS					
Acrolein	< 10	< 10	< 10	< 10	< 10
Acrylonitrile	< 10	< 10	< 10	< 10	< 10
Benzene	< 5	< 5	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5	< 5	< 5
2-Chloroethylvinylether	< 10	< 10	< 10	< 10	< 10
Chloroform	< 5	< 5	< 5	< 5	< 5
Chloromethane	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5
Methylene Chloride	< 5	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5
Trans-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
1,1,1-Trichloroethane	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5	< 5	< 5
Vinyl Chloride *	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5
trans-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5

Table VII-2. Continued

CLIENT SAMPLE ID:	TRIP BLANK36A	TRIP BLANK37A	TRIP BLANK38A	TRIP BLANK39A	TRIP BLANK40
MMES SAMPLE ID:	00795	00729	00728	00783	00784
SAMPLE DATE:	08/20/86	08/20/86	08/20/86	08/20/86	08/20/86
ANALYSIS DATE:	09/04/86	08/28/86	08/28/86	09/02/86	09/02/86
FILE NAME:	3V795	3V729	3V728	2V783	3V784
INSTRUMENT ID:	MS3	MS3	MS3	MS3	MS3
MATRIX:	WATER	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l	ug/l
COMPOUNDS					
Acrolein	< 10	< 10	< 10	< 10	< 10
Acrylonitrile	< 10	< 10	< 10	< 10	< 10
Benzene	< 5	< 5	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5	< 5	< 5
2-Chloroethylvinylether	< 10	< 10	< 10	< 10	< 10
Chloroform	< 5	< 5	< 5	< 5	< 5
Chloromethane	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5
Methylene Chloride	< 5	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5
Trans-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
1,1,1-Trichloroethane	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5	< 5	< 5
Vinyl Chloride *	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5
trans-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5

Table VII-2. Continued

CLIENT SAMPLE ID:	TRIP BLANK41A	TRIP BLANK42A	TRIP BLANK46A	TRIP BLANK47	TRIP BLANK48A
MMES SAMPLE ID:	00818	00819	00878	00875	00884
SAMPLE DATE:	08/20/86	08/20/86	08/20/86	08/20/86	08/20/86
ANALYSIS DATE:	09/03/86	09/03/86	09/04/86	09/04/86	09/04/86
FILE NAME:	3V818	3V819	3V878	3V875	2V884
INSTRUMENT ID:	MS3	MS3	MS3	MS3	MS2
MATRIX:	WATER	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l	ug/l
COMPOUNDS					
Acrolein	< 10	< 10	< 10	< 10	< 10
Acrylonitrile	< 10	< 10	< 10	< 10	< 10
Benzene	< 5	< 5	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5	< 5	< 5
2-Chloroethylvinylether	< 10	< 10	< 10	< 10	< 10
Chloroform	< 5	< 5	< 5	< 5	< 5
Chloromethane	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5
Methylene Chloride	< 5	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5
Trans-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
1,1,1-Trichloroethane	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5	< 5	< 5
Vinyl Chloride*	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5
trans-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5

Table VII-2. Continued

CLIENT SAMPLE ID:	TRIP BLANK49	TRIP BLANK56A	TRIP BLANK57A	TRIP BLANK62A
MMES SAMPLE ID:	00788	00829	00798	00816
SAMPLE DATE:	08/26/86	08/26/86	08/26/86	08/26/86
ANALYSIS DATE:	09/02/86	09/03/86	09/04/86	09/03/86
FILE NAME:	3V788	3V829	3V798	2V816
INSTRUMENT ID:	MS3	MS3	MS3	MS2
MATRIX:	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l
COMPOUNDS				
Acrolein	< 10	< 10	< 10	< 10
Acrylonitrile	< 10	< 10	< 10	< 10
Benzene	< 5	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5	< 5
2-Chloroethylvinylether	< 10	< 10	< 10	< 10
Chloroform	< 5	< 5	< 5	< 5
Chloromethane	< 5	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5
Methylene Chloride	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5
Trans-1,3-Dichloropropene	< 5	< 5	< 5	< 5
1,1,1-Trichloroethane	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5	< 5
Vinyl Chloride*	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	< 5	< 5	< 5	< 5
trans-1,2-Dichloroethene	< 5	< 5	< 5	< 5

Table VII-2. Continued

CLIENT SAMPLE ID:	TRIP BLK-63A	TRIP BLANK64A	TRIP BLK-65
MMES SAMPLE ID:	00902	00841	00903
SAMPLE DATE:	08/27/86	08/27/86	08/27/86
ANALYSIS DATE:	09/05/86	09/03/86	09/05/86
FILE NAME:	3V902	2V841	3V903
INSTRUMENT ID:	MS3	MS2	MS3
MATRIX:	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l
COMPOUNDS			
Acrolein	< 10	< 10	< 10
Acrylonitrile	< 10	< 10	< 10
Benzene	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5
2-Chloroethylvinylether	< 10	< 10	< 10
Chloroform	14	< 5	< 5
Chloromethane	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5
Methylene Chloride	28	< 5	10
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5
Toluene	< 5	< 5	< 5
Trans-1,3-Dichloropropene	< 5	< 5	< 5
1,1,1-Trichloroethane	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5
Vinyl Chloride *	< 1	< 1	< 1
cis-1,2-Dichloroethene	< 5	< 5	< 5
trans-1,2-Dichloroethene	< 5	< 5	< 5

Table VII-3. Results of analyses for base/neutral acid extractable compounds in aqueous trip blanks accompanying samples collected during 26 August to 4 September 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon

CLIENT SAMPLE ID:	TBLK-1	TB-3	TRIP BLK-41
MMES SAMPLE ID:	00887	00791	00818
SAMPLE DATE:	09/03/86	08/21/86	08/21/86
EXTRACTION DATE:	09/09/86	09/05/86	09/09/86
ANALYSIS DATE:	09/16/86	09/12/86	09/16/86
FILE NAME:	BNA887	BNA791	BNA818
INSTRUMENT ID:	MS1	MS1	MS1
MATRIX:	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l
COMPOUNDS			
Acenaphthalene	< 10	< 10	< 10
Acenaphthene	< 10	< 10	< 10
Anthracene	< 10	< 10	< 10
Benzidine	< 80	< 80	< 80
Benzo(a)Anthracene	< 10	< 10	< 10
Benzo(a)Pyrene	< 10	< 10	< 10
Benzo(b+k)fluoranthenes	< 10	< 10	< 10
Benzo(g,h,i)Perylene	< 10	< 10	< 10
4-Bromophenyl-phenylether	< 10	< 10	< 10
Butylbenzylphthalate	< 10	< 10	< 10
4-Chloro-3-Methylphenol	< 10	< 10	< 10
bis(2-Chloroethoxy)Methane	< 10	< 10	< 10
bis(2-Chloroethyl)Ether	< 10	< 10	< 10
bis(2-Chloroisopropyl)Ether	< 10	< 10	< 10
2-Chloronaphthalene	< 10	< 10	< 10
2-Chlorophenol	< 10	< 10	< 10
4-Chlorophenyl-phenylether	< 10	< 10	< 10
Chrysene	< 10	< 10	< 10
Di-n-Butylphthalate	< 10	< 10	< 10
Di-n-Octyl Phthalate	< 10	< 10	< 10
Dibenz(a,h)Anthracene	< 10	< 10	< 10
1,2-Dichlorobenzene	< 10	< 10	< 10
1,4-Dichlorobenzene	< 10	< 10	< 10
1,3-Dichlorobenzene	< 10	< 10	< 10
3,3'-Dichlorobenzidine	< 20	< 20	< 20
2,4-Dichlorophenol	< 10	< 10	< 10
Diethylphthalate	< 10	< 10	< 10
Dimethyl Phthalate	< 10	< 10	< 10
2,4-Dimethylphenol	< 10	< 10	< 10
4,6-Dinitro-2-Methylphenol	< 50	< 50	< 50
2,4-Dinitrophenol	< 50	< 50	< 50
2,6-Dinitrotoluene	< 10	< 10	< 10
2,4-Dinitrotoluene	< 10	< 10	< 10
1,2-Diphenylhydrazine	< 10	< 10	< 10
bis(2-Ethylhexyl)Phthalate	< 10	< 10	< 10

Table VII-3. Continued

CLIENT SAMPLE ID:	TBLK-1	TB-3	TRIP BLK-41
MMES SAMPLE ID:	00887	00791	00818
SAMPLE DATE:	09/03/86	08/21/86	08/21/86
EXTRACTION DATE:	09/09/86	09/05/86	09/09/86
ANALYSIS DATE:	09/16/86	09/12/86	09/16/86
FILE NAME:	BNA887	BNA791	BNA818
INSTRUMENT ID:	MS1	MS1	MS1
MATRIX:	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l
COMPOUNDS			
Fluoranthene	< 10	< 10	< 10
Fluorene	< 10	< 10	< 10
Hexachlorobenzene	< 10	< 10	< 10
Hexachlorobutadiene	< 10	< 10	< 10
Hexachlorocyclopentadiene	< 10	< 10	< 10
Hexachloroethane	< 10	< 10	< 10
Indeno(1,2,3-cd)Pyrene	< 10	< 10	< 10
Isophorone	< 10	< 10	< 10
N-Nitroso-Di-n-Propylamine	< 10	< 10	< 10
N-Nitrosodimethylamine	< 5	< 5	< 5
N-Nitrosodiphenylamine	< 10	< 10	< 10
Naphthalene	< 10	< 10	< 10
Nitrobenzene	< 10	< 10	< 10
4-Nitrophenol	< 50	< 50	< 50
2-Nitrophenol	< 10	< 10	< 10
Pentachlorophenol	< 50	< 50	< 50
Phenanthrene	< 10	< 10	< 10
Phenol	< 10	< 10	< 10
Pyrene	< 10	< 10	< 10
1,2,4-Trichlorobenzene	< 10	< 10	< 10
2,4,6-Trichlorophenol	< 10	< 10	< 10

Table VII-4. Results of analysis for PCBs in aqueous trip blanks accompanying samples collected during 26 August to 4 September 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon

	1	2	3	4	5	6
SAMPLE DATE:	8/21/86	8/21/86				
ANALYSIS DATE:	10/3/86	10/2/86				
MMES SAMPLE ID:	0818	0842				
CLIENT SAMPLE ID:	TP BLNK 41	TRP BLNK 3				
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ug/L)					
PCB 1016	<0.50	<0.50				
PCB 1221	<0.50	<0.50				
PCB 1232	<0.50	<0.50				
CB 1242	<0.50	<0.50				
CB 1248	<0.50	<0.50				
PCB 1254	<1.0	<1.0				
PCB 1260	<1.0	<1.0				

Table VII-5. Results of analysis for priority pollutant metals in aqueous trip blanks accompanying samples collected during 26 August to 4 September 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon

---

Reported as total metals

Units: ppb (μg/L)

MMES ID		0791	0818							
Client ID		Trip Blank 3	Trip Blank 41							
Sample Date		8/20/86	8/21/86							
Metal	Method									
Antimony	ICP	<200	<200							
Arsenic	Furnace	<10	<10							
Barium	ICP	<200	<200							
Beryllium	ICP	<5	<5							
Cadmium	ICP	<10	<10							
Chromium	ICP	<20	<20							
Copper	ICP	<25	<25							
Lead	Furnace	<10	<10							
Mercury	Cold Vapor	<0.30	<0.30							
Nickel	ICP	<40	<40							
Selenium	Furnace	<5	<5							
Silver	ICP	<50	<50							
Thallium	ICP	<500	<500							
Zinc	ICP	<50	<50							

Table VII-6. Results of chemical analysis of aqueous trip blanks accompanying samples collected during 26 August to 4 September 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon

	1	2	3	4	5	6
SAMPLE DATE:	9/3/86	8/20-21/86	8/21/86	8/20/86	8/26/86	
MMES SAMPLE ID:	0887	0791/0842	0818	0788	0890	
CLIENT SAMPLE ID:	TR BLNK 1	TR BLNK 3	TR BLNK 41	TR BLNK 49	TR BLNK 51	
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppm (mg/L)					
fluoride	<0.24	<0.24	<0.24	<0.24	<0.24	
sulfate	<0.94	<0.94	<0.94	<0.94	<0.94	
free cyanide	<0.010	<0.010	<0.010	<0.010	<0.010	
total cyanide	<0.010	<0.010	<0.010	<0.010	<0.010	
sodium	<1.0	<1.0	<1.0	<1.0	<1.0	

GROUND-WATER ANALYSIS

SEPTEMBER 1986

LABORATORY BLANKS - INORGANICS

Table D-10. QC Summary -- Blanks

☒ METALS ☐ NON-METALS ☐ PHYSICAL

MMES ID # 0787-0840

Matrix Water Analysis Type Total Units µg/L

Parameter	Detection Limit	Blanks (Prep)	Method
Antimony	200	<200	ICP
Arsenic	10	<10	Furnace
Barium	200	<200	ICP
Beryllium	5	<5	ICP
Cadmium	10	<10	ICP
Chromium	20	<20	ICP
Copper	25	<25	ICP
Lead	10	<10	Furnace
Mercury	0.30	<0.30	Cold Vapor
Nickel	40	<40	ICP
Selenium	5	<5	Furnace
Silver	50	<50	ICP
Sodium	1000	<1000	Flame
Thallium	500	<500	ICP
Zinc	50	<50	ICP

Ok
CWF

Table D-8. QC Summary -- Blanks

☒ METALS ☐ NON-METALS ☐ PHYSICAL

MMES ID # 0726-0757

Matrix Water Analysis Type Total Units µg/L

Parameter	Detection Limit	Blanks (Prep)	Method
Antimony	200	<200	ICP
Arsenic	10	<10	Furnace
Barium	200	<200	ICP
Beryllium	5	<5	ICP
Cadmium	10	<10	ICP
Chromium	20	<20	ICP
Copper	25	<25	ICP
Lead	10	<10	Furnace
Mercury	0.30	<0.30	Cold Vapor
Nickel	40	<40	ICP
Selenium	5	<5	Furnace
Silver	50	<50	ICP
Sodium	1000	<1000	Flame
Thallium	500	<500	ICP
Zinc	50	<50	ICP

Table D-9. QC Summary -- Blanks

☒ METALS ☐ NON-METALS ☐ PHYSICAL

MMES ID # 0761-0782

Matrix Water Analysis Type Total Units µg/L

Parameter	Detection Limit	Blanks (Prep)	Method
Antimony	200	<200	ICP
Arsenic	10	<10	Furnace
Barium	200	<200	ICP
Beryllium	5	<5	ICP
Cadmium	10	<10	ICP
Chromium	20	<20	ICP
Copper	25	<25	ICP
Lead	10	<10	Furnace
Mercury	0.30	<0.30	Cold Vapor
Nickel	40	<40	ICP
Selenium	5	<5	Furnace
Silver	50	<50	ICP
Sodium	1000	<1000	Flame
Thallium	500	<500	ICP
Zinc	50	<50	ICP

Table D-10. QC Summary -- Blanks

☒ METALS ☐ NON-METALS ☐ PHYSICAL

MMES ID # 0787-0840

Matrix Water Analysis Type Total Units µg/L

Parameter	Detection Limit	Blanks (Prep)	Method
Antimony	200	<200	ICP
Arsenic	10	<10	Furnace
Barium	200	<200	ICP
Beryllium	5	<5	ICP
Cadmium	10	<10	ICP
Chromium	20	<20	ICP
Copper	25	<25	ICP
Lead	10	<10	Furnace
Mercury	0.30	<0.30	Cold Vapor
Nickel	40	<40	ICP
Selenium	5	<5	Furnace
Silver	50	<50	ICP
Sodium	1000	<1000	Flame
Thallium	500	<500	ICP
Zinc	50	<50	ICP

Ok
CWB

GROUND-WATER ANALYSIS

SEPTEMBER 1986

LABORATORY DUPLICATES - INORGANICS

Table D-1. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

Matrix Water Analysis Type Total cyanide Units mg/L

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD[a]
Total cyanide	0730	0.010	0.026	0.021	(b)
Total cyanide	0781	0.010	<0.010	<0.010	NC[c]
Total cyanide	0790	0.010	<0.010	<0.010	NC
Total cyanide	0797	0.010	<0.010	<0.010	NC
Total cyanide	0891	0.010	1.04	1.07	1
Total cyanide	0896	0.010	1.17	1.18	1

[a] RPD = [(S-D)/(S+D)/2] x 100

[b] For results <5x DL, values must agree within ± DL

[c] RPD not calculated (NC), result < DL

Table D-2. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

Matrix Water Analysis Type Free cyanide Units mg/L

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD[a]
Free cyanide	0750	0.010	0.049	0.054	10
Free cyanide	0761	0.010	<0.010	<0.010	NC[b]
Free cyanide	0781	0.010	<0.010	<0.010	NC
Free cyanide	0790	0.010	<0.010	<0.010	NC
Free cyanide	0797	0.010	<0.010	<0.010	NC
Free cyanide	0777	0.010	<0.010	<0.010	NC
Free cyanide	0785	0.010	0.093	0.081	14

[a] RPD = [(S-D)/(S+D)/2] x 100

[b] RPD not calculated (NC), result <DL

Table D-5. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

Matrix Water Analysis Type Dissolved Units mg/L

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD[a]
Fluoride	0770	0.235	0.89	0.91	(b)
Fluoride	0781	0.235	1.08	1.24	(b)
Fluoride	0790	0.235	0.77	0.87	(b)
Fluoride	0797	0.235	1.34	1.28	2
Fluoride	0817	0.235	0.72	0.70	(b)
Fluoride	0874	0.235	0.38	0.34	(b)
Fluoride	0885	0.235	1.43	1.40	2

[a] RPD = [(S-D)/(S+D)/2] x 100

[b] For results <5x DL, values must agree within ± DL

Table D-6. QC Summary -- Duplicate Analyses

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

Matrix Water Analysis Type Dissolved Units mg/L

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD*
Sulfate	0770	0.930	20.4	21.2	4
Sulfate	0781	0.930	23.9	23.3	2
Sulfate	0790	0.930	24.5	24.6	0.4
Sulfate	0797	0.930	22.1	22.1	0
Sulfate	0817	0.930	20.9	20.9	0
Sulfate	0874	0.930	26.0	25.0	4
Sulfate	0885	0.930	40.4	42.0	4

*RPD = [(S-D)/(S+D)/2] x 100

Table D-11. QC Summary -- Duplicate Analyses

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

MMES ID# 0750-0752

Matrix Water Analysis Type Total Units µg/L

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD[a]
Antimony	0752	200	<200	<200	NC[b]
Arsenic	0752	10	<10	<10	NC
Barium	0752	200	<200	<200	NC
Beryllium	0752	5	<5	<5	NC
Cadmium	0752	10	<10	<10	NC
Chromium	0752	20	<20	<20	NC
Copper	0752	25	<25	<25	NC
Lead	0752	10	<10	<10	NC
Mercury	0752	0.30	<0.30	<0.30	NC
Nickel	0752	40	<40	<40	NC
Selenium	0752	5	<5	<5	NC
Silver	0752	50	<50	<50	NC
Sodium	0752	1000	22000	20500	7
Thallium	0752	500	<500	<500	NC
Zinc	0752	50	<50	<50	NC

[a] RPD = [(S-D)/(S+D)/2] x 100

[b] RPD not calculated (NC), result <DL

Table D-12. QC Summary -- Duplicate Analyses

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

MMES ID# 0761-0782

Matrix Water Analysis Type Total Units µg/L

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD[a]
Antimony	0761	200	<200	<200	NC[b]
Arsenic	0761	10	<10	<10	NC
Barium	0761	200	588	550	(c)
Beryllium	0761	5	<5	<5	NC
Cadmium	0761	10	<10	<10	NC
Chromium	0761	20	<20	<20	NC
Copper	0761	25	26	31	(c)
Lead	0761	10	<10	<10	NC
Mercury	0761	0.30	<0.30	<0.30	NC
Nickel	0761	40	<40	<40	NC
Selenium	0761	5	<5	<5	NC
Silver	0761	50	<50	<50	NC
Sodium	0761	1000	162000	160000	1
Thallium	0761	500	<500	<500	NC
Zinc	0761	50	142	142	(c)

[a] RPD = $[(S-D)/(S+D)/2] \times 100$
[b] RPD not calculated (NC), result < DL
(c) For results <5x DL, values must agree within ± DL

Table D-13. QC Summary -- Duplicate Analyses

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

MMES ID# 0761-0782

Matrix Water Analysis Type Total Units µg/L

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD[a]
Antimony	0781	200	<200	<200	NC[b]
Arsenic	0781	10	<10	<10	NC
Barium	0781	200	<200	<200	NC
Beryllium	0781	5	<5	<5	NC
Cadmium	0781	10	<10	<10	NC
Chromium	0781	20	<20	<20	NC
Copper	0781	25	<25	<25	NC
Lead	0781	10	<10	<10	NC
Mercury	0781	0.30	<0.30	<0.30	NC
Nickel	0781	40	<40	<40	NC
Selenium	0781	5	<5	<5	NC
Silver	0781	50	<50	<50	NC
Sodium	0781	1000	19000	20000	5
Thallium	0781	500	<500	<500	NC
Zinc	0781	50	<50	<50	NC

[a] RPD = $[(S-D)/(S+D)/2] \times 100$

[b] RPD not calculated (NC), result < DL

Table D-14. QC Summary -- Duplicate Analyses

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

MMES ID# 0806-0840

Matrix Water

Analysis Type Total

Units µg/L

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD[a]
Antimony	0806	200	<200	<200	NC[b]
Arsenic	0806	10	<10	<10	NC
Barium	0806	200	<200	<200	NC
Beryllium	0806	5	<5	<5	NC
Cadmium	0806	10	<10	<10	NC
Chromium	0806	20	<20	<20	NC
Copper	0806	25	<25	<25	NC
Lead	0806	10	<10	<10	NC
Mercury	0806	0.30	<0.30	<0.30	NC
Nickel	0806	40	<40	<40	NC
Selenium	0806	5	<5	<5	NC
Silver	0806	50	<50	<50	NC
Sodium	0806	1000	43000	39000	10
Thallium	0806	500	<500	<500	NC
Zinc	0806	50	<50	52	(c)

[a] RPD = $[(S-D)/(S+D)/2] \times 100$

[b] RPD not calculated (NC), result < DL

(c) For results <5x DL, values must agree within ± DL

Table D-15. QC Summary -- Duplicate Analyses

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

0806-0840
MMES ID# 0873-0901

Matrix Water

Analysis Type Total

Units µg/L

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD(a)
Antimony	0817	200	<200	<200	NC(b)
Arsenic	0817	10	<10	<10	NC
Barium	0817	200	<200	<200	NC
Beryllium	0817	5	<5	<5	NC
Cadmium	0817	10	<10	<10	NC
Chromium	0817	20	<20	<20	NC
Copper	0817	25	<25	<25	NC
Lead	0817	10	<10	<10	NC
Mercury	0817	0.30	<0.30	<0.30	NC
Nickel	0817	40	<40	<40	NC
Selenium	0817	5	<5	<5	NC
Silver	0817	50	<50	<50	NC
Sodium	0817	1000	23000	24000	4
Thallium	0817	500	<500	<500	NC
Zinc	0817	50	<50	<50	NC

(a) RPD = $[(S-D)/(S+D)/2] \times 100$

(b) RPD not calculated (NC), result < DL

Table D-16. QC Summary -- Duplicate Analyses

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 7/85 (see clarifications below the table). Sample (S) and duplicate (D) values and their RPD's are listed in the table below:

MMES ID# 0873-0901

Matrix Water Analysis Type Total Units µg/L

Parameter	MMES ID	Detection Limit (DL)	Sample	Duplicate	RPD[a]
Antimony	0874	200	<200	<200	NC[b]
Arsenic	0874	10	<10	<10	NC
Barium	0874	200	<200	<200	NC
Beryllium	0874	5	<5	<5	NC
Cadmium	0874	10	<10	<10	NC
Chromium	0874	20	<20	<20	NC
Copper	0874	25	<25	<25	NC
Lead	0874	10	<10	<10	NC
Mercury	0874	0.30	<0.30	<0.30	NC
Nickel	0874	40	<40	<40	NC
Selenium	0874	5	<5	<5	NC
Silver	0874	50	<50	<50	NC
Sodium	0874	1000	7400	6700	10%
Thallium	0874	500	<500	<500	NC
Zinc	0874	50	60	77	(c)

[a] RPD = [(S-D)/(S+D)/2] x 100

[b] RPD not calculated (NC), result < DL

[c] For results <5x DL, values must agree within ± DL

GROUND-WATER ANALYSIS

SEPTEMBER 1986

MATRIX SPIKES - INORGANICS

Table D-3. QC Summary -- Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spike sample result (SSR), sample result (SR), spike added (SA), and the percent recovery (%R) are also listed in the table below.

Matrix Water Analysis Type Total cyanide Units µg/L

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R[a]
Total cyanide	0727	75-125	(b)	(b)	(b)	(b)
Total cyanide	0774	75-125	96	0	100	96
Total cyanide	0807	75-125	(b)	(b)	(b)	(b)
Total cyanide	0787	75-125	97	0	100	97
Total cyanide	0751	75-125	(b)	(b)	(b)	(b)

(a) %R = [(SSR-SR)/SA] x 100
(b) Sample concentration >4x SA, %R not calculated

Table D-4. QC Summary -- Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spike sample result (SSR), sample result (SR), spike added (SA), and the percent recovery (%R) are also listed in the table below.

Matrix Water Analysis Type Free cyanide Units μg/L

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R*
Free cyanide	0751	75-125	101	12.3	100	89
Free cyanide	0774	75-125	96	0	100	96
Free cyanide	0773	75-125	110	4.4	100	105
Free cyanide	0807	75-125	89	8.0	100	81
Free cyanide	0777	75-125	92	0	100	92
Free cyanide	0888	75-125	100	0	100	100
Free cyanide	0787	75-125	95	0	100	95

* %R = [(SSR-SR)/SA] x 100

Table D-7. QC Summary -- Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spike sample result (SSR), sample result (SR), spike added (SA), and the percent recovery (%R) are also listed in the table below.

Matrix Water Analysis Type Dissolved Units mg/L

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R(a)
Fluoride	0761	75-125	118	12	100	106
Fluoride	0776	75-125	11.65	0.82	10	109
Fluoride	0807	75-125	12.37	4.16	10	86
Fluoride	0839	75-125	9.94	1.23	10	88
Fluoride	0881	75-125	10.51	0.65	10	99
Sulfate	0761	75-125	(b)	(b)	(b)	(b)
Sulfate	0776	75-125	73.48	23.94	50	99
Sulfate	0787	75-125	73	22	50	102
Sulfate	0807	75-125	63	31	30	107
Sulfate	0839	75-125	81.77	33.68	50	96
Sulfate	0881	75-125	101.87	49.46	50	105

(a) %R = [(SSR-SR) SA] x 100
(b)Sample concentration >4x SA, %R not calculated

Table D-18. QC Summary -- Spike Recoveries

Matrix Water Analysis Type Total Units μg/L

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R*
Antimony	0770	75-125	862	100	1000	76
Arsenic	0770	75-125	17.6	0	20	88
Barium	0770	85-115	569	49	500	104
Beryllium	0770	75-125	47.5	0	50	95
Cadmium	0770	75-125	48	0	50	96
Chromium	0770	75-125	201	0	200	101
Copper	0770	75-125	240	0	250	96
Lead	0770	75-125	28.5	4.3	20	121
Mercury	0770	75-125	2.86	0	2.86	100
Nickel	0770	75-125	474	0	500	95
Selenium	0770	75-125	8.8	0	10	88
Silver	0770	75-125	97	0	100	97
Sodium	0770	75-125	54000	17000	40000	92
Thallium	0770	75-125	502	0	500	100
Zinc	0770	75-125	212	0	200	106

* %R = [(SSR-SR)/SA] x 100

Table D-19. QC Summary -- Spike Recoveries

Matrix Water Analysis Type Total Units µg/L

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R(a)
Antimony	0779	75-125	906	0	1000	91
Arsenic	0779	75-125	23	0	20	115
Barium	0779	85-115	536	18	500	104
Beryllium	0779	75-125	47	0	50	94
Cadmium	0779	75-125	52	0	50	104
Chromium	0779	75-125	204	0	200	102
Copper	0779	75-125	252	0	250	101
Lead	0776	75-125	28	6.2	20	109
Mercury	0776	75-125	2.83	0	2.86	99
Nickel	0779	75-125	395	0	500	79
Selenium	0776	75-125	6.8	0	10	68(b)
Silver	0779	75-125	85	0	100	85
Sodium	0776	75-125	49000	13000	40000	92
Thallium	0779	75-125	457	78	500	76
Zinc	0779	75-125	377	177	200	100

(a) %R = [(SSR-SR)/SA] x 100

(b) Low spike recovery due to matrix interferences

Table D-20. QC Summary -- Spike Recoveries

Matrix Water Analysis Type Total Units µg/L

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R*
Antimony	0787	75-125	970	0	1000	97
Arsenic	0787	75-125	18.2	0	20	91
Barium	0787	85-115	556	32	500	105
Beryllium	0787	75-125	51	0	50	101
Cadmium	0787	75-125	50	0	50	100
Chromium	0787	75-125	201	13	200	94
Copper	0787	75-125	257	0	250	103
Lead	0787	75-125	37	21	20	80
Mercury	0787	75-125	3.2	0	2.86	112
Nickel	0787	75-125	406	0	400	102
Selenium	0787	75-125	9.2	0	10	92
Silver	0787	75-125	89	0	100	89
Sodium	0787	75-125	71200	32400	40000	97
Thallium	0787	75-125	770	0	1000	77
Zinc	0787	75-125	275	24	200	125

* %R = [(SSR-SR)/SA] x 100

Table D-21. QC Summary -- Spike Recoveries

Matrix Water

Analysis Type Total

Units μg/L

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R[a]
Antimony	0839	75-125	1004	0	1000	100
Arsenic	0839	75-125	19	0	20	95
Barium	0839	85-115	536	19	500	103
Beryllium	0839	75-125	51	0	50	101
Cadmium	0839	75-125	52	0	50	104
Chromium	0839	75-125	208	0	200	104
Copper	0839	75-125	253	0	250	101
Lead	0839	75-125	19.3	0	20	97
Mercury	0839	75-125	2.80	0	2.86	98
Nickel	0839	75-125	411	0	400	103
Selenium	0839	75-125	6.7	0	10	67[b]
Silver	0839	75-125	91	0	100	91
Sodium	0839	75-125	62800	26000	40000	92
Thallium	0839	75-125	783	0	1000	78
Zinc	0839	75-125	228	66	200	81

[a] %R = [(SSR-SR)/SA] x 100

[b] Low spike recovery due to matrix interferences

Table D-22. QC Summary -- Spike Recoveries

Matrix Water   Analysis Type Total   Units μg/L .

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R[a]
Antimony	0881	75-125	--	--	--	--[b]
Arsenic	0881	75-125	40.1	17.3	20	114[c]
Barium	0881	85-115	585	58	500	105
Beryllium	0881	75-125	52	0	50	104
Cadmium	0881	75-125	52	0	50	104
Chromium	0881	75-125	202	0	200	101
Copper	0881	75-125	251	0	250	100
Lead	0881	75-125	30.3	8.3	20	110
Mercury	0881	75-125	2.72	0	2.86	95
Nickel	0881	75-125	408	63	400	86
Selenium	0881	75-125	12.2	0	10	122
Silver	0881	75-125	95	0	100	95
Sodium	0881	75-125	44700	10100	40000	86
Thallium	0881	75-125	933	0	1000	93
Zinc	0881	75-125	455	213	200	121

(a)%R = [(SSR-SR)/SA] x 100
(b)Sample not spiked for this parameter
(c)Sample dilutes 1:5 due to matrix interferences

Table D-17. QC Summary -- Spike Recoveries

Matrix Water Analysis Type Total Units μg/L

Parameter	MMES ID	Control Limits	Spiked Sample Result (SSR)	Sample Result (SR)	Spike Added (SA)	%R*
Antimony	0727	75-125	924	0	1000	92
Arsenic	0727	75-125	21	0	20	105
Barium	0727	85-115	641	141	500	100
Beryllium	0727	75-125	50	0	50	100
Cadmium	0727	75-125	49	0	50	98
Chromium	0727	75-125	200	0	200	100
Copper	0727	75-125	261	0	250	104
Lead	0727	75-125	20.8	3.4	20	87
Mercury	0727	75-125	2.81	0	2.86	98
Nickel	0727	75-125	490	0	500	98
Selenium	0727	75-125	9.3	0	10	93
Silver	0727	75-125	90	0	100	90
Sodium	0727	75-125	61000	22000	40000	98
Thallium	0727	75-125	471	0	500	94
Zinc	0727	75-125	221	38	200	92

* %R = [(SSR-SR)/SA] x 100

GROUND-WATER ANALYSIS

SEPTEMBER 1986

FIELD BLANKS

Table VI-1. List of field blanks received from The Dalles Reduction Facility and corresponding laboratory tracking numbers

Martin Marietta Reduction Facility Sample ID	Martin Marietta Environmental Systems Lab ID
Field Blank 1	0832
Field Blank 2	0774
Field Blank 3	0782
Field Blank 4	0726
Field Blank 5	0824
Field Blank 6	0876

Table VI-2. Results of analysis for volatile organic compounds in an aqueous field blank collected on 27 August 1986 at the Martin Marietta Reduction Facility, The Dalles, Oregon

CLIENT SAMPLE ID:	FIELD BLANK-3
MMES SAMPLE ID:	00782
SAMPLE DATE:	08/27/86
ANALYSIS DATE:	09/02/86
FILE NAME:	2V782
INSTRUMENT ID:	MS3
MATRIX:	WATER
UNITS:	ug/l

COMPOUNDS	
Acrolein	< 10
Acrylonitrile	< 10
Benzene	< 5
Bromodichloromethane	< 5
Bromoform	< 5
Bromomethane	< 5
Carbon Tetrachloride	< 5
Chlorobenzene	< 5
Chloroethane	< 5
2-Chloroethylvinylether	< 10
Chloroform	< 5
Chloromethane	< 5
Dibromochloromethane	< 5
1,1-Dichloroethane	< 5
1,2-Dichloroethane	< 5
1,1-Dichloroethene	< 5
1,2-Dichloropropane	< 5
cis-1,3-Dichloropropene	< 5
Ethylbenzene	< 5
Methylene Chloride	< 5
1,1,2,2-Tetrachloroethane	< 5
Tetrachloroethene	< 5
Toluene	< 5
Trans-1,3-Dichloropropene	< 5
1,1,1-Trichloroethane	< 5
1,1,2-Trichloroethane	< 5
Trichloroethene	< 5
Trichlorofluoromethane	< 5
Vinyl Chloride*	< 1
cis-1,2-Dichloroethene	< 5
trans-1,2-Dichloroethene	< 5

---

*Any value reported between the instrument detection limit (IDL = 1 ppb) and the level of quantitation (LOQ = 5 ppb) is marked with an * and sh nsidered qualitative.

Table VI-3. Results of analysis for base/neutral acid extractable compounds in an aqueous field blank collected on 27 August 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon

CLIENT SAMPLE ID: FBLK-3

MMES SAMPLE ID: 00782
SAMPLE DATE: 08/27/86
EXTRACTION DATE: 09/03/86
ANALYSIS DATE: 09/11/86
FILE NAME: BNA782B
INSTRUMENT ID: MS1
MATRIX: WATER
UNITS: ug/1

COMPOUNDS	
Acenaphthalene	< 10
Acenaphthene	< 10
Anthracene	< 10
Benzidine	< 80
Benzo(a)Anthracene	< 10
Benzo(a)Pyrene	< 10
Benzo(b+k)fluoranthenes	< 10
Benzo(g,h,i)Perylene	< 10
4-Bromophenyl-phenylether	< 10
Butylbenzylphthalate	< 10
4-Chloro-3-Methylphenol	< 10
bis(2-Chloroethoxy)Methane	< 10
bis(2-Chloroethyl)Ether	< 10
bis(2-Chloroisopropyl)Ether	< 10
2-Chloronaphthalene	< 10
2-Chlorophenol	< 10
4-Chlorophenyl-phenylether	< 10
Chrysene	< 10
Di-n-Butylphthalate	< 10
Di-n-Octyl Phthalate	< 10
Dibenz(a,h)Anthracene	< 10
1,2-Dichlorobenzene	< 10
1,4-Dichlorobenzene	< 10
1,3-Dichlorobenzene	< 10
3,3'-Dichlorobenzidine	< 20
2,4-Dichlorophenol	< 10
Diethylphthalate	< 10
Dimethyl Phthalate	< 10
2,4-Dimethylphenol	< 10
4,6-Dinitro-2-Methylphenol	< 50
2,4-Dinitrophenol	< 50
2,6-Dinitrotoluene	< 10
2,4-Dinitrotoluene	< 10
1,2-Diphenylhydrazine	< 10
bis(2-Ethylhexyl)Phthalate	< 10

Table VI-3. Continued

CLIENT SAMPLE ID: FBLK-3

MMES SAMPLE ID: 00782
SAMPLE DATE: 08/27/86
EXTRACTION DATE: 09/03/86
ANALYSIS DATE: 09/11/86
FILE NAME: BNA782B
INSTRUMENT ID: MS1
MATRIX: WATER
UNITS: ug/l

COMPOUNDS	
Fluoranthene	< 10
Fluorene	< 10
Hexachlorobenzene	< 10
Hexachlorobutadiene	< 10
Hexachlorocyclopentadiene	< 10
Hexachloroethane	< 10
Indeno(1,2,3-cd)Pyrene	< 10
Isophorone	< 10
N-Nitroso-Di-n-Propylamine	< 10
N-Nitrosodimethylamine	< 5
N-Nitrosodiphenylamine	< 10
Naphthalene	< 10
Nitrobenzene	< 10
4-Nitrophenol	< 50
2-Nitrophenol	< 10
Pentachlorophenol	< 50
Phenanthrene	< 10
Phenol	< 10
Pyrene	< 10
1,2,4-Trichlorobenzene	< 10
2,4,6-Trichlorophenol	< 10

VI-4. Results of analysis for PCBs in an aqueous field blank collected on 27 August 1986 from the Martin Marietta Reduction Facilty, The Dalles, Oregon

	1	2	3	4	5	6
SAMPLE DATE:	8/27/86					
ANALYSIS DATE:	9/30/86					
MMES SAMPLE ID:	0774					
CLIENT SAMPLE ID:	FLD BLNK 2					
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ug/L)					
PCB 1016	<0.50					
PCB 1221	<0.50					
PCB 1232	<0.50					
PCB 1242	<0.50					
PCB 1248	<0.50					
PCB 1254	<1.0					
PCB 1260	<1.0					

Table VI-5. Results of analysis for priority pollutant metals in aqueous field blanks collected during 26 August to 3 September 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon

Reported as total metals

Units: ppb (µg/L)

MMES ID		0832	0774	0782	0726	0824	0876		
Client ID		Field Blank 1	Field Blank 2	Field Blank 3	Field Blank 4	Field Blank 5	Field Blank 6		
Sample Date		9/1/86	8/27/86	8/27/86	8/26/86	9/1/86	9/3/86		
Metal	Method								
Antimony	ICP	<200	<200	<200	<200	<200	<200		
Arsenic	Furnace	<10	<10	<10	<10	<10	<10		
Barium	ICP	<200	<200	<200	<200	<200	<200		
Beryllium	ICP	<5	<5	<5	<5	<5	<5		
Cadmium	ICP	<10	<10	<10	<10	<10	<10		
Chromium	ICP	<20	<20	<20	<20	<20	<20		
Copper	ICP	<25	<25	<25	<25	<25	<25		
Lead	Furnace	<10	<10	<10	<10	<10	<10		
Mercury	Cold Vapor	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30		
Nickel	ICP	<40	<40	<40	<40	<40	<40		
Selenium	Furnace	<5	<5	<5	<5	<5	<5		
Silver	ICP	<50	<50	<50	<50	<50	<50		
Thallium	ICP	<500	<500	<500	<500	<500	<500		
Zinc	ICP	<50	<50	<50	<50	<50	<50		

Table VI-6. Results of chemical analysis of aqueous field blanks collected during 26 August to 3 September 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon

	1	2	3	4	5	6
SAMPLE DATE:	9/1/86	8/27/86	8/27/86	8/26/86	9/1/86	9/3/86
MMES SAMPLE ID:	0832	0774	0782	0726	0824	0876
CLIENT SAMPLE ID:	FLD BLNK 1	FLD BLNK 2	FLD BLNK 3	FLD BLNK 4	FLD BLNK 5	FLD BLNK 6
NOTE:						
COMPOUNDS	FINAL CONCENTRATION - ppm (mg/L)					
fluoride	<0.24	<0.24	<0.24	<0.24	<0.24	<0.24
sulfate	<0.94	<0.94	<0.94	<0.94	<0.94	<0.94
free cyanide	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
total cyanide	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
sodium	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

GROUND-WATER ANALYSIS

SEPTEMBER 1986

FIELD REPLICATES

Table V-1. List of replicate samples received from The Dalles Reduction Facility and corresponding laboratory tracking numbers

Martin Marietta Reduction Facility Sample ID	Martin Marietta Environmental Systems Lab ID
REP-1	0801
REP-2	0901
REP-3	0897
REP-4	0794
REP-5	0770
REP-6	0754
REP-7	0781
REP-8	0828
REP-9	0840
REP-10	0883

Table V-2. Results of analysis for volatile organic compounds in aqueous replicate samples collected during 27 August to 3 September 1986 from monitor wells at the Martin Marietta Reduction Facility, The Dalles, Oregon

CLIENT SAMPLE ID:	REP-2	REP-3	REP-4	REP-5	REP-7
MMES SAMPLE ID:	00901	00897	00794	00770	00781
SAMPLE DATE:	09/03/86	09/03/86	08/28/86	08/27/86	08/27/86
ANALYSIS DATE:	09/05/86	09/05/86	09/02/86	09/02/86	09/02/86
FILE NAME:	3V901	3V897	3V794	2V770	2V781
INSTRUMENT ID:	MS3	MS3	MS3	MS3	MS3
MATRIX:	WATER	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l	ug/l
COMPOUNDS					
Acrolein	< 10	< 10	< 10	< 10	< 10
Acrylonitrile	< 10	< 10	< 10	< 10	< 10
Benzene	< 5	< 5	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5	< 5	< 5
2-Chloroethylvinylether	< 10	< 10	< 10	< 10	< 10
Chloroform	< 5	< 5	< 5	< 5	< 5
Chloromethane	< 5	< 5	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5
Methylene Chloride	< 5	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5
Trans-1,3-Dichloropropene	< 5	< 5	< 5	< 5	< 5
1,1,1-Trichloroethane	< 5	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5	< 5	< 5
Vinyl Chloride*	< 1	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5
trans-1,2-Dichloroethene	< 5	< 5	< 5	< 5	< 5

---

*Any value reported between the instrument detection limit (IDL = 1 ppb) and the level of quantitation (LOQ = 5 ppb) is marked with an * and sh[illegible]onsidered qualitative.

Table V-3. Results of analysis for base/neutral acid extractable compounds in aqueous replicate samples collected during 27 August to 3 September 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon

CLIENT SAMPLE ID:	REP-2	REP-3	REP-4	REP-5	REP-7
MMES SAMPLE ID:	00901	00897	00794	00770	00781
SAMPLE DATE:	09/03/86	09/03/86	08/28/86	08/27/86	08/27/86
EXTRACTION DATE:	09/09/86	09/09/86	09/05/86	09/03/86	09/03/86
ANALYSIS DATE:	09/15/86	09/16/86	09/12/86	09/06/86	09/11/86
FILE NAME:	BNA901	BNA897	BNA794	BNA770	BNA781
INSTRUMENT ID:	MS1	MS1	MS1	MS1	MS1
MATRIX:	WATER	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l	ug/l
COMPOUNDS					
Acenaphthalene	< 10	< 10	< 10	< 10	< 10
Acenaphthene	< 10	< 10	< 10	< 10	< 10
Anthracene	< 10	< 10	< 10	< 10	< 10
Benzidine	< 80	< 80	< 80	< 80	< 80
Benzo(a)Anthracene	< 10	< 10	< 10	< 10	< 10
Benzo(a)Pyrene	< 10	< 10	< 10	< 10	< 10
Benzo(b+k)fluoranthenes	< 10	< 10	< 10	< 10	< 10
Benzo(g,h,i)Perylene	< 10	< 10	< 10	< 10	< 10
4-Bromophenyl-phenylether	< 10	< 10	< 10	< 10	< 10
Butylbenzylphthalate	< 10	< 10	< 10	< 10	< 10
4-Chloro-3-Methylphenol	< 10	< 10	< 10	< 10	< 10
bis(2-Chloroethoxy)Methane	< 10	< 10	< 10	< 10	< 10
bis(2-Chloroethyl)Ether	< 10	< 10	< 10	< 10	< 10
bis(2-Chloroisopropyl)Ether	< 10	< 10	< 10	< 10	< 10
2-Chloronaphthalene	< 10	< 10	< 10	< 10	< 10
2-Chlorophenol	< 10	< 10	< 10	< 10	< 10
4-Chlorophenyl-phenylether	< 10	< 10	< 10	< 10	< 10
Chrysene	< 10	< 10	< 10	< 10	< 10
Di-n-Butylphthalate	< 10	< 10	< 10	< 10	< 10
Di-n-Octyl Phthalate	< 10	< 10	< 10	< 10	< 10
Dibenz(a,h)Anthracene	< 10	< 10	< 10	< 10	< 10
1,2-Dichlorobenzene	< 10	< 10	< 10	< 10	< 10
1,4-Dichlorobenzene	< 10	< 10	< 10	< 10	< 10
1,3-Dichlorobenzene	< 10	< 10	< 10	< 10	< 10
3,3'-Dichlorobenzidine	< 20	< 20	< 20	< 20	< 20
2,4-Dichlorophenol	< 10	< 10	< 10	< 10	< 10
Diethylphthalate	< 10	< 10	< 10	< 10	< 10
Dimethyl Phthalate	< 10	< 10	< 10	< 10	< 10
2,4-Dimethylphenol	< 10	< 10	< 10	< 10	< 10
4,6-Dinitro-2-Methylphenol	< 50	< 50	< 50	< 50	< 50
2,4-Dinitrophenol	< 50	< 50	< 50	< 50	< 50
2,6-Dinitrotoluene	< 10	< 10	< 10	< 10	< 10
2,4-Dinitrotoluene	< 10	< 10	< 10	< 10	< 10
1,2-Diphenylhydrazine	< 10	< 10	< 10	< 10	< 10
bis(2-Ethylhexyl)Phthalate	< 10	< 10	< 10	< 10	< 10

Table V-2. Continued

CLIENT SAMPLE ID: REP-8

MMES SAMPLE ID: 00828
SAMPLE DATE: 09/01/86
ANALYSIS DATE: 09/03/86
FILE NAME: 3V828
INSTRUMENT ID: MS3
MATRIX: WATER
UNITS: ug/l

COMPOUNDS	
Acrolein	< 10
Acrylonitrile	< 10
Benzene	< 5
Bromodichloromethane	< 5
Bromoform	< 5
Bromomethane	< 5
Carbon Tetrachloride	< 5
Chlorobenzene	< 5
Chloroethane	< 5
2-Chloroethylvinylether	< 10
Chloroform	< 5
Chloromethane	< 5
Dibromochloromethane	< 5
1,1-Dichloroethane	< 5
1,2-Dichloroethane	< 5
1,1-Dichloroethene	< 5
1,2-Dichloropropane	< 5
cis-1,3-Dichloropropene	< 5
Ethylbenzene	< 5
Methylene Chloride	< 5
1,1,2,2-Tetrachloroethane	< 5
Tetrachloroethene	< 5
Toluene	< 5
Trans-1,3-Dichloropropene	< 5
1,1,1-Trichloroethane	< 5
1,1,2-Trichloroethane	< 5
Trichloroethene	< 5
Trichlorofluoromethane	< 5
Vinyl Chloride *	< 1
cis-1,2-Dichloroethene	< 5
trans-1,2-Dichloroethene	< 5

Table V-3. Continued

CLIENT SAMPLE ID:	REP-2	REP-3	REP-4	REP-5	REP-7
MMES SAMPLE ID:	00901	00897	00794	00770	00781
SAMPLE DATE:	09/03/86	09/03/86	08/28/86	08/27/86	08/27/86
EXTRACTION DATE:	09/09/86	09/09/86	09/05/86	09/03/86	09/03/86
ANALYSIS DATE:	09/15/86	09/16/86	09/12/86	09/06/86	09/11/86
FILE NAME:	BNA901	BNA897	BNA794	BNA770	BNA781
INSTRUMENT ID:	MS1	MS1	MS1	MS1	MS1
MATRIX:	WATER	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l	ug/l
COMPOUNDS					
Fluoranthene	< 10	< 10	< 10	< 10	< 10
Fluorene	< 10	< 10	< 10	< 10	< 10
Hexachlorobenzene	< 10	< 10	< 10	< 10	< 10
Hexachlorobutadiene	< 10	< 10	< 10	< 10	< 10
Hexachlorocyclopentadiene	< 10	< 10	< 10	< 10	< 10
Hexachloroethane	< 10	< 10	< 10	< 10	< 10
Indeno(1,2,3-cd)Pyrene	< 10	< 10	< 10	< 10	< 10
Isophorone	< 10	< 10	< 10	< 10	< 10
N-Nitroso-Di-n-Propylamine	< 10	< 10	< 10	< 10	< 10
N-Nitrosodimethylamine	< 5	< 5	< 5	< 5	< 5
N-Nitrosodiphenylamine	< 10	< 10	< 10	< 10	< 10
Naphthalene	< 10	< 10	< 10	< 10	< 10
Nitrobenzene	< 10	< 10	< 10	< 10	< 10
4-Nitrophenol	< 50	< 50	< 50	< 50	< 50
2-Nitrophenol	< 10	< 10	< 10	< 10	< 10
Pentachlorophenol	< 50	< 50	< 50	< 50	< 50
Phenanthrene	< 10	< 10	< 10	< 10	< 10
Phenol	< 10	< 10	< 10	< 10	< 10
Pyrene	< 10	< 10	< 10	< 10	< 10
1,2,4-Trichlorobenzene	< 10	< 10	< 10	< 10	< 10
2,4,6-Trichlorophenol	< 10	< 10	< 10	< 10	< 10

Table V-3. Continued

CLIENT SAMPLE ID: REP-8

MMES SAMPLE ID: 00828
SAMPLE DATE: 09/01/86
EXTRACTION DATE: 09/09/86
ANALYSIS DATE: 09/16/86
FILE NAME: BNA828
INSTRUMENT ID: MS1
MATRIX: WATER
UNITS: ug/l

COMPOUNDS	
Acenaphthalene	< 10
Acenaphthene	< 10
Anthracene	< 10
Benzidine	< 80
Benzo(a)Anthracene	< 10
Benzo(a)Pyrene	< 10
Benzo(b+k)fluoranthenes	< 10
Benzo(g,h,i)Perylene	< 10
4-Bromophenyl-phenylether	< 10
Butylbenzylphthalate	< 10
4-Chloro-3-Methylphenol	< 10
bis(2-Chloroethoxy)Methane	< 10
bis(2-Chloroethyl)Ether	< 10
bis(2-Chloroisopropyl)Ether	< 10
2-Chloronaphthalene	< 10
2-Chlorophenol	< 10
4-Chlorophenyl-phenylether	< 10
Chrysene	< 10
Di-n-Butylphthalate	< 10
Di-n-Octyl Phthalate	< 10
Dibenz(a,h)Anthracene	< 10
1,2-Dichlorobenzene	< 10
1,4-Dichlorobenzene	< 10
1,3-Dichlorobenzene	< 10
3,3'-Dichlorobenzidine	< 20
2,4-Dichlorophenol	< 10
Diethylphthalate	< 10
Dimethyl Phthalate	< 10
2,4-Dimethylphenol	< 10
4,6-Dinitro-2-Methylphenol	< 50
2,4-Dinitrophenol	< 50
2,6-Dinitrotoluene	< 10
2,4-Dinitrotoluene	< 10
1,2-Diphenylhydrazine	< 10
bis(2-Ethylhexyl)Phthalate	< 10

Table V-3. Continued

CLIENT SAMPLE ID: REP-8

MMES SAMPLE ID: 00828
SAMPLE DATE: 09/01/86
EXTRACTION DATE: 09/09/86
ANALYSIS DATE: 09/16/86
FILE NAME: BNA828
INSTRUMENT ID: MS1
MATRIX: WATER
UNITS: ug/l

COMPOUNDS	
Fluoranthene	< 10
Fluorene	< 10
Hexachlorobenzene	< 10
Hexachlorobutadiene	< 10
Hexachlorocyclopentadiene	< 10
Hexachloroethane	< 10
Indeno(1,2,3-cd)Pyrene	< 10
Isophorone	< 10
N-Nitroso-Di-n-Propylamine	< 10
N-Nitrosodimethylamine	< 5
N-Nitrosodiphenylamine	< 10
Naphthalene	< 10
Nitrobenzene	< 10
4-Nitrophenol	< 50
2-Nitrophenol	< 10
Pentachlorophenol	< 50
Phenanthrene	< 10
Phenol	< 10
Pyrene	< 10
1,2,4-Trichlorobenzene	< 10
2,4,6-Trichlorophenol	< 10

Table V-4. Results of analysis for PCBs in an aqueous replicate sample collected on 2 September 1986 form the Martin Marietta Reduction Facility, The Dalles, Oregon Table

	1	2	3	4	5	6
SAMPLE DATE:	9/2/86					
ANALYSIS DATE:	10/3/86					
MMES SAMPLE ID:	0840					
CLIENT SAMPLE ID:	REP-9					
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppb (ug/L)					
PCB 1016	<0.50					
PCB 1221	<0.50					
PCB 1232	<0.50					
PCB 1242	<0.50					
PCB 1248	<0.50					
PCB 1254	<1.0					
PCB 1260	<1.0					

Table V-5. Results of analysis for priority pollutant metals in aqueous replicate samples collected during 26 August to 3 September 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon

---

Reported as total metals

Units: ppb (μg/L)

MMES ID		0801	0901	0897	0794	0770	0754	0781	0828	0840	0883
Client ID		REP-1	REP-2	REP-3	REP-4	REP-5	REP-6	REP-7	REP-8	REP-9	REP-10
Sample Date		8/28/86	9/3/86	9/3/86	8/28/86	8/27/86	8/26/86	8/27/86	9/1/86	9/2/86	9/2/86
Metal	Method										
Antimony	ICP	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
Arsenic	Furnace	<10	<10	<50*	<10	<10	<10	<10	<10	<10	<10
Barium	ICP	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
Beryllium	ICP	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Cadmium	ICP	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chromium	ICP	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Copper	ICP	<25	<25	<25	<25	<25	<25	<25	<25	<25	<25
Lead	Furnace	<10	<10	23	<10	<10	<10	<10	<10	23	<10
Mercury	Cold Vapor	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30
Nickel	ICP	<40	<40	<40	<40	<40	<40	<40	<40	<40	<40
Selenium	Furnace	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Silver	ICP	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Thallium	ICP	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Zinc	ICP	<50	55	106	66	<50	<50	<50	<50	<50	232

*Sample diluted due to matrix interferences.

Table V-6. Results of chemical analysis of aequous replicate samples collected during 26 August to 3 September 1986 from the Martin Marietta Reduction Facility, The Dalles, Oregon

	1	2	3	4	5	6
SAMPLE DATE:	8/28/86	9/3/86	9/3/86	8/28/86	8/27/86	8/26/86
MMES SAMPLE ID:	0801	0901	0897	0794	0770	0754
CLIENT SAMPLE ID:	REP-1	REP-2	REP-3	REP-4	REP-5	REP-6
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppm (mg/L)					
fluoride	0.82	1.0	1.5	0.92	0.89	0.85
sulfate	15	44	37	24	20	75
free cyanide	0.078	0.47	0.84	<0.010	<0.010	0.051
total cyanide	0.49	1.2	1.6	<0.010	0.10	0.43
sodium	23	37	40	17	17	23

Table V-6. Continued

	1	2	3	4	5	6
SAMPLE DATE:	8/27/86	9/1/86	9/2/86	9/2/86		
MMES SAMPLE ID:	0781	0828	0840	0883		
CLIENT SAMPLE ID:	REP-7	REP-8	REP-9	REP-10		
NOTE:						
COMPOUNDS	FINAL CONCENTRATION = ppm (mg/L)					
fluoride	1.1	0.93	0.87	0.63		
sulfate	24	39	41	50		
free cyanide	<0.010	<0.010	<0.010	0.024		
total cyanide	<0.010	<0.010	0.016	0.35		
sodium	19	38	28	12		

558/9

LABORATORY DATA VALIDATION OF RESULTS OF CHEMICAL ANALYSIS OF AIR SAMPLES COLLECTED BETWEEN 4 JUNE AND 25 JULY 1986 FROM THE MARTIN MARIETTA REDUCTION FACILITY, THE DALLES, OREGON

REPORT SUMMARY

Between 4 June and 25 July 1986, Martin Marietta Environmental Systems received 128 air impinger solutions (0.5N NaOH), collected between 29 May and 23 July 1986 for cyanide and fluoride, auqeous trip blanks, and 8 aqueous field blanks from the Martin Marietta Reduction Facility, The Dalles, Oregon. A master list of the samples received and corresponding laboratory tracking numbers are shown in Table 1. The impinger solutions were analyzed for cyanide (HCN) and fluoride (HF). Samples were analyzed according to the methods specified in the QAPP.

Impinger solutions used during field collection were analyzed for gaseous cyanide (HCN), and fluoride (HF) and these values were then corrected for volume of air sampled (60 L) and standard temperature and pressure and reported as mg CN or mg F per m^3 air (see Appendix C). The concentrations of cyanide and fluoride in air were all reported to be less or equal to 0.10 mg/m^3 air. The OSHA permissible exposure limts* as found in 29 CFR 1910.1000 (as of 1 July 1985) for HCN and HF are 11 and 2 mg/m^3, respectively.

---

* Defined as 8-hour time-weighted average levels.

LABORATORY DATA VALIDATION

MARTIN MARIETTA - THE DALLES

AIR

SAMPLES COLLECTED JUNE - JULY 1986

MASTER SAMPLE LIST

Table 1. List of samples received on 4 June 1986 and corresponding laboratory tracking numbers

Martin Marietta Reduction Facility Sample ID			Martin Marietta Environmental Systems Lab ID
529 AMA-Air	5/29/86	10:31	4158
529 AMB-Air	5/29/86	08:52	4159
529 AMC-Air	5/29/86	09:00	4160
529 AMD-Air	5/29/86	09:11	4161
529 PMA-Air	5/29/86	15:03	4162
529 PMB-Air	5/29/86	13:19	4163
529 PMC-Air	5/29/86	13:30	4164
529 PMD-Air	5/29/86	13:40	4165
530 AMA-Air	5/30/86	11:41	4166
530 AMB-Air	5/30/86	10:04	4167
530 AMC-Air	5/30/86	10:10	4168
530 AMD-Air	5/30/86	10:26	4169
530 PMA-Air	5/30/86	16:03	4170
530 PMB-Air	5/30/86	14:15	4171
530 PMC-Air	5/30/86	14:26	4172
530 PMD-Air	5/30/86	14:47	4173
Trip Blank 1	5/27/86	16:00	4174
Field Blank 1	5/30/86	14:00	4175

Table 2. List of samples received on 6 June 1986 and corresponding laboratory tracking numbers

Martin Marietta Reduction Facility Sample ID			Martin Marietta Environmental Systems Lab ID
62 PMB-Air	6/2/86	13:54	4408
62 PMA-Air	6/2/86	15:32	4409
62 PMD-Air	6/2/86	14:12	4410
62 PMC-Air	6/2/86	14:02	4411
62 AMA-Air	6/2/86	11:03	4412
62 AMD-Air	6/2/86	09:48	4413
62 AMB-Air	6/2/86	09:30	4414
62 AMC-Air	6/2/86	09:38	4415
64 AMB-Air	6/4/86	09:59	4416
64 AMC-Air	6/4/86	10:09	4417
64 AMD-Air	6/4/86	10:21	4418
64 AMA-Air	6/4/86	11:50	4419
64 PMA-Air	6/4/86	16:35	4420
64 PMC-Air	6/4/86	15:10	4421
64 PMB-Air	6/4/86	15:02	4422
64 PMD-Air	6/4/86	15:25	4423
Trip Blank 2	5/27/86	16:00	4424
Field Blank 2	5/30/86	14:00	4425

Table 3. List of samples received on 13 June 1986 and corresponding laboratory tracking numbers

Martin Marietta Reduction Facility Sample ID			Martin Marietta Environmental Systems Lab ID
Tank Truck	6/12/86	05:45	4830
Tank Truck	6/12/86	05:45	4831
Tank Truck	6/12/86	05:45	4832
69 AMD-Air	6/9/86	09:53	4833
69 AMB-Air	6/9/86	09:31	4834
69 AMC-Air	6/9/86	09:40	4835
69 AMA-Air	6/9/86	11:11	4836
69 PMD-Air	6/9/86	14:13	4837
69 PMA-Air	6/9/86	15:30	4838
69 PMC-Air	6/9/86	13:58	4839
69 PMB-Air	6/9/86	13:50	4840
611 AMB-Air	6/11/86	08:44	4841
611 AMA-Air	6/11/86	08:34	4842
611 AMD-Air	6/11/86	10:02	4843
611 AMC-Air	6/11/86	08:51	4844
611 PMA-Air	6/11/86	13:45	4845
611 PMC-Air	6/11/86	14:00	4846
611 PMD-Air	6/11/86	14:11	4847
611 PMB-Air	6/11/86	13:55	4848
Field Blank 3	6/12/86	10:00	4849
Trip Blank 3	5/27/86	16:00	4850

Table 4. List of samples received on 20 June 1986 and corresponding laboratory tracking numbers

Martin Marietta Reduction Facility Sample ID			Martin Marietta Environmental Systems Lab ID
616 AMC-Air	6/16/86	09:55	4935
616 AMD-Air	6/16/86	10:05	4936
616 AMA-Air	6/16/86	11:19	4937
616 AMB-Air	6/16/86	09:49	4938
616 PMD-Air	6/16/86	14:20	4939
616 PMA-Air	6/16/86	15:31	4940
616 PMB-Air	6/16/86	14:01	4941
616 PMC-Air	6/16/86	14:09	4942
618 AMA-Air	6/18/86	11:15	4943
618 AMB-Air	6/18/86	09:41	4944
618 AMD-Air	6/18/86	10:01	4945
618 AMC-Air	6/18/86	09:49	4946
618 PMA-Air	6/18/86	16:14	4947
618 PMC-Air	6/18/86	14:42	4948
618 PMD-Air	6/18/86	14:52	4949
618 PMB-Air	6/18/86	14:34	4950
Field Blank 4	6/19/86	09:30	4951
Trip Blank 4	6/19/86	09:30	4952

Table 5. List of samples received on 27 June 1986 and corresponding laboratory tracking numbers

Martin Marietta Reduction Facility Sample ID			Martin Marietta Environmental Systems Lab ID
623 AMA-Air	6/23/86	09:29	4989
623 AMD-Air	6/23/86	09:59	4990
623 AMB-Air	6/23/86	09:40	4991
623 AMC-Air	6/23/86	09:46	4992
623 PMD-Air	6/23/86	13:58	4993
623 PMC-Air	6/23/86	13:47	4994
623 PMA-Air	6/23/86	15:09	4995
623 PMB-Air	6/23/86	13:42	4996
625 AMB-Air	6/25/86	08:46	4997
625 AMC-Air	6/25/86	08:54	4998
625 AMA-Air	6/25/86	10:22	4999
625 AMD-Air	6/25/86	09:11	0001
625 PMA-Air	6/25/86	15:11	0002
625 PMC-Air	6/25/86	13:48	0003
625 PMB-Air	6/25/86	13:36	0004
625 PMD-Air	6/25/86	14:00	0005
Trip Blank 5	6/19/86	11:00	0006
Field Blank 5	6/26/86	07:00	0007

Table 6. List of samples received on 11 July 1986 and corresponding laboratory tracking numbers

Martin Marietta Reduction Facility Sample ID			Martin Marietta Environmental Systems Lab ID
77 AMA-Air	7/7/86	10:32	0094
77 AMC-Air	7/7/86	10:06	0095
77 AMD-Air	7/7/86	10:18	0096
77 AMB-Air	7/7/86	10:01	0097
77 PMC-Air	7/7/86	14:16	0098
77 PMA-Air	7/7/86	14:41	0099
77 PMB-Air	7/7/86	14:10	0100
77 PMD-Air	7/7/86	14:27	0101
79 AMA-Air	7/9/86	11:39	0102
79 AMB-Air	7/9/86	10:12	0103
79 AMC-Air	7/9/86	10:18	0104
79 AMD-Air	7/9/86	10:28	0105
79 PMD-Air	7/9/86	14:43	0106
79 PMB-Air	7/9/86	14:14	0107
79 PMA-Air	7/9/86	15:55	0108
79 PMC-Air	7/9/86	14:30	0109
Trip Blank 6	7/8/86	13:00	0110
Field Blank 6	7/10/86	08:30	0111

Table 7. List of samples received on 18 July 1986 and corresponding laboratory tracking numbers

Martin Marietta Reduction Facility Sample ID			Martin Marietta Environmental Systems Lab ID
714 AMA-Air	7/14/86	10:26	0118
714 AMB-Air	7/14/86	08:54	0119
714 AMC-Air	7/14/86	09:00	0120
714 AMD-Air	7/14/86	09:13	0121
714 PMA-Air	7/14/86	15:01	0122
714 PMB-Air	7/14/86	13:31	0123
714 PMC-Air	7/14/86	13:36	0124
714 PMD-Air	7/14/86	13:45	0125
716 AMA-Air	7/16/86	09:58	0126
716 AMD-Air	7/16/86	10:25	0127
716 AMB-Air	7/16/86	10:07	0128
716 AMC-Air	7/16/86	10:13	0129
716 PMA-Air	7/16/86	15:30	0130
716 PMB-Air	7/16/86	14:02	0131
716 PMC-Air	7/16/86	14:07	0132
716 PMD-Air	7/16/86	14:16	0133
Trip Blank	7/11/86	13:00	0134
Field Blank 7	7/17/86	09:30	0135

Table 8. List of samples received on 25 July 1986 and corresponding laboratory tracking numbers

Martin Marietta Reduction Facility Sample ID			Martin Marietta Environmental Systems Lab ID
721 AMD-Air	7/21/86	10:32	0180
721 AMC-Air	7/21/86	10:22	0181
721 AMB-Air	7/21/86	10:14	0182
721 AMA-Air	7/21/86	11:43	0183
721 PMC-Air	7/21/86	14:55	0184
721 PMA-Air	7/21/86	16:23	0185
721 PMB-Air	7/21/86	14:50	0186
721 PMD-Air	7/21/86	15:05	0187
723 AMC-Air	7/23/86	09:52	0188
723 AMA-Air	7/23/86	11:17	0189
723 AMD-Air	7/23/86	10:02	0190
723 AMB-Air	7/23/86	04:46	0191
723 PMA-Air	7/23/86	14:13	0192
723 PMB-Air	7/23/86	14:19	0193
723 PMD-Air	7/23/86	14:36	0194
723 PMC-Air	7/23/86	14:24	0195
Trip Blank 8	7/24/86	09:00	0196
Field Blank 8	7/24/86	09:00	0197

ANALYTICAL METHODS SUMARY

AIR

SAMPLES COLLECTED JUNE - JULY 1986

Table III-1. Summary of analytical methods and detection limits employed for analysis of samples collected from the Martin Marietta Reduction Facility, The Dalles, Oregon

Parameter	Method	Detection Limit (mg/L)
Cyanide in air	808(a)	0.26(b)
Fluoride in air	809(a)	0.20

(a)Methods of Air Sampling and Analysis, 2nd Edition American Public Health Association.
(b)High detection level due to small ample volume.

CALCULATION OF CYANIDE OR FLUORIDE CONCENTRATION IN AIR

CALCULATION OF CYANIDE OR FLUORIDE CONCENTRATION IN AIR

X = CN or F

1. The mV readings from the analysis of the sample are converted to µg X/mL of solution using the calibration curve.

2. The µg content of the sample is multiplied by the sample volume to obtain the total µg X in the sample.

3. Convert the volume of air sampled to standard conditions of 25°C and 760 Torr:

$$Vs = V \times \frac{P}{760} \times \frac{298}{T+273}$$

where

Vs = volume of air in liters at 25°C and 760 Torr

V = volume of air in liters as measured

P = Barometric pressure in Torr

T = temperature of air in degrees centigrade

4. The concentration of X in the air sampled can be expressed in µg X per liter or mg X per cubic meter.

Since, $mg/m^3 = \mu g/liter$

then $$mg/m^3 = \frac{\text{total } \mu g\ X}{Vs}$$

5. Example: (cyanide)

a) Impinger solution measurement was 0.2 µg/ml

b) From step 2; 0.2 µg/ml x 20 ml = 4 µg of CN

c) From step 3; Vs approximates 60-liter

d) From step 4; CN, $mg/m^3 = \frac{4\ \mu g}{60\ L}$

LABORATORY DATA VALIDATION

AIR SAMPLES COLLECTED JUNE - JULY 1986

Laboratory Blanks

Parameters: Fluoride A Cyanide A

Criteria:

A -	Acceptable:	No contaminants detected in any blanks above the LOQ;
P -	Provisional:	Some blanks contaminated; concentrations of contaminants do not appear to interfere with sample results;
U -	Unacceptable:	Gross contamination in blanks, interference with results apparent, data unuseable.

Remarks:

AIR SAMPLES COLLECTED JUNE - JULY 1986

Laboratory Duplicates

Parameters: Fluoride A Cyanide A

Criteria:

A - Acceptable: All RPD's within QC limits;

U - Unacceptable: RPD outside QC limits, data should be flagged with a J.

Remarks:

No difference existed between any laboratory duplicates. All results were below detection limits. RPD's were not calculated.

AIR SAMPLES COLLECTED JUNE - JULY 1986

Spiked Sample Analysis

Parameters: Fluoride A Cyanide P

Criteria:

A - Acceptable: All %R within QC limits;

P - Provisional: Some %R outside QC limits, flag data J;

U - Unacceptable: All %R outside QC limts, flag data R.

Remarks:

Cyanide - Two samples (4171 and 4421) had low % recoveries for spikes. These samples are associated with sample batches 4158-4175 and 4408-4425. These data are flagged J.

DATA CLASSIFICATION

AIR

MAY - JUNE 1986

Air 1986

Air-quality monitoring was conducted in two different measurement programs: (1) Health and Safety Air-Quality Monitoring, May 27-June 18, 1986; and (2) Ambient Air-Monitoring Study, May 29-July 29, 1986. This QA review addresses the Ambient Air-Monitoring Study and the Health and Safety Air-Quality Monitoring Study.

Health and Safety Air-Quality Study

The Health and Safety Air-Quality Monitoring Study did not involve laboratory anayses. Measurements were made in the field with a Photoionization Detector (TIP) and Draeger tubes for cyanide and fluoride. Daily calibration of the TIP with isobutylene was indicated on a daily log along with measurements of both the TIP and the Draeger tubes. Draeger tubes do not require primary calibration. Results of measurements were recorded in a bound field log book. This data may be used for qualitative (Level A) purposes. The use of the data for Level B (quantitative) purposes may not be done.

Ambient Air-Monitoring Study

During the period between May 29 and July 23, 1986, 128 air-impinger solutions (0.5N NaOH) were collected along with 8 aqueous field blanks and 9 aqueous trip blanks and were submitted for analyses of cyanide and fluoride to MMES. The results of these analyses are presented in a report entitled, "Results of Chemical Analysis of Air, Drilling Fluid, and Tank Truck Samples Collected Between 4 June and 25 July, 1986, from the Martin Marietta Reduction Facility, The Dalles, Oregon." In addition, 13 split samples (impinger solutions), 5 aqueous field blanks, and 5 aqueous trip blanks were submitted to Laucks Testing Laboratories, Inc., of Seattle, Washington.

DATA CLASSIFICATION SUMMARY CHECKLIST

Level A Criteria

Matrix: Air - 1986

To be classified for Level A use, the data must meet the following criteria:

	Criteria	Evaluation Result
1.	Sampling dates were recorded;	A
2.	Signatures of Sampling Team are on each water sample log, soil sample log, or air sampling log;	A
3.	Sampling locations were clearly designated and described;	A
4.	Sampling depth increment for soils was recorded;	N
5.	Sample collection technique was described on air sampling logs;	A
6.	Field preparation techniques were clearly described where applicable;	N
7.	Sample preservation techniques were clearly described, consistent, and adequate for the parameters to be analyzed and the sample matrix;	A
8.	Shipping bill of lading or constant surveillance documentation is available;	A
9.	The laboratory sample preparation or extraction date is recorded and available;	N
10.	The laboratory sample analysis date is recorded and available;	A

Level A Criteria - Air (Continued)

Criteria	Evaluation Result
11. The laboratory sample preparation technique is recorded and available either in the laboratory report or in the laboratories approved SOP;	A
12. The methods of analysis are listed in the laboratory reports and are consistent with the methods specified in the QAPP and laboratory contract;	A
13. The laboratory analytical detection limits or limits of quantitation (LOQ) are given in lab reports;	A
14. Field records include:	
o Air sampling log sheets	A
o Soil/sediment log sheets	N
o Water sampling log sheets	N
o QC field checklist	N
o Field instrument calibration logs	N
o Master log book bound with sequentially numbered pages	A
o Daily log book	A
o Chain-of-Custody forms	A
15. All applicable records described above were properly created and are on file;	A
16. Samples passed laboratory data validation without any R flags (samples with J flags may be accepted at this level)	A

Remarks:

All required documentation is available and on file.

Conclusion:

Data is acceptable for qualitative purposes.

DATA CLASSIFICATION SUMMARY CHECKLIST

Level B Criteria

Matrix: Air - 1986

To be classified for Level B use, the data must meet the following criteria:

Criteria	Evaluation Result
A. Data Validation Result	
1. Samples of this matrix have not been flagged J or R during data validation;	P
2. All samples of this matrix have been classified as Level A data;	A
B. Quantitative Statistical Significance	
1. Laboratory and field instruments were properly standardized (calibrated) employing proper methods and records are available;	A
2. Sample bottle preparation was proper and appropriate for the parameters measured and the sample matrix;	A
3. All laboratory procedures were referenced to approved American Public Health Association methods and were contained in an approved SOP manual;	A
4. Analytical QC data was available to demonstrate proper instrument calibration;	A
5. Laboratory QC check sample standards are EPA and NBS traceable and were used at least once each three months;	N

Level B Criteria - Air (Continued)

Criteria	Evaluation Result
6. Laboratory reagent (method) blanks were analyzed at a frequency of at least 1 per 20 samples;	A
7. Laboratory duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
8. Laboratory matrix spikes were analyzed at a frequency of at least 1 per 20 samples;	A
9. Field replicates were analyzed at a frequency of at least 1 per 20 samples;	N
10. Field split samples were analyzed at a frequency of at least 1 per 20 samples per matrix;	A
11. Appropriate and sufficient QC data with acceptance criteria were presented to allow data validation by the project QA officer;	A
12. The laboratories used were approved by the EPA for participation in the Contract Laboratory Program (CLP);	A
13. The laboratories participated in round-robin testing program by EPA or other accrediting agency;	A
14. Quality control limits were consistent with the limits established for EPA's CLP;	A
C. Custody and Document Control	
1. Field custody of all samples was noted in a bound field log book;	A
2. Transfer of custody documentation (chain-of-custody form) signed by field and laboratory sample custodians is available and properly completed;	A

Level B Criteria - Air (Continued)

Criteria	Evaluation Result
3. Laboratory custody is documented by a designated lab sample custodian in a master log and a secured sample storage area;	A
4. Sample identification and assigned laboratory tracking numbers are traceable through the entire monitoring system;	A
5. Field notebooks, log sheets, log books, checklists, reports, data validations, and all custody documents are stored in a secure repository or under the control of a document custodian;	A
6. All records, forms, log books, etc., are filled out completely in indelible ink without alterations except as initialed;	A
7. All sample log sheets have been signed by the sample collector;	A
8. Field log book sheets are signed by the field sample custodian.	A
D. <u>Sample Representativeness</u>	
1. Compatibility exists between field and laboratory measurements where applicable or incompatibilities have been suitably explained;	N
2. Samples were properly preserved;	A/U
3. Laboratory analysis and/or sample preparation or extraction were within allowable holding times established for the sample preservation and methods used;	A
4. Sample storage was maintained within suitable temperature, light and moisture conditions to guarantee sample integrity;	A
5. Proper sample containers were used for the parameters analyzed;	A

Level B Criteria - Air (Continued)

Criteria	Evaluation Result
6. Proper sample collection equipment was used such that the equipment would neither contribute nor remove any substance to or from the sample;	A
7. The sample site selection criteria are consistent with the ojbectives of the investigation and will provide the required data.	A

Remarks:

Section A.1	Samples 4158-4175 and 4408-4425 analyzed in batch for cyanide have been flagged as estimated (J) and with a U because no analyte was detected.
Section B.10	Field split samples were collected and submitted to Laucks Testing Laboratory for analysis. None of the Laucks samples were analyzed within allowable holding times nor did Laucks consistently employ specified approved methods of analysis. Field split data has been invalidated.
Section D.2	None of the samples collected for fluoride were properly preserved. Cyanide samples were properly collected and preserved. The fluoride samples were collected in 0.5 M NaOH instead of the required 0.1 N MaOH. The higher alkalinity of the 0.5 M NaOH resulted in sample matrix interferences during analysis. Therefore, the laboratory modified the analytical procedure and adjusted the pH of the samples with acid to neutralize the alkalinity before fluoride was measured. A description of the procedure performed by MMES and the evaluation of the procedure modification is attached (Exhibit 4). Because the approved method has been modified without prior approval from EPA, the fluoride data may only be considered qualitative.

Level B Criteria - Air (Continued)

Criteria	Evaluation Result
Except for the cyanide samples flagged with J codes, the remainig cyanide data may be classified to Level B.	

EXHIBITS

Interoffice Memo

MARTIN MARIETTA

ENVIRONMENTAL SYSTEMS

EXHIBIT 4

DATE 1 December 1986

TO Joe Arlauskas

FROM Mila Javellana Mjavellana

SUBJECT Method Modification for Analysis of Fluoride in Atmospheric Samples Collected from The Dalles, Oregon

Atmospheric impinger samples collected between 4 June and 25 July 1986 from The Dalles, Oregon were submitted to our laboratory in June, 1986 for fluoride analysis. Method 809 (APHA)* was used to collect and measure atmospheric fluoride. Samples were collected by Geraghty and Miller personnel.

According to the method, air samples were to be collected using midget impingers containing 0.1 M NaOH. When the samples were being analyzed, it was noticed that spike recoveries were consistently low, which led the analyst to investigate possible sample matrix problems. It was later learned that instead of 0.1 M NaOH, 0.5 M NaOH was used in the field to collect the samples.

It was thought that the high concentration of OH^- ions (i.e., OH^- ions poison the F^-probe) in the samples (i.e., 0.5 vs. 0.1 M NaOH) was the matrix interference that caused low spike recoveries. To compensate for the OH^- interference, a modification to the method was made as follows: 5 ml of the sample was neutralized with 5 ml of 0.5 M HCl before F^- was measured.

A comparative study was then conducted to show the effect of OH^- interference in F^- measurement and is shown in Table 1. The table shows that by neutralizing the sample collected in 0.5 M NaOH with 0.5 M HCl the concentration reading of the blank and 20 ppm F^- is improved (compare B.2 to B.3 and B.3 to B.1 in Table 1). If samples were collected in 0.1 M NaOH, modification of the method wouldn't have been necessary.

In summary, the modification to the method did not affect sample results.

RP-708/bf

---

* Methods of Air Sampling and Analysis, 2nd Edition, American Public Health Association

Table 1

	F^- Probe Readings (mv)	Measured Concentration (ppm)
A. Calibration Curve (as per method)		
F^- standards in H_2O (ppm)		
Blk	445.5	---
0.8	340.0	---
10	263.9	---
20	239.0	---
100	200.7	---
200	181.8	---
1000	146	---
B. Lab generated samples		
1. Sample collected in 0.1 N NaOH as per method		
Spiked F^- conc. (ppm)		
Blk	348.0	<0.8
0.8	340.0	0.8
20.0	239.8	20.0
200	181.4	200.0
2. Samples collected in 0.5 M NaOH		
Spiked F^- conc. (ppm)		
Blk	217	45
20	217	45
200	180	200
3. Samples from B.2 above but modified with HCl (as performed for all samples)		
Spiked F^- conc. (ppm)		
Blk	389	<0.8
20	242.7	18

---

* Methods of Air Sampling and Analysis, 2nd Edition, American Public Health Association.

QC SUPPORT DATA

FOR

AIR ANALYSIS

JUNE - JULY 1986

Table I-1. QC Summary -- Blanks

☐ METALS ☒ NON-METALS ☐ PHYSICAL

Matrix Aqueous Units mg/L

Parameter	Detection Limit	Blanks (Prep)	Method	Associate Samples (MMES ID)
Fluoride	0.2	<0.2	ISE	4158-4175
Fluoride	0.2	<0.2	ISE	4408-4425
Fluoride	0.2	<0.2	ISE	4833-4850
Fluoride	0.2	<0.2	ISE	4935-4952
Fluoride	0.2	<0.2	ISE	4989-0007
Fluoride	0.2	<0.2	ISE	0094-0111
Fluoride	0.2	<0.2	ISE	0118-0135
Fluoride	0.2	<0.2	ISE	0180-0197

Table II-1. QC Summary -- Blanks

☐ METALS ☒ NON-METALS ☐ PHYSICAL

Matrix Aqueous

Units mg/L

Parameter	Detection Limit	Blanks (Prep)	Method	Associate Samples (MMES ID)
Cyanide	0.26	<0.26	ISE	4158-4175
Cyanide	0.26	<0.26	ISE	4408-4425
Cyanide	0.26	<0.26	ISE	4833-4850
Cyanide	0.26	<0.26	ISE	4935-4952
Cyanide	0.26	<0.26	ISE	4989-0007
Cyanide	0.26	<0.26	ISE	0094-0111
Cyanide	0.26	<0.26	ISE	0118-0135
Cyanide	0.26	<0.26	ISE	0180-0197

AIR ANALYSIS

JUNE - JULY 1986

LABORATORY DUPLICATES

Table II-2. QC Summary - Duplicate Samples Analysis

Ten percent of all samples received was analyzed as a duplicate for the parameters listed in the table below. Sample and duplicate results are listed below.

Parameter	MMES ID	Sample Result (mg/L)	Duplicate Result (mg/L)
Cyanide (in air)	4170	<0.26	<0.26
Cyanide (in air)	4420	<0.26	<0.26
Cyanide (in air)	4844	<0.26	<0.26
Cyanide (in air)	4941	<0.26	<0.26
Cyanide (in air)	4995	<0.26	<0.26
Cyanide (in air)	0104	<0.26	<0.26
Cyanide (in air)	0099	<0.26	<0.26
Cyanide (in air)	0123	<0.26	<0.26
Cyanide (in air)	0129	<0.26	<0.26
Cyanide (in air)	0186	<0.26	<0.26
Cyanide (in air)	01983	<0.26	<0.26

Table I-2. QC Summary -- Duplicate Sample Analysis

Ten percent of all samples received was analyzed as a duplicate for the parameters listed in the table below. Sample and duplicate results are listed below.

Parameter	MMES ID	Sample Result (mg/L)	Duplicate Result (mg/L)
Fluoride (in air)	4166	<0.20	<0.20
Fluoride (in air)	4416	<0.20	<0.20
Fluoride (in air)	4840	<0.20	<0.20
Fluoride (in air)	4943	<0.20	<0.20
Fluoride (in air)	4997	<0.20	<0.20
Fluoride (in air)	0102	<0.20	<0.20
Fluoride (in air)	0122	<0.20	<0.20
Fluoride (in air)	0130	<0.20	<0.20
Fluoride (in air)	0185	<0.20	<0.20
Fluoride (in air)	0192	<0.20	<0.20

AIR ANALYSIS

JUNE - JULY 1986

SPIKED SAMPLES ANALYSIS

Table I-3. QC Summary -- Spiked Sample Analysis

Ten percent of all samples received was spiked and analyzed for the parameters listed below. Spike recoveries (%) and control limits are summarized below.

Parameter	MMES ID	Spike Recovery (%)	Control Limits
Fluoride	4165	90	75-125
Fluoride	4410	90	75-125
Fluoride	4838	94	75-125
Fluoride	4945	80	75-125
Fluoride	4994	85	75-125
Fluoride	0103	100	75-125
Fluoride	0119	90	75-125
Fluoride	0125	85	75-125
Fluoride	0181	85	75-125
Fluoride	0189	95	75-125

*Concentrations of spike added - 20 ppm.

Table II-3. QC Summary -- Spiked Sample Analysis

Ten percent of all samples received was spiked and analyzed for the parameters listed below. Spike recoveries (%) and control limits are summarized below.

Parameter	MMES ID	Spike Recovery (%)	Control Limits
Cyanide	4171	45(a)	75-125
Cyanide	4421	42(a)	75-125
Cyanide	4837	88(b)	75-125
Cyanide	4945	105(b)	75-125
Cyanide	4996	105(b)	75-125
Cyanide	0105	115(b)	75-125
Cyanide	0095	100(b)	75-125
Cyanide	0118	104(b)	75-125
Cyanide	0126	96(b)	75-125
Cyanide	0182	100(b)	75-125
Cyanide	0190	111(b)	75-125

(a) Low spike recovery due to matrix interferences. Samples could not be reanalyzed due to holding time restraints.

(b) Sample pH was adjusted prior to analysis.

(c) Concentration of spike added - 20 ppm.

558/17

LABORATORY DATA VALIDATION
OF RESULTS OF CHEMICAL ANALYSIS
OF SOIL AND SURFACE WATER SAMPLES
COLLECTED BETWEEN 22 AND 26 JUNE
AND ON 2 AUGUST 1987

REPORT SUMMARY

This report presents analytical data for soil and water samples collected at the Martin Marietta Aluminum Reduction Plant, The Dalles, Oregon as part of the remedial investigation/feasibility study work plan being conducted by Geraghty & Miller, Inc. Versar, Inc., ESM Operations Environmental Chemistry Laboratory performed the work presented in this report according to the "Task Order for Laboratory Services No. 901-999-701" (Contract No. 87-ETMF-002 with Martin Marietta Corporation).

Between 24 and 29 June and on 4 August 1987, ESM Operations received 22 soil and 8 water samples, 5 field blanks, and 3 trip blanks that were collected between 22 and 26 June and on 2 August 1987 at the Martin Marietta Aluminum Reduction Plant, The Dalles, Oregon. Lists of samples received and corresponding laboratory tracking numbers are presented in a master list.

Quality control protocols specified in Task Order 901-999-701 were adhered to and results are presented. EPA-CLP quality control limits were employed for the respective methods. Laboratory levels of quantitation are listed.

QUALITY ASSURANCE SUMMARY

1. Sample holding times for total and free cyanide for samples collected at the Landfill Ditch Area were exceeded (see #2 below). Samples 3338 and 3339 for analysis of base neutral acids required re-extraction outside of sample holding time due to surrogate percent recoveries were within QC limits in the re-extracted samples. Both sets of results are included in the report. All other sample holding times were met.

2. Samples collected from the Landfill Ditch on 23 June 1987 and listed below were analyzed for total and free cyanide because sample holding times were exceeded.

ESM ID	Client ID	Parameters
2925	DLSW-REP 1E	(Total and free cyanide fluoride, sulfate, chloride, carbonate, bicarbonate, BNA's, purgeables (VOCs), calcium, magnesium, postassium and sodium)
2927	LDAWG	
2928	Trip Blank	
2929	LDBWG	
2930	LDFB	

The site was therefore, resampled for all requested parameters. Data for the original (except for cyanides) and recollected samples are included in this report. The trip blank was not resampled).

3. Due to difficulties encountered in the field, samples at the Landfill Ditch Area during sample preservation with acid such as violent effervescing, ESM advised the Geraghty & Miller sampling team to send unpreserved samples. These samples foamed extensively during volatile purging and BNA extraction. Difficulties in analyzing for other parameters were also experienced due to matrix interferences. The aliquot to be analyzed for metal cations (Ca, Mg, K, Na) was filtered and required dilution to minimize matraix effects. The quantitation levels for purgeable and BNA organics were adjusted due to sample dilution necessary to minimize foaming during purging and extraction. The recollected samples showed increased matrix interferences (compared to the initial sampling) and foamed during purging and extraction. Quantitation levels were adjusted accordingly.

4. Due to sample inhomogeneity and matrix interferences, soil samples collected from the Salvage Area (ESM ID 2990), Cathode Waste Pad Area (2991-2995) and Metal Storage Pad Area (2934-2942) required multiple analyses for total and free cyanide. QC outliers due to sample inhomogeneity or matrix interferences are identified on the data tables and QC summaries.

5. Data presented in tables containing general chemistry parameters (i.e., metals, ions, and cyanides) for soil samples are reported in dry weight units, mg/kg.

558/6

SAMPLE IDENTIFICATION KEY
Martin Marietta - The Dalles
Quality Assurance Review
Soil and Surface Water Samples
Collected June - August 1987

Master List

Sample	Lab. ID	Field Replicate	Field Blank	Trip Blank
Soil				
LRASC	2910			
LRBSC	2911	Soil Rep 1E 2913	LRFB 2915	
LRCSC	2912			
LRDSC	2914			
Phase	2916	Soil Rep 2917	PHFB 2918	Trip Blank 2926
ODCSC-1	2932			
BRASC	2934	Soil Rep. 4R 2942	BRFB 2933	
MPASG	2935	Soil Rep. 3R 2947		
MPBSG	2936			
MPCSG	2937			
CASG	2938			
CWBSG	2939			
CWCSG	2940			
CWASC-1	2991			
SASC	2990		SAFB 2992	
OCWPSC-A	2993			
OCWPSC-B	2994			
OCWPSC-C	2995			
Surface Water				
LDAWG	2927	DLSW ReP. 1E 2925	LDFB 2930	
LDBWG	2929		Sampler Rinsate	Trip Blank 5 2928 Trip Blank 5 2934
OCWP-Pit B	2988			
Scrubber pipe effluent	2989			
LDBWG - Repeat	3333	DLSW Rep. 1E 3339	LDFB - Repeat 3341	
LDAWG - Repeat	33340			

LABORATORY DATA VALIDATION SUMMARY
MARTIN MARIETTA - THE DALLES
QUALITY ASSURANCE REVIEW
SOIL AND SURFACE WATER
SAMPLES COLLECTED JUNE-AUGUST 1987

DATA QUALIFIERS

Matrix	Qualifier	Sample	Lab ID	Parameter	Explanation
				Batch 1	
Soil	None	LRASC	2910	Fluoride (340.2)	Batch leaching duplicate had relative percent difference (RPD) outside QC limits due inhomogeniety but RPD for analytical duplicate within QC limits.
	None	LRBSC	2911	Fluoride	
	None	LRCSC	2912	Fluoride	
	None	LRDSC	2914	Fluoride	
	None	Soil			
	None	Rep1E	2915	Fluoride	
	Conclusion (1)		Sample inhomogeniety cannot be controlled with soil samples. Data is acceptable for classification.		
				Batch 1	
Soil	J	LRASC	2910	Sulfate - (Turbidimetric Method 375.4)	
	J	LRBSC	2911	Sulfate	Matrix Spike-percent recovery (% R) too high - outside QC limits - due to matrix interferences.
	J	LRCSC	2912	Sulfate	
	J	LRDSC	2913	Sulfate	
	J	Soil			
	J	Rep1E	2914	Sulfate	
	Conclusion (2)		The data may be considered as estimated value. Classification may not be higher than Level A.		
				Batch 1	
Soil	J	LRASC	2910	Free Cyanide - 412 H	
	J	LRBSC	2911	Free Cyanide	Matrix Spike - percent recovery (% R) too low - outside QC limits due to matrix inferferences.
	J	LRCSC	2912	Free Cyanide	
	J	LRDSC	2913	Free Cyanide	
	J	Soil			
	J	Rep1E	2914	Free Cyanide	
	J	PHASC	2916	Free Cyanide	
	J	Soil			
		Rep2	2916	Free Cyanide	
	Conclusion (3)		The data may only be considered as estimated value. Classification may not be higher than Level A.		

Soil con't

Matrix	Qualifier	Sample	Lab ID	Parameter	Explanation
				<u>Batch 2, 3</u>	
Soil	None	BRASC	2934	Fluoride (340.2)	Batch leaching duplicate had RPD outside QC limits due to sample inhomogeneity. RPD for analytical duplicate within QC limits.
	None	Soil Rep4R	2942	Fluoride	
	None	MPASG	2935	Fluoride	
	None	MPBSG	2936	Fluoride	
	None	MPCSG	2937	Fluoride	
	None	Soil Rep3R	2941	Fluoride	
	None	CWASG	2938	Fluoride	
	None	CWBSG	2939	Fluroide	
	None	CWCSG	2940	Fluoride	
	Conclusion (4)		Sample inhomogeniety cannot be controlled with soil samples. Data is acceptable for classification.		
				<u>Batch 3</u>	
Soil	J	SASC	2990	Free Cyanide - 412 H	
	J	CWASC-1	2991	Free Cyanide	Matrix Spike - % R too low - outside QC limits due to matrix interferences.
	J	OCWPSC-A	2993	Free Cyanide	
	UJ	OCWPSC-B	2994	Free Cyanide	
	J	OCWPSC-C	2995	Free Cyanide	
	Conclusion (5)		The data may only be considered as estimated value. Classification may not be higher than Level A. Sample OCWPSC-B is qualified as UJ because the reported value is listed as below the detection limit. Because matrix spikes are low outside QC limits a non-detected value may only be estimated.		

Matrix	Qualifier	Sample	Lab ID	Parameter	Explanation
				Batch 1	
Surface Water	UJ UJ UJ	LDAWG LDBWG DLSW-REP1E	2927 2929 2925	Base Neutral Analysis - 625	(a) The identification DLSW-REP1E refers to a replicate sample collected from location "B" of the landfill ditch. The data, however, is not consistent with sample LDBWG but rather LDAWG. Thus, the samples appear to have been misidentified. This appears to have occurred in the extraction laboratory because other parameter comparisons are consistent. (b) The daily lab extraction blank (BLK0625W) showed 43 ppb of Bis (2 ethylhexyl) phthalate suggesting LDAWG and DLSW Rep1E may have been contaminated with this compound during extraction. (See field replicate comparison Page D635).
	Conclusion (6)				The data is qualified as estimated J because of apparent improper identification. However, the sample analysis met all required QC checks; and, samples LDAWG, LDBWG, and DLSW Rep1E were collected from puddles of stagnant water located in the landfill ditch approximately 20-30 feet apart. Since the characteristics of the water from each puddle were identified, the mis-identification may be a moot point. It is suggested the data may be applied in a general sense to the landfill ditch as a whole rather than to the specific location in the ditch.
Soil	None	CWASG	2938	Free Cyanide Fluoride	RPD between primary sample and field split sample exceed 30% criteria established in QAPP for interlaboratory precision due to uncontrollable intrinsic sample differences.
	Conclusion (7)				Allowable RPD specified in QAPP for field splits is 30%. No criteria is specified for field replicates. CLP guidelines for laboratory duplicates allows 35% for inorganics analysis in soils. No criteria is specified for organics. EPA functional guidelines for data validation state that field data (blanks, spikes, duplicates, splits) should not be the basis

Soil con't

Matrix	Qualifier	Sample	Lab ID	Parameter	Explanation
					of accepting or rejecting data but rather as additional evidence in support of conclusions arrived at by a review of the total QA package. Since all other QA parameters were within QC limits the data is accepted as valid and the RPD is the result of uncontrollable intrinsic sample differences. The data may be classified.
Soil	None	LDBWG-Repent	3338	Calcium	RPD between sample and field replicate was greater than 35% due to uncontrollable intrisic sample differences.
	None	DLSW-REP1E Repent	3339	Bicarbonate	
	Conclusion (8)				Allowable RPD specified in QAPP for field splits is 30%. No criteria is specified for field replicates. CLP guidelines for laboratory duplicates allows 35% for inorganics analysis in soils. No criteria is specified for organics. EPA functional guidelines for data validation state that field data (blanks, spikes, duplicates, splits) should not be the basis of accepting or rejecting data but rather as additional evidence in support of conclusions arrived at by a review of the total QA package. Since all other QA parameters were within QC limits the data is accepted as valid and the RPD is the result of uncontrollable intrinsic sample differences. The data may be classified.
Soil	None	LRBSC	2911	Total Cyanide	RPD between sample and field replicate was greater than 35% due to uncontrollable intrinsic sample differences.
	None	Soil Rep1E	2913	Total Cyanide	
	None	MPASG	2935	Total Cyanide	
	None	Soil Rep3R	2947	Total Cyanide	
	None	BRASC	2934	Total Cyanide	
	None	Soil Rep4R	2942	Total Cyanide	

Soil con't

Matrix	Qualifier	Sample	Lab ID	Parameter	Explanation
	Conclusion (9)				Allowable RPD specified in QAPP for field splits is 30%. No criteria is specified for field replicates. CLP guidelines for laboratory duplicates allows 35% for inorganics analysis in soils. No criteria is specified for organics. EPA functional guidelines for data validation state that field data (blanks, spikes, duplicates, splits) should not be the basis of accepting or rejecting data but rather as additional evidence in support of conclusions arrived at by a review of the total QA package. Since all other QA parameters were within QC limits the data is accepted as valid and the RPD is the result of uncontrollable intrinsic sample differences. The data may be classified.
Soil	None None	PHASCS Soil Rep2	2916 2917	Base/Neutral Extractable Compounds Benzo (g,h,i) perylene Dibenz (a,h) anthracene	Relative percent differences between sample and field replicate were greater than 35% due to intrinsic sample differences.
	Conclusion (10)				Allowable RPD specified in QAPP for field splits is 30%. No criteria is specified for field replicates. CLP guidelines for laboratory duplicates allows 35% for inorganics analysis in soils. No criteria is specified for organics. EPA functional guidelines fot data validation state that field data (blanks, spikes, duplicates, splits) should not be the basis of accepting or rejecting data but rather as additional evidence in support of conclusions arrived at by a review of the total QA package. Since all other QA parameters were within QC limits the data is accepted as valid and the RPD is the result of uncontrollable intrinsic sample differences. The data may be classified.
Surface Water	None	LDAWG LDBWG DLSW-ReplE	2927 2929 2925	Total Cyanide Free Cyanide	Holding times were exceeded; samples were not analyzed but were recollected and analyzed within required holding times

LABORATORY DATA VALIDATION SUMMARY
MARTIN MARIETTA - THE DALLES
QUALITY ASSURANCE REVIEW
SOIL AND SURFACE WATER SAMPLES COLLECTED
JUNE - AUGUST 1987

LEVELS OF QUANTITATION AND METHODS SUMMARY

LEVELS OF QUANTITATION
FOR
ORGANIC ANALYSIS

The Levels of Quantitation (LOQ) for the organic analyses were determined using the procedure specified in the USEPA Contract Laboratory Program Statement of Work, 7/85 Revision Page A-4, paragraph c.

This method requires the analysis of each compound in triplicate at a level equivalent to 3 to 5 times the Contract Required Detection Limit (now called the Contract Required Quantitation Level). The actual LOQs for each sample may vary, however, dependent on how much sample was extracted or analyzed, required dilutions, sample matrix, etc.

Table D-1. Levels of quantitation for volatiles in an aqueous matrix

COMPOUNDS	MATRIX: WATER UNITS: UG/L DILUTION FACTOR: 1
Acrolein	10
Acrylonitrile	10
Benzene	5
Bromodichloromethane	5
Bromoform	5
Bromomethane	5
Carbon Tetrachloride	5
Chlorobenzene	5
Chloroethane	5
2-Chloroethylvinylether	10
Chloroform	5
Chloromethane	5
Dibromochloromethane	5
1,3-Dichlorobenzene	5
1,2-Dichlorobenzene	5
1,4-Dichlorobenzene	5
1,1-Dichloroethane	5
1,2-Dichloroethane	5
1,1-Dichloroethene	5
1,2-Dichloropropane	5
trans-1,3-Dichloropropene	5
cis-1,3-Dichloropropene	5
Ethylbenzene	5
Methylene Chloride	5
1,1,2,2-Tetrachloroethane	5
Tetrachloroethene	5
Toluene	5
1,1,1-Trichloroethane	5
1,1,2-Trichloroethane	5
Trichloroethene	5
Trichlorofluoromethane	5
Vinyl Chloride	1
cis-1,2-Dichloroethene	5
trans-1,2-Dichloroethene	5

Table D-2. Levels of quantitation for base/neutral acid extractables in an aqueous matrix

COMPOUNDS	MATRIX: WATER UNITS: UG/L
Acenaphthalene	10
Acenaphthene	10
Anthracene	10
Benzidine	80
Benzo(a)Anthracene	10
Benzo(a)Pyrene	10
Benzo(b+k)fluoranthenes	10
Benzo(g,h,i)Perylene	10
4-Bromophenyl-phenylether	10
Butylbenzylphthalate	10
4-Chloro-3-Methylphenol	10
bis(2-Chloroethoxy)Methane	10
bis(2-Chloroethyl)Ether	10
bis(2-Chloroisopropyl)Ether	10
2-Chloronaphthalene	10
2-Chlorophenol	10
4-Chlorophenyl-phenylether	10
Chrysene	10
Di-n-Butylphthalate	10
Di-n-Octyl Phthalate	10
Dibenz(a,h)Anthracene	10
1,2-Dichlorobenzene	10
1,4-Dichlorobenzene	10
1,3-Dichlorobenzene	10
3,3'-Dichlorobenzidine	20
2,4-Dichlorophenol	10
Diethylphthalate	10
Dimethyl Phthalate	10
2,4-Dimethylphenol	10
4,6-Dinitro-2-Methylphenol	50
2,4-Dinitrophenol	50
2,4-Dinitrotoluene	10
2,6-Dinitrotoluene	10
1,2-Diphenylhydrazine	10
bis(2-Ethylhexyl)Phthalate	10
Fluoranthene	10

Table D-2. Continued

COMPOUNDS	MATRIX: WATER UNITS: UG/L
Fluorene	10
Hexachlorobenzene	10
Hexachlorobutadiene	10
Hexachlorocyclopentadiene	10
Hexachloroethane	10
Indeno(1,2,3-cd)Pyrene	10
Isophorone	10
N-Nitroso-Di-n-Propylamine	10
N-Nitrosodimethylamine	5
N-Nitrosodiphenylamine	10
Naphthalene	10
Nitrobenzene	10
4-Nitrophenol	50
2-Nitrophenol	10
Pentachlorophenol	50
Phenanthrene	10
Phenol	10
Pyrene	10
1,2,4-Trichlorobenzene	10
2,4,6-Trichlorophenol	10

Table D-3. Levels of quantitation for base/neutral acid extractables in a soil matrix

COMPOUNDS	MATRIX: SOIL UNITS: UG/KG
Acenaphthalene	1670
Acenaphthene	1670
Anthracene	1670
Benzidine	3030
Benzo(a)Anthracene	1670
Benzo(a)Pyrene	1670
Benzo(b+k)fluoranthenes	1670
Benzo(g,h,i)Perylene	1670
4-Bromophenyl-phenylether	1670
Butylbenzylphthalate	1670
bis(2-Chloroethoxy)Methane	1670
bis(2-Chloroethyl)Ether	1670
bis(2-Chloroisopropyl)Ether	1670
2-Chloronaphthalene	1670
4-Chlorophenyl-phenylether	1670
Chrysene	1670
Di-n-Butylphthalate	1670
Di-n-Octyl Phthalate	1670
Dibenz(a,h)Anthracene	1670
1,3-Dichlorobenzene	1670
1,2-Dichlorobenzene	1670
1,4-Dichlorobenzene	1670
3,3'-Dichlorobenzidine	3330
Diethylphthalate	1670
Dimethyl Phthalate	1670
2,4-Dinitrotoluene	1670
2,6-Dinitrotoluene	1670
1,2-Diphenylhydrazine	1670
bis(2-Ethylhexyl)Phthalate	1670
Fluoranthene	1670
Fluorene	1670
Hexachlorobenzene	1670
Hexachlorobutadiene	1670
Hexachlorocyclopentadiene	1670
Hexachloroethane	1670
Indeno(1,2,3-cd)Pyrene	1670

Table D-3. Continued

COMPOUNDS	MATRIX: SOIL UNITS: UG/KG
Isophorone	1670
N-Nitroso-Di-n-Propylamin	1670
N-Nitrosodimethylamine	1670
N-Nitrosodiphenylamine	1670
Naphthalene	1670
Nitrobenzene	1670
Phenanthrene	1670
Pyrene	1670
1,2,4-Trichlorobenzene	1670

LEVELS OF QUANTITATION
FOR
INORGANIC ANALYSIS

The Levels of Quantitation (LOQ) for inorganic analyses were determined using the procedure specified in "Principles of Environmental Analysis" Analytical Chemistry, Volume 55, Pages 2210-2218, December 1983. The actual LOQs for each sample will vary depending on sample size, required dilutions, sample matrix, etc.

Table D-4. Levels of quantitation for chemical parameters in aqueous and soil matrices

VERSAR INC., ESM OPERATIONS
LEVELS OF QUANTITATION

Parameter	Method	LEVEL OF QUANTITATION	
		WATER (mg/L)	SOIL (mg/kg)
Total Cyanide	335.2	0.010	0.50
Free Cyanide	412H(1)	0.010	0.50
Fluoride	300.0	1.6	NA(2)
Fluoride	340.2	1.0	1.0
Sulfate	375.4	5.0	5.0
Sulfate	300.0	2.0	NA
Chloride	325.3	1.1	NA
Carbonate	403	10	NA
Bicarbonate	403	10	NA
Sodium	273.1	1.0	200
Sodium	200.7	1.0	NA
Calcium	200.7	0.50	NA
Magnesium	200.7	0.50	NA
Potassium	200.7	1.0	NA
Arsenic	206.2	0.01	2.0

(1) Standard Methods
(2) NA= Not Applicable

Table D-5. Levels of quantitation for metals in EP TOX extract matrix

LEVELS OF QUANTITATION

Parameter (EP TOX METALS*)	Method	LEVEL OF QUANTITATION Units: ug/L
Arsenic	200.7	200
Barium	200.7	200
Cadmium	200.7	50
Chromium	200.7	50
Lead	200.7	200
Mercury	239.2	0.30
Selenium	200.7	200
Silver	200.7	50

* Samples prepared using method 1310 from SW-846 2nd Edition USEPA 1982

LABORATORY DATA VALIDATION

Note: Any Data Qualifier Codes determined from this validation are listed in the Data Qualifier Table for this section.

LABORATORY DATA VALIDATION SUMMARY
MARTIN MARIETTA - THE DALLES
QUALITY ASSURANCE REVIEW
SOIL AND SURFACE WATER SAMPLES COLLECTED
JUNE - AUGUST 1987

Holding Times

Parameters:

Soil: T. Cyanide A F. Cyanide A Fluoride A
Sulfate P E.P. Toxicity Metals A Sodium A
Arsenic A VOA N B/N A Acid N

Surface Water: T. Cyanide P F. Cyanide P Fluoride P
Sulfate A Sodium A Arsenic N
Calcium A Magnesium A Potassium A
Bicarbonate A Carbonate A Chloride A
VOA ___ B/N ___ Acids ___

Criteria:

A - Acceptable: All QAPP and 40 CFR 136 specific holding times met.

P - Provisional: Some QAPP and 40 CFR 136 specified holding times exceeded.

U - Unacceptable: All holding times exceeded.

N - Analysis not performed.

Remarks:

All soil samples analyzed by Versar met all required holding times, but soil sample LRASC-Split analyzed by Compuchem for sulfate exceeded holding time. Holding times for water samples LDAWG (2927), LDBWG (2929), DLSW-REPIE (2925), and LDFB (2915) were exceeded by Versar for total cyanide and free cyanide. These samples were recollected and analyzed within proper holding times. However, since these samples were collected from small, stagnant, puddles in the landfill ditch considerable evaporation had taken place between the initial sampling and the resampling. Hence, concentrations of parameters analyzed within holding times in the initial sample appear markedly increased in the repeat sample.

Holding time for sample LDAWG-Split (139050) was exceeded by Compuchem for Fluoride.

Table C-36. Holding time summary for samples collected from 22 June through 2 August 1987 from Martin Marietta Reduction Facility, The Dalles, Oregon.

PARAMETER	SAMPLE ESM ID	SAMPLE MATRIX	SAMPLE DATES				HOLDING TIME REQUIREMENT
			COLLECTION	LAB RECEIPT	PREPARATION EXTRACTION	ANALYSIS	
Arsenic	2910-2914	soil	6-22-87	6-24-87	6-26-87	7/9,23/87	6 months
EP Tox Metals (except mercury)	2910-2914	soil	6-22-87	6-24-87	6-25-87	7/23,24/87	6 months
Mercury (EP Tox)	2910-2914	soil	6-22-87	6-24-87	6-25-87	7-6-87	28 days
Fluoride (340.2)	2925-2930	water	6-23-87	6-26-87	NA	6-30;7-2-87	28 days
Fluoride (300.0)	2925,2927	water	6-23-87	6-26-87	NA	7-17-87	28 days
	2928-2930	water	6-23-87	6-26-87	NA	7/1,7/87	28 days
Fluoride (340.2)	2934,2939	soil	6-24-87	6-26-87	6-30-87	7-7-87	28 days
Fluoride (340.2)	2935-2938	soil	6-24-87	6-26-87	6-30-87	7-1-87	28 days
Fluoride (340.2)	2940-2942	soil	6-24-87	6-26-87	7-1-87	7-2-87	28 days
Sulfate (375.4)	2925-2930	water	6-23-87	6-26-87	NA	7-9-87	28 days
Sulfate (300.0)	2925-2930	water	6-23-87	6-26-87	NA	7/1,7/87	28 days
Chloride	2925-2930	water	6-23-87	6-26-87	NA	7-9-87	28 days
Calcium	2925-2929	water	6-23-87	6-26-87	NA	7-29-87	6 months
Magnesium	2925-2929	water	6-23-87	6-26-87	NA	7-29-87	6 months
Potassium	2925-2929	water	6-23-87	6-26-87	NA	7-30-87	6 months
Sodium	2925-2929	water	6-23-87	6-26-87	NA	7-27-87	6 months
Fluoride (300.0)	2988-2989	water	6-26-87	6-29-87	NA	7/17,23/87	28 days
Fluoride (340.2)	2988-2989	water	6-26-87	6-29-87	NA	7-17-87	28 days
Total Cyanide	2988-2989	water	6-26-87	6-29-87	7-9-87	7-10-87	14 days
Free Cyanide	2988-2989	water	6-26-87	6-29-87	7-10-87	7-10-87	14 days

NA= Not Applicable

Table C-37. Holding time summary for samples collected from 22 June through 2 August 1987 from Martin Marietta Reduction Facility, The Dalles, Oregon.

PARAMETER	SAMPLE ESM ID	SAMPLE MATRIX	SAMPLE DATES				HOLDING TIME REQUIREMENT
			COLLECTION	LAB RECEIPT	PREPARATION EXTRACTION	ANALYSIS	
Total Cyanide	2910-2914	soil	6-22-87	6-24-87	6-24-87	6-26-87	14 days
Total Cyanide	2916	soil	6-23-87	6-24-87	6-24-87	6-26-87	14 days
Total Cyanide	2917	soil	6-23-87	6-24-87	6-30-87	7-6-87	14 days
Total Cyanide	2934-2938;2940	soil	6-24-87	6-26-87	6-29-87	7-6-87	14 days
Total Cyanide	2941	soil	6-24-87	6-26-87	6-30-87	7-8-87	14 days
Total Cyanide	2942	soil	6-24-87	6-26-87	6-29-87	7-8-87	14 days
Total Cyanide	2990-2991;2993	soil	6-26-87	6-29-87	7-9-87	7-10-87	14 days
Total Cyanide	2994-2995	soil	6-26-87	6-29-87	7-10-87	7-10-87	14 days
Free Cyanide	2910-2914	soil	6-22-87	6-24-87	7-2-87	7-6-87	14 days
Free Cyanide	2934-2936	soil	6-24-87	6-26-87	7-2-87	7-6-87	14 days
Free Cyanide	2937-2938 2940-2942	soil	6-24-87	6-26-87	7-8-87	7-8-87	14 days
Free Cyanide	2939	soil	6-24-87	6-26-87	7-8-87	7-8-87	14 days
Free Cyanide	2990-2991	soil	6-26-87	6-29-87	7-10-87	7-10-87	14 days
Free Cyanide	2993-2995	soil	6-26-87	6-29-87	7-10-87	7-10-87	14 days
Fluoride (340.2)	2910-2914	soil	6-22-87	6-24-87	6-25-87	6-26-87	28 days
Fluoride (340.2)	2916-2917	soil	6-23-87	6-24-87	6-25-87	6-26-87	28 days
Sulfate (300.0)	2910-2914	soil	6-22-87	6-24-87	6-30;7-13-87	7/1,16/87	28 days
Sulfate (375.4)	2910-2914	soil	6-22-87	6-24-87	6-29-87	7-8-87	28 days
Sodium	2910-2914	soil	6-22-87	6-24-87	6-26-87	7-24-87	6 months
Sodium	2916-2917	soil	6-23-87	6-24-87	6-26-87	7-24-87	6 months
Sodium	2934-2942	soil	6-24-87	6-26-87	7-7-87	7-27-87	6 months
Sodium	2990-2991 2993-2995	soil	6-26-87	6-29-87	6-30-87	7-27-87	6 months

Comments: The holding time for cyanide (total and free) in soils is advisory.

Table C-38. Holding time summary for samples collected from 22 June through 2 August 1987 from Martin Marietta Reduction Facility, The Dalles, Oregon.

PARAMETER	SAMPLE ESM ID	SAMPLE MATRIX	SAMPLE DATES				HOLDING TIME REQUIREMENT
			COLLECTION	LAB RECEIPT	PREPARATION EXTRACTION	ANALYSIS	
Total Cyanide	3338-3341	water	8-2-87	8-4-87	8-10-87	8-10-87	14 days
Free Cyanide	3338-3341	water	8-2-87	8-4-87	8-7-87	8-8-87	14 days
Fluoride (340.2)	3338-3341	water	8-2-87	8-4-87	NA	8-8-87	28 days
Fluoride (300.0)	3338-3339;3342	water	8-2-87	8-4-87	NA	8-7-87	28 days
Fluoride (300.0)	3340	water	8-2-87	8-4-87	NA	8-10-87	28 days
Sulfate (375.4)	3338-3341	water	8-2-87	8-4-87	NA	8-11-87	28 days
Sulfate (300.0)	3338-3339;3341	water	8-2-87	8-4-87	NA	8-7-87	28 days
Sulfate (300.0)	3339	water	8-2-87	8-4-87	NA	8-10-87	28 days
Chloride	3338-3341	water	8-2-87	8-4-87	NA	8-7-87	28 days
Calcium	3338-3341	water	8-2-87	8-4-87	NA	8-9-87	6 months
Magnesium	3338-3341	water	8-2-87	8-4-87	NA	8-9-87	6 months
Potassium	3338-3341	water	8-2-87	8-4-87	NA	8-9-87	6 months
Sodium	3338-3341	water	8-2-87	8-4-87	NA	8-9-87	6 months

NA= Not Applicable

SOILS AND SURFACE-WATER ANALYSIS
JUNE - AUGUST 1987

GC/MS Tuning and Performance

Parameters:

Soil: VOC (BFB) A B/N/A (DFTPP) A

Water: VOC (BFB) A B/N/A (DFTPP) A

Criteria:

A -	Acceptable:	All criteria met, spectra of good quality.
P -	Provisional:	All criteria not met, spectra of reasonable quality, data useable.
U -	Unacceptable:	Criteria not met, spectra of poor quality, data unuseable.

Remarks:

None.

SOILS AND SURFACE-WATER ANALYSIS
JUNE - AUGUST 1987

Initial and Continuing Calibration Checks - Organics

Parameters:

Soil: VOC A B/N A Acid N

Water: VOC A B/N A Acid A

Criteria:

A -	Acceptable:	All criteria met.
P -	Provisional:	Some criteria met, data useable.
U -	Unacceptable:	Criteria not met, data unuseable.
N -	Not Applicable	

Remarks:

None.

SOILS AND SURFACE-WATER ANALYSIS
JUNE - AUGUST 1987

Laboratory Blanks - Organics Analysis

Parameters:

Soil: VOC N B/N A Acids N

Surface Water: VOC A B/N P Acids A

Criteria:

A -	Acceptable:	No contaminants above minimum detection limit, no interference with sample results, appropriate blank used for each GC/MS system and extraction method.
P -	Provisional:	Contaminants present but minimal interference with sample results.
U -	Unacceptable:	Gross contamination, too much interference to use data for certain components or the entire fraction appropriate blanks not analyzed.
N -	Not analyzed:	Analysis not performed, blank not required.

Remarks:

Only one blank (BLK0625W) showed contamination with Bis(2-Ethylhexyl) Phthalate at 43 ppb. This contaminant was also found in two samples, LDAWG (2927) and DLSW-REP-1E (2925) which were extracted at the same time. This parameter has been flagged J in each sample.

SOILS AND SURFACE-WATER ANALYSIS
JUNE - AUGUST 1987

Surrogate Spike Results

Parameters:

Soil: VOC A B/N A Acid A

Surface Water: VOC A B/N P Acid P

Note: Sample data flagged on individual basis.

A. Individual Sample flagging criteria.

Acceptable:	All surrogate recoveries within criteria.
Suspect:	Any surrogate recoveries outside criteria and/or recoveries of <10 percent substantiated as a matrix effect.
Invalid:	Any recoveries of <10 percent that are unsubstantiated as a matrix effect.

Matrix Parameter	No. Samples	No. Suspect	No. Invalid
Soil			
VOC	1	0	0
B/N	4	0	0
Acid	4	1	0
Surface Water			
VOC	16	0	0
B/N	17	1	0
Acid	17	3	3

B. Summary of Surrogates

Surrogate Spikes (Continued)

Criteria:

A -	Acceptable:	<10 percent of samples reported as suspect.
P -	Provisional:	>10 percent but <50 percent of samples reported as suspect.
U -	Unacceptable:	>50 percent of samples reported as suspect and/or >10 percent samples reported as invalid.

Remarks:

Sample PHFB (2918) compound 2-Fluorobiphenyl was low outside QC limits but >10 percent recovery.

Soil sample OCWP-Pit B (2988) compound 2-Fluorobiphenyl was low outside QC limits but >10 percent recovery.

Water samples LDBWG (3338), DLSW-Rep. 1E (3339) and LDAWG (3340) compound 2-Fluorophenol was low outside QC limits but none were >10 percent recovery. This compound is flagged as a J on these samples.

SOILS AND SURFACE-WATER ANALYSIS
JUNE - AUGUST 1987

Matrix Spike/Matrix Spike Duplicate - Organics

A. Matrix Spikes:

Parameters:

Soil: VOC N B/N N Acid N

Surface Water: VOC A B/N A Acid P

Note: No action is taken on matrix spike results alone.

A - Acceptable: <10% of compounds outside criteria.

P - Provisional: >10% but <50% of compounds outside criteria.

U - Unacceptable: >50% of compounds outside criteria and/or >10% of compounds with recoveries of <10%

N - Not applicable

Matrix	Parameter	No. Compounds	No. Outside Criteria	No. <10% Recovery
Soil:	VOA	0	0	0
	B/N	0	0	0
	Acids	0	0	0
Surface Water:	VOA	5 x 2 = 10	0	0
	B/N	6 x 2 = 12	1	0
	Acids	5 x 2 = 10	2	1

Remarks:

No matrix spikes were reported for soil sample PHASC - at least 1 spike should have been performed. Sample LDAWG (2927), compound Acenapthene % recovery low outside QC limits but >10%. Sample LDAWG (2927), compounds 2-Chlorophenol and nitrophenol were not detected in sample but % Recoveries of spikes were low outside QC limits. Nitrophenol had 0 % Recovery.

B. Matrix Spike Duplicates.

Parameters:

Soil: VOA N B/N N Acid N

Water: VOA A B/N A Acid P

Criteria:

A - Acceptable: <10% of compounds outside criteria.

P - Provisional: >10% but <50% of compounds outside criteria.

U - Unacceptable: >50% of compounds outside criteria.

N - Not applicable

Matrix	Parameter	No. Compounds	No. Outside Criteria
Soil:	VOA	0	0
	B/N	0	0
	Acid	0	0
Water:	VOA	5 x 2 = 10	0
	B/N	6 x 2 = 12	0
	Acid	5 x 2 = 10	1

Remarks:

See above remarks.

SOILS AND SURFACE WATER ANALYSIS
JUNE - AUGUST 1987

Trip Blanks

Parameters:

Water: T. Cyanide A F. Cyanide A Sulfate A
Fluoride A Carbonate A Bicarbonate A
Sodium A Potassium A Magnesium A
Calcium A

Criteria:

A -	Acceptable:	No evidence of contamination above minimum detection limits.
P -	Provisional:	Contaminants present but minimal or no evidence of interference with sample results.
U -	Unacceptable:	Gross contamination resulting in definite compromise to the sample data integrity.

Remarks:

All acceptable.

SOILS AND SURFACE WATER ANALYSIS
JUNE - AUGUST 1987

Concentration of Calibration Curve Standards - Inorganics

Parameters:

Soil/Water:
Fluoride A Sulfate A T. Cyanide A
F. Cyanide A Arsenic P Sodium A
EP Toxicity (ICP) A Calcium (ICP) A
Magnesium (ICP) A Potassium (ICP) A
Chloride A

Criteria:

A - Acceptable:	All curves five point curves with lowest standard at the LOQ. ICP one point.
P - Provisional:	Three point curve with lowest standard at the LOQ.
U - Unacceptable:	Less than three point curve and/or lowest standard not at the LOQ; no one-point verification for ICP.

Remarks:

Only three point curve used for arsenic - other QC acceptable; data is not affected.

558/4

SOILS AND SURFACE-WATER ANALYSIS
JUNE - AUGUST 1987

Laboratory Blanks - Inorganics Analyses

Parameters:

Soil: T. Cyanide A F. Cyanide A Fluoride A
Sulfate A E.P. Toxicity A Sodium A
Arsenic A

Surface Water: T. Cyanide A F. Cyanide A Fluoride A
Sulfate A Sodium A Arsenic A Calcium A
Magnesium A Potassium A Chloride A
Alkalinity A

Criteria:

A -	Acceptable:	No contaminants above LOQ, no interference with sample results.
P -	Provisional:	Contaminants present but minimal interference with sample results.
U -	Unacceptable:	Gross contamination, too much interference to use data or appropriate blanks not analyzed.

Remarks:

None required.

SOILS AND SURFACE-WATER ANALYSIS
JUNE - AUGUST 1987

Initial and Continuing Calibration Verification - Inorganics

Parameters:

Soil: Arsenic A Sodium A Fluoride A Sulfate A
T. Cyanide N F. Cyanide N

Surface Water: Arsenic A Barium A Cadmium A Chromium A
Lead A Mercury A Selenium A Silver A
Calcium A Magnesium A Potassium A
Sodium A Fluoride A Sulfate A

Criteria:

A - Acceptable: Percent Recovery (%R) of ICVS and CCVS inside QC limits.

P - Provisional: %R of ICVS or CCVS outside QC limits but not less than 50% nor greater than 150%.

U - Unacceptable: %R of ICVS or CCVS outside QC limits but less than 50% or greater than 150%.

N - Not applicable.

Remarks:

None required.

SOILS AND SURFACE-WATER ANALYSIS
JUNE - AUGUST 1987

ICP Serial Dilutions - Inorganics

Parameters:

Water: Potassium A Magnesium A Calcium A
Sodium A

Criteria:

A - Acceptable: %R within QC limits.

U - Unacceptable: %R outside QC limits.

Remarks:

None required.

SOILS AND SURFACE-WATER ANALYSIS
JUNE - AUGUST 1987

Laboratory Duplicates - Inorganics/Organics

Parameters:

Soil:
T. Cyanide A F. Cyanide A Fluoride P
Sulfate A E.P. Toxicity A Sodium A
Arsenic A VOA N B/N N Acid N

Surface Water
T. Cyanide A F. Cyanide A Fluoride A
Sulfate A Sodium A Arsenic A Calcium N
Magnesium N Potasium N Bicarbonate N
Carbonate N Chloride N VOA N B/N A
Acids A

Criteria:

A - Acceptable: All rerlative percent differences (RPD's) are within QC limits.

P - Provisional: Some RPD's outside QC limits but <35%.

U - Unacceptable: All RPD's outside QC limits and >35%.

N - Analysis not performed.

Remarks:

All batch leaching duplicates performed by Versar for Fluoride were outside QC limits, but all analytical duplicates were well within QC limits. The cause of the high RPD for leaching duplicates is sample inhomogeniety which was uncontrollable.

All Compuchem duplicates had acceptable RPD's. However, Compuchem failed to run a duplicate for sodium, arsenic, B/N/A or VOA as requested.

SOILS AND SURFACE-WATER ANALYSIS
JUNE - AUGUST 1987

Matrix Spikes - Inorganics

Parameters:

Soil: Arsenic A Sodium A Fluoride A Sulfate P
T. Cyanide A F. Cyanide P E.P. Toxicity
Metals A

Water: Sodium A Fluoride A T. Cyanide N
F. Cyanide N

Criteria:

A - Acceptable: All %R within QC limits or meet CLP criteria.

P_1 - Provisional: Some %R not within QC limits but are not <30%; or are >125% and analyte is > Instrument Detection Limit (IDL) - flag data J;

P_2 - Provisional: Some %R not within QC limits but are not <30% and analyte was reported <IDL - flag data UJ;

P_3 - Provisional: %R are less than 30% and analyte was detected at >LOQ - flag data J;

U - Unacceptable: %R <30% and sample results are reported as <IDL - flag R;

N - Not appliclabe or matrix spike diluted out, not reported due to high analyte concentration.

Remarks:

Soil - P - Sulfate - Matrix interference high spike recovery - see batch qualifiers - 2910-2914.

Soil - P - Free Cyanide - Matrix interference - low spike recovery - see batch qualifiers - 2910 - 2916, 2990 - 2995.

SOILS AND SURFACE WATER ANALYSIS
JUNE - AUGUST 1987

Laboratory Control Sample (LCS) - Inorganics

Parameters:

Soil/Water: Arsenic A T. Cyanide A F. Cyanide A Sodium A

Criteria:

A -	Acceptable:	All %R within QC limits or CLP criteria.
P -	Provisional:	%R outside QC limits but not <30% or is >120% - flag data J;
U -	Unacceptable:	If LCS recovery falls less than 30%, this is indicative of severe laboratory or method deficiencies and the data should be reported as unuseable - flag R.

Remarks:

None required.

Audit review of 10 percent of the data revealed that all LCSs were within acceptable QC limits.

LCS analysis was performed on all inorganic parameters covered by CLP. These included total and free cyanide and all metals that were analyzed. It should be noted that free cyanide is not covered by CLP, but an LCS was analyzed for this parameter anyway. Fluoride and sulfate are not included under the CLP protocol. Therefore, an LCS was not analyzed for these parameters.

The sources used for the LCS included aqueous LCS solution from EPA when available or the Initial Calibration Verification Standard (ICVS) when LCS solution was not available. For cyanide, the distilled mid-range calibration standard was used as the LCS when a formal LCS solution was not available.

SOIL AND SURFACE WATER ANALYSIS
JUNE - AUGUST 1987

Post Digestion Spikes (Furnace)

Parameters:

Soil: Arsenic A

Criteria:

A - Acceptable: Percent Recovery within QC limits.

U - Unacceptable: Percent Recovery outside QC limits.

Remarks:

None required.

DATA CLASSIFICATION

SOIL - SURFACE WATER

JUNE - AUGUST 1987

558/17

DATA CLASSIFICATION

Sampling and Analysis June - September 1987

A second round of samples was collected and analyzed during this time period from selected locations. The matrices sampled included soil, surface water, and ground water. Like the laboratory data developed in 1986, the 1987 laboratory data have been validated and the data requiring QC qualifer codes have been flagged as required. To determine the data usefulness and applicability, the data have been further classified as follows:

Classification Process

As with the laboratory data validation, the classification of data is based on specifically defined criteria. Samples are evaluated by matrix against the criteria and judged as acceptable, provisional, or unacceptable. The explanation of the criteria is as follows:

A - Acceptable:	All criteria have been successfully met for all samples.
P - Provisional:	Some samples have not fully met the criteria but the information is obtainable.

U - Unacceptable: The criteria has not been met with any samples and is not obtainable. This data may not be classified for use unless sufficient other data criteria have been met and scientific judgement indicate the data may be useful if classified.

N - Not Applicable.

Soil and Surface Water - 1987

During the period 22 June to 29 June and 4 August 1987, 22 grab and composite soil samples, 8 water samples, 5 field blanks and 3 trip blanks were collected at the Martin Marietta Aluminum Reduction Plant, The Dalles, Oregon by G&M. These samples were submitted for chemical analysis to Versar, Inc., ESM Operations Environmental Chemistry Laboratory. In addition, 4 field split soil samples and 1 field split water sample were submitted to Compuchem Laboratories in North Carolina.

Soil samples submitted to both labortories were selectively analyzed for total and free cyanide, sulfate, fluoride, arsenic, sodium, EP toxicity metals, and base/neutral extractable organic compounds. Surface water samples from the landfill ditch were analyzed for total and free cyanide, fluoride, BNAs, VOCs, calcium, magnesium, potassium, chloride, sulfate, carbonate, and bicarbonate.

DATA CLASSIFICATION SUMMARY CHECKLIST

Level A Criteria

Matrix: Soil - 1987

To be classified for Level A use, the data must meet the following criteria:

Criteria	Evaluation Result
1. Sampling dates were recorded;	A
2. Signatures of Sampling Team on each water sample log or soil sample log;	A
3. Sampling locations were clearly designated and described;	A
4. Sampling depth increment for soils was recorded;	A
5. Sample collection technique was described on water sample log or soil sample log;	A
6. Field preparation techniques were clearly described where applicable;	A
7. Sample preservation techniques were clearly described, consistent, and adequate for the parameters to be analyzed and the sample matrix;	A
8. Shipping bill of lading or constant surveillance documentation is available;	A
9. The laboratory sample preparation or extraction date is recorded and available;	A
10. The laboratory sample analysis date is recorded and available;	A

Level A Criteria - Soil (Continued)

Criteria	Evaluation Result
11. The laboratory sample preparation technique is recorded and available either in the laboratory report or in the laboratory's approved SOP;	A
12. The methods of analysis are listed in the laboratory reports and are consistent with the methods specified in the QAPP and laboratory contract;	A
13. The laboratory analytical detection limits or limits of quantitation (LOQ) are given in lab reports and are adequate for project objectives;	A
14. Field records include:	
o Soil/sediment log sheets	A
o Water sampling log sheets	N
o QC field checklist	A
o Field instrument calibration logs	A
o Master log book bound with sequentially numbered pages	A
o Daily log book	A
o Chain-of-Custody forms	A
15. All applicable records described above were properly created and are on file;	A
16. Samples passed laboratory data validation without any R flags (samples with J flags may be accepted at this level).	A

Remarks:

All soil data developed during this sampling round is classified Level A for qualitative use.

DATA CLASSIFICATION SUMMARY CHECKLIST

Level B Criteria

Matrix: Soil - 1987

To be classified for Level B use, the data must meet the following criteria:

Criteria	Evaluation Result
A. Data Validation Result	
1. Samples of this matrix have not been flagged J or R during data validation;	P
2. All samples of this matrix have been classified as Level A data;	A
B. Quantitative Statistical Significance	
1. Laboratory and field instruments were properly standardized (calibrated) employing proper methods and records are available;	A
2. Sample bottle preparation was proper and appropriate for the parameters measured and the sample matrix;	A
3. All laboratory procedures were referenced to approved EPA methods and were contained in an approved SOP manual;	A
4. Analytical QC data was available to demonstrate proper instrument calibration;	A
5. Laboratory QC check sample standards are EPA and NBS traceable and were used at least once each three months;	A

Level B Criteria - Soil (Continued)

Criteria	Evaluation Result
6. Laboratory reagent (method) blanks were analyzed at a frequency of at least 1 per 20 samples;	A
7. Laboratory duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
8. Laboratory matrix spikes and matrix spike duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
9. Field replicates were analyzed at a frequency of at least 1 per 20 samples;	A
10. Field blanks were submitted at a frequency of at least 1 per 20 samples;	A
11. One trip blank was submitted for VOCs analysis with each cooler;	A
12. Field split samples were analyzed at a frequency of at least 1 per 20 samples per matrix;	A
13. Appropriate and sufficient QC data with acceptance criteria were presented to allow data validation by the project QA officer;	A
14. The laboratories used were approved by the EPA for participation in the Contract Laboratory Program (CLP);	A
15. The laboratories participated in round-robin testing program by EPA or other accrediting agency;	A
16. Quality control limits were consistent with the limits established for EPA's CLP;	A
17. All samples submitted were analyzed for the requested parameters.	A

Level B Criteria - Soil (Continued)

Criteria	Evaluation Result
C. Custody and Document Control	
1. Field custody of all samples was noted in a bound field log book;	A
2. Transfer of custody documentation (chain-of-custody form) signed by field and laboratory sample custodians is available and properly completed;	A
3. Laboratory custody is documented by a designated lab sample custodian in a master log and a secured sample storage area;	A
4. Sample identification and assigned laboratory tracking numbers are traceable through the entire monitoring system;	A
5. Field notebooks, log sheets, log books, checklists, reports, data validations, and all custody documents are stored in a secure repository or under the control of a document custodian;	A
6. All records, forms, log books, etc., are filled out completely in indelible ink without alterations except as initialed;	A
7. All sample log sheets have been signed by the sample collector;	A
8. Field log book sheets signed by the field sample custodian.	A
D. Sample Representativeness	
1. Compatibility exists between field and laboratory measurements, where applicable, or incompatibilities have been suitably explained;	A

Criteria	Evaluation Result
2. Laboratory analysis and/or sample preparation or extraction were within allowable holding times established for the sample preservation and methods used;	A
3. Sample storage was maintained within suitable temperature, light and moisture conditions to guarantee sample integrity;	A
4. Proper sample containers were used for the parameters analyzed;	A
5. Proper sample collection equipment was used such that the equipment would neither contribute nor remove any substance to or from the sample;	A
6. The sample site selection criteria are consistent with the ojbectives of the investigation and will provide the required data.	A

Remarks:

Section A.1. P Seventeen soil samples from this (1987) sampling round have been flagged J or UJ for various parameters and reasons expained in the Data Qualifer table in the Laboratory Data Validation section for these samples. The values reported for these saples are estimated (Level A) only and may not be classified for Level B use.

Conclusion:

All soils data for the samples collected between June - August 1987 is classified for Level B use except those samples described in Remarks above.

DATA CLASSIFICATION SUMMARY CHECKLIST

Level A Criteria

Matrix: Surface Water - 1987

To be classified for Level A use, the data must meet the following criteria:

Criteria	Evaluation Result
1. Sampling dates were recorded;	A
2. Signatures of Sampling Team on each water sample log or soil sample log;	A
3. Sampling locations were clearly designated and described;	A
4. Sampling depth increment for soils was recorded;	A
5. Sample collection technique was described on water sample log or soil sample log;	A
6. Field preparation techniques were clearly described where applicable;	A
7. Sample preservation techniques were clearly described, consistent, and adequate for the parameters to be analyzed and the sample matrix;	A
8. Shipping bill of lading or constant surveillance documentation is available;	A
9. The laboratory sample preparation or extraction date is recorded and available;	A
10. The laboratory sample analysis date is recorded and available;	A

Level A Criteria - Surface Water (Continued)

Criteria	Evaluation Result
11. The laboratory sample preparation technique is recorded and available either in the laboratory report or in the laboratories approved SOP;	A
12. The methods of analysis are listed in the laboratory reports and are consistent with the methods specified in the QAPP and laboratory contract;	A
13. The laboratory analytical detection limits or limits of quantitation (LOQ) are given in lab reports and are adequate for project objectives;	A
14. Field records include:	
o Soil/sediment log sheets	N
o Water sampling log sheets	A
o QC field checklist	A
o Field instrument calibration logs	A
o Master log book bound with sequentially numbered pages	A
o Daily log book	A
o Chain-of-Custody forms	A
15. All applicable records described above were properly created and are on file;	A
16. Samples passed laboratory data validation without any R flags (samples with J flags may be accepted at this level).	A

<u>Remarks</u>:

All surface water (aqueous) data developed during this sampling round is classified Level A for qualitative use.

DATA CLASSIFICATION SUMMARY CHECKLIST

Level B Criteria

Matrix: Surface Water - 1987

To be classified for Level B use, the data must meet the following criteria:

Criteria	Evaluation Result
A. Data Validation Result	
1. Samples of this matrix have not been flagged J or R during data validation;	P
2. All samples of this matrix have been classified as Level A data;	A
B. Quantitative Statistical Significance	
1. Laboratory and field instruments were properly standardized (calibrated) employing proper methods and records are available;	A
2. Sample bottle preparation was proper and appropriate for the parameters measured and the sample matrix;	A
3. All laboratory procedures were referenced to approved EPA methods and were contained in an approved SOP manual;	A
4. Analytical QC data was available to demonstrate proper instrument calibration;	A
5. Laboratory QC check sample standards are EPA and NBS traceable and were used at least once each three months;	A

Level B Criteria - Surface Water (Continued)

	Criteria	Evaluation Result
6.	Laboratory reagent (method) blanks were analyzed at a frequency of at least 1 per 20 samples;	A
7.	Laboratory duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
8.	Laboratory matrix spikes and matrix spike duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
9.	Field replicates were analyzed at a frequency of at least 1 per 20 samples;	A
10.	Field blanks were submitted at a frequency of at least 1 per 20 samples;	A
11.	One trip blank was submitted for VOCs analysis with each cooler;	A
12.	Field split samples were analyzed at a frequency of at least 1 per 20 samples per matrix;	A
13.	Appropriate and sufficient QC data with acceptance criteria were presented to allow data validation by the project QA officer;	A
14.	The laboratories used were approved by the EPA for participation in the Contract Laboratory Program (CLP);	A
15.	The laboratories participated in round-robin testing program by EPA or other accrediting agency;	A
16.	Quality control limits were consistent with the limits established for EPA's CLP;	A
17.	All samples submitted were analyzed for the requested parameters.	A

Level B Criteria - Surface Water (Continued)

	Criteria	Evaluation Result
C.	Custody and Document Control	
1.	Field custody of all samples was noted in a bound field log book;	A
2.	Transfer of custody documentation (chain-of-custody form) signed by field and laboratory sample custodians is available and properly completed;	A
3.	Laboratory custody is documented by a designated lab sample custodian in a master log and a secured sample storage area;	A
4.	Sample identification and assigned laboratory tracking numbers are traceable through the entire monitoring system;	A
5.	Field notebooks, log sheets, log books, checklists, reports, data validations, and all custody documents are stored in a secure repository or under the control of a document custodian;	A
6.	All records, forms, log books, etc., are filled out completely in indelible ink without alterations except as initialed;	A
7.	All sample log sheets have been signed by the sample collector;	A
8.	Field log book sheets signed by the field sample custodian.	A
D.	Sample Representativeness	
1.	Compatibility exists between field and laboratory measurements or incompatibilities have been suitably explained;	A

Level B Criteria - Surface Water (Continued)

	Criteria	Evaluation Result
2.	Laboratory analysis and/or sample preparation or extraction were within allowable holding times established for the sample preservation and methods used;	A
3.	Sample storage was maintained within suitable temperature, light and moisture conditions to guarantee sample integrity;	A
4.	Proper sample containers were used for the parameters analyzed;	A
5.	Proper sample collection equipment was used such that the equipment would neither contribute nor remove any substance to or from the sample;	A
6.	The sample site selection criteria are consistent with the objectives of the investigation and will provide the required data.	A

Remarks:

Three surface water samples from this sampling round have been flagged J for B/N/A analysis. These samples are LDAWG, LDBWG, and DLSW-Rep 1E and are explained in the Data Qualifer table in the Laboratory Data Validation section for these samples. The values reported for these samples are estimated (Level A) only and may not be classified for Level B use.

Conclusion:

All aqueous or surface water samples not listed under remarks above collected between June - August 1987 are classified for Level B use.

QC SUPPORT DATA

FOR

SOILS AND SURFACE-WATER ANALYSIS

JUNE - AUGUST 1987

SOILS AND SURFACE-WATER ANALYSIS

JUNE - AUGUST 1987

INITIAL AND CONTINUING CALIBRATION CHECKS

ORGANICS

QUALITY CONTROL DATA SUMMARY FOR ORGANIC ANALYSIS

ASSOCIATED SAMPLES: 2916-2918

FRACTION: BNAs

A. TUNING (In chronological order)

B. INITIAL (5-POINT) CALIBRATION

C. CONTINUING CALIBRATION (In chronological order)

D. EPA TRACEABLE SAMPLE

INITIAL CALIBRATION DATA
SEMIVOLATILE HSL COMPOUNDS
(PAGE 1)

CASE NO: 5203
REGION: LAB
INSTRUMENT ID: MSA
CONTRACTOR: VERSAR ESMO
CALIBRATION DATE: 01/27/87
CONTRACT NO:

MINIMUM AVE RF FOR SPCC IS 0.050   MAXIMUM %RSD FOR CCC IS 30%

LABORATORY ID	012751A1	012752A1	012753A1	012754A2	012755A2			CCC*
COMPOUND	RF(20)	RF(50)	RF(80)	RF(120)	RF(160)	AVE RF	% RSD	SPCC**
PHENOL	1.927	1.839	1.613	1.610	1.528	1.703	10.0 ✓	*
BIS(2-CHLOROETHYL)ETHER . . .	1.839	1.762	1.664	1.652	1.582	1.700	5.9	
2-CHLOROPHENOL	1.725	1.618	1.450	1.441	1.455	1.538	8.3	
1,3-DICHLOROBENZENE	1.938	1.802	1.719	1.692	1.707	1.772	5.8	
1,4-DICHLOROBENZENE	2.047	1.863	1.789	1.708	1.722	1.826	7.6 ✓	*
BENZYL ALCOHOL	0.952	0.961	0.891	0.910	0.940	0.931	3.2	
1,2-DICHLOROBENZENE	1.960	1.775	1.700	1.664	1.684	1.757	6.9	
2-METHYLPHENOL	0.952	0.961	0.891	0.910	0.940	0.931	3.2	
BIS(2-CHLOROISOPROPYL)ETHER .	2.096	2.056	1.860	1.914	1.849	1.955	5.8	
4-METHYLPHENOL	1.509	1.384	1.273	1.244	1.255	1.333	8.5	
N-NITROSO-DI-N-PROPYLAMINE . .	1.621	1.628	1.478	1.902	1.871	1.700 ✓	10.6	* *
HEXACHLOROETHANE	0.936	0.918	0.882	0.864	0.884	0.897	3.3	
NITROBENZENE	0.543	0.518	0.486	0.478	0.487	0.502	5.4	
ISOPHORONE	1.011	0.950	0.954	0.968	0.962	0.969	2.5	
2-NITROPHENOL	0.198	0.201	0.206	0.214	0.215	0.207	3.7 ✓	*
2,4-DIMETHYLPHENOL	0.319	0.307	0.311	0.314	0.314	0.313	1.4	
BENZOIC ACID	X	0.109	0.095	0.177	0.090	0.118	34.2	
BIS(2-CHLOROETHOXY)METHANE . .	0.535	0.497	0.493	0.493	0.495	0.503	3.6	
2,4-DICHLOROPHENOL	0.325	0.290	0.291	0.293	0.292	0.298	5.0 ✓	*
1,2,4-TRICHLOROBENZENE	0.403	0.353	0.353	0.336	0.336	0.356	7.7	
NAPHTHALENE	1.153	1.028	0.996	0.951	0.947	1.015	8.3	
4-CHLOROANILINE	0.135	0.166	0.182	0.258	0.154	0.179	26.5	
HEXACHLOROBUTADIENE	0.264	0.228	0.241	0.225	0.220	0.236	7.5 ✓	*
4-CHLORO-3-METHYLPHENOL . . .	0.402	0.368	0.374	0.372	0.359	0.375	4.3 ✓	*
2-METHYLNAPHTHALENE	1.048	0.650	0.841	0.819	0.816	0.875	11.2	
HEXACHLOROCYCLOPENTADIENE . .	0.252	0.230	0.239	0.287	0.301	0.262 ✓	11.8	* *
2,4,6-TRICHLOROPHENOL	0.427	0.405	0.429	0.491	0.556	0.462	13.4 ✓	*
2,4,5-TRICHLOROPHENOL	X	0.423	0.418	0.346	0.279	0.367	18.6	
2-CHLORONAPHTHALENE	1.463	1.285	1.285	1.261	1.263	1.311	6.5	
2-NITROANILINE	X	0.461	0.390	0.402	0.434	0.422	7.6	
DIMETHYL PHTHALATE	1.868	1.674	1.289	1.599	1.154	1.517	19.2	
ACENAPHTHALENE	1.988	1.832	1.800	1.690	1.723	1.807	6.4	
3-NITROANILINE	X	0.109	0.084	0.060	0.117	0.093	27.9	
ACENAPHTHENE	1.514	1.290	1.273	0.998	0.874	1.190	21.4 ✓	*
2,4-DINITROPHENOL	X	0.117	0.108	0.113	0.114	0.113 ✓	3.3	* *
4-NITROPHENOL	X	0.189	0.115	1.055	0.121	0.370 ✓	123.8	* *
DIBENZOFURAN	2.321	1.872	1.826	1.786	1.209	1.803	22.0	

RESPONSE FACTOR (NUMBER IS THE AMOUNT OF NANOGRAMS)
AVE RF - AVERAGE RESPONSE FACTOR
%RSD - - PERCENT RELATIVE STANDARD DEVIATION
CCC - - CALIBRATION CHECK COMPOUNDS (*)
SPCC - - SYSTEM PERFORMANCE CHECK COMPOUNDS (**)
X - - - NOT DETECTABLE AT 20 NG

FORM VI

INITIAL CALIBRATION DATA
SEMIVOLATILE HSL COMPOUNDS
(PAGE 1)

CASE NO: 5203
REGION: LAB
INSTRUMENT ID: MSA
ONTRACTOR: VERSAR ESMD
CALIBRATION DATE: 01/27/87
ONTRACT NO:

MINIMUM AVE RF FOR SPCC IS 0.050   MAXIMUM %RSD FOR CCC IS 30%

LABORATORY ID	012751A1	012752A1	012753A1	012754A2	012755A2			CCC*
COMPOUND	RF(20)	RF(50)	RF(80)	RF(120)	RF(160)	AVE RF	% RSD	SPCC**
PHENOL	1.927	1.839	1.613	1.610	1.528	1.703	10.0 ✓	*
BIS(2-CHLOROETHYL)ETHER	1.839	1.762	1.664	1.652	1.582	1.700	5.9	
2-CHLOROPHENOL	1.725	1.618	1.450	1.441	1.455	1.538	8.3	
1,3-DICHLOROBENZENE	1.938	1.902	1.719	1.692	1.707	1.772	5.8	
1,4-DICHLOROBENZENE	2.047	1.863	1.789	1.708	1.722	1.826	7.6 ✓	*
BENZYL ALCOHOL	0.952	0.961	0.891	0.910	0.940	0.931	3.2	
1,2-DICHLOROBENZENE	1.960	1.775	1.700	1.664	1.684	1.757	6.9	
2-METHYLPHENOL	0.952	0.961	0.891	0.910	0.940	0.931	3.2	
BIS(2-CHLOROISOPROPYL)ETHER	2.096	2.056	1.860	1.914	1.849	1.955	5.8	
4-METHYLPHENOL	1.509	1.384	1.273	1.244	1.255	1.333	8.5	
N-NITROSO-DI-N-PROPYLAMINE	1.621	1.628	1.478	1.902	1.871	1.700 ✓	10.6	* *
HEXACHLOROETHANE	0.936	0.918	0.882	0.864	0.884	0.897	3.3	
NITROBENZENE	0.543	0.518	0.486	0.478	0.487	0.502	5.4	
ISOPHORONE	1.011	0.950	0.954	0.968	0.962	0.969	2.5	
2-NITROPHENOL	0.198	0.201	0.206	0.214	0.215	0.207	3.7 ✓	*
2,4-DIMETHYLPHENOL	0.319	0.307	0.311	0.314	0.314	0.313	1.4	
BENZOIC ACID	X	0.109	0.095	0.177	0.090	0.118	34.2	
IS(2-CHLOROETHOXY)METHANE	0.535	0.497	0.493	0.493	0.495	0.503	3.6	
,4-DICHLOROPHENOL	0.325	0.290	0.291	0.293	0.292	0.298	5.0 ✓	*
1,2,4-TRICHLOROBENZENE	0.403	0.353	0.353	0.336	0.336	0.356	7.7	
NAPHTHALENE	1.153	1.028	0.996	0.951	0.947	1.015	8.3	
4-CHLOROANILINE	0.135	0.166	0.182	0.258	0.154	0.179	26.5	
HEXACHLOROBUTADIENE	0.264	0.228	0.241	0.225	0.220	0.236	7.5 ✓	*
4-CHLORO-3-METHYLPHENOL	0.402	0.368	0.374	0.372	0.359	0.375	4.3 ✓	*
2-METHYLNAPHTHALENE	1.048	0.850	0.841	0.819	0.816	0.875	11.2	
HEXACHLOROCYCLOPENTADIENE	0.252	0.230	0.239	0.287	0.301	0.262 ✓	11.9	* *
2,4,6-TRICHLOROPHENOL	0.427	0.405	0.429	0.491	0.556	0.462	13.4 ✓	*
2,4,5-TRICHLOROPHENOL	X	0.423	0.416	0.346	0.279	0.367	16.6	
2-CHLORONAPHTHALENE	1.463	1.295	1.285	1.261	1.263	1.311	6.5	
2-NITROANILINE	X	0.461	0.390	0.402	0.434	0.422	7.6	
DIMETHYL PHTHALATE	1.868	1.674	1.289	1.599	1.154	1.517	19.2	
ACENAPHTHALENE	1.988	1.832	1.800	1.690	1.723	1.807	6.4	
3-NITROANILINE	X	0.109	0.084	0.060	0.117	0.093	27.9	
ACENAPHTHENE	1.514	1.290	1.273	0.998	0.874	1.190	21.4 ✓	*
2,4-DINITROPHENOL	X	0.117	0.108	0.113	0.114	0.113 ✓	3.3	* *
4-NITROPHENOL	X	0.139	0.115	1.055	0.121	0.370 ✓	123.8	* *
DIBENZOFURAN	2.321	1.872	1.826	1.786	1.209	1.803	22.0	

RESPONSE FACTOR (NUMBER IS THE AMOUNT OF NANOGRAMS)
AVE RF - AVERAGE RESPONSE FACTOR
%RSD - - PERCENT RELATIVE STANDARD DEVIATION
CCC - - CALIBRATION CHECK COMPOUNDS (*)
SPCC - - SYSTEM PERFORMANCE CHECK COMPOUNDS (**)
X - - - NOT DETECTABLE AT 20 NG

FORM VI

271-13 [illegible]

```
                     GC/MS TUNING AND MASS CALIBRATION
                        DECAFLUOROTRIPHENYLPHOSPHINE

CASE NUMBER:  000000      LABORATORY:  MMES      CONTRACT:   000000
INST ID:      MS1         SENS DATE:  07/09/87   SENS TIME:   9:40:00
LAB ID:       0708DFTA2   CALI DATE:  04/15/86   ANALYST:    KW
DATA RELEASE AUTHORIZED BY:
                                ____________________

  M/E      ION ABUNDANCE CRITERIA                    SPEC # 604
  ===      ======================                    ==========

  51       30 TO 60% OF MASS 198                       39.61
  68       LESS THAN 2% OF MASS 69                      0.00   ( 0.00) 1
  69       MASS 69 RELATIVE ABUNDANCE                  61.14
  70       LESS THAN 2% OF MASS 69                      0.00   ( 0.00) 1
  127      40 TO 60% OF MASS 198                       57.80
  197      LESS THAN 1% OF MASS 198                     0.00
  198      BASE PEAK, 100% RELATIVE ABUNDANCE         100.00
  199      5 TO 9% OF MASS 198                          7.94
  275      10 TO 30% OF MASS 198                       27.07
  365      GREATER THAN 1% OF MASS 198                  5.17
  441      LESS THAN MASS 443                          11.79
  442      GREATER THAN 40% OF MASS 198                69.11
  443      17 TO 23% OF MASS 442                       15.20   (22.00) 2

    1 - VALUE IN PARENTHESIS IS % OF MASS 69
    2 - VALUE IN PARENTHESIS IS % OF MASS 442
```

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 1)

ase No: 5203 Region: ______ Calibration Date: 07/09/87
ntractor: VERSAR ESMO Time: 11:29
Contract No: ______ Laboratory ID: 0709S2A2
Instrument ID: MS-A Initial Cali. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
Phenol		1.703	1.827	-7.3 ✓	*	
bis(2-Chloroethyl)Ether		1.700	1.547	9.0		
2-Chlorophenol		1.538	1.603	-4.2		
1,3-Dichlorobenzene		1.772	1.675	5.5		
1,4-Dichlorobenzene		1.826	1.705	6.6 ✓	*	
Benzyl Alcohol		0.931				
1,2-Dichlorobenzene		1.757	1.678	4.5		
2-Methylphenol		0.931				
bis(2-Chloroisopropyl)Ether		1.955	1.395	28.6		
4-Methylphenol		1.333				
N-Nitroso-Di-n-Propylamine		1.700 ✓	1.302 ✓	23.4		* *
Hexachloroethane		0.897	1.006	-12.2		
Nitrobenzene		0.502	0.896	-78.5		
Isophorone		0.969	0.987	-1.9		
2-Nitrophenol		0.207	0.235	-13.5 ✓	*	
2,4-Dimethylphenol		0.313	0.561	-79.2		
Benzoic Acid	x	0.118				
s(2-Chloroethoxy)Methane		0.503	0.547	-8.7		
,4-Dichlorophenol		0.298	0.302	-1.3 ✓	*	
1,2,4-Trichlorobenzene		0.356	0.359	-0.8		
Naphthalene		1.015	1.086	-7.0		
4-Chloroaniline		0.179				
Hexachlorobutadiene		0.236	0.264	-11.9 ✓	*	
4-Chloro-3-Methylphenol		0.375	0.447	-19.2 ✓	*	
2-Methylnaphthalene		0.875				
Hexachlorocyclopentadiene		0.262 ✓	0.334 ✓	-27.5		* *
2,4,6-Trichlorophenol		0.462	0.387	16.2 ✓	*	
2,4,5-Trichlorophenol	x	0.367				
2-Chloronaphthalene		1.311	1.176	10.3		
2-Nitroaniline	x	0.422				
Dimethyl Phthalate		1.517	1.572	-3.6		
Acenaphthalene		1.807	1.713	5.2		
2,6-Dinitrotoluene			0.267			
3-Nitroaniline	x	0.093				
Acenaphthene		1.190	1.250	-5.0 ✓	*	
2,4-Dinitrophenol	x	0.113 ✓	0.144 ✓	-27.4		* *

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
. - - - Due to low response analyze at 80 total nanograms
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 2)

Case No: 5203 Region: ______ Calibration Date: 07/09/87
Contractor: VERSAR ESMO Time: 11:29
Contract No: ______ Laboratory ID: 0709S2A2
Instrument ID: MS-A Initial Cali. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
4-Nitrophenol	x	0.370	0.335	9.5		* *
Dibenzofuran		1.803				
2,4-Dinitrotoluene		0.344	0.428	-24.4		
Diethylphthalate		1.686	1.839	-9.1		
4-Chlorophenyl-phenylether . .		0.676	0.680	-0.6		
Fluorene		1.275	1.328	-4.2		
4-Nitroaniline	x	0.097				
4,6-Dinitro-2-Methylphenol . .	x	0.128	0.151	-18.0		
N-Nitrosodiphenylamine		0.494	0.459	7.1	*	
4-Bromophenyl-phenylether . .		0.316	0.303	4.1		
Hexachlorobenzene		0.373	0.398	-6.7		
Pentachlorophenol	x	0.160	0.193	-20.6	*	
Phenanthrene		1.193	1.138	4.6		
Anthracene		1.194	1.089	8.8		
Di-n-Butylphthalate		1.615	1.632	-1.1		
Fluoranthene		1.228	1.190	3.1	*	
Pyrene		1.449	1.831	-26.4		
Butylbenzylphthalate		0.758	0.877	-15.7		
3,3'-Dichlorobenzidine		0.051	0.136	-166.7		
Benzo(a)Anthracene		1.100	1.089	1.0		
Chrysene		1.128	1.059	6.1		
bis(2-Ethylhexyl)Phthalate . .		1.072	1.070	0.2		
Chrysene						
Di-n-Octyl Phthalate		2.656	2.013	24.2	*	
Benzo(b+k)fluoranthenes . . .			1.376			
Benzo(b)fluoranthene		1.564				
Benzo(k)fluoranthene		1.568				
Benzo(a)Pyrene		1.209	1.231	-1.8	*	
Indeno(1,2,3-cd)Pyrene		0.701	1.086	-54.9		
Dibenz(a,h)Anthracene		0.705	0.757	-7.4		
Benzo(g,h,i)Perylene		0.724	0.876	-21.0		
Perylene						
C8 to C20 HYDROCARBONS						

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
x - - - Due to low response analyze at 80 total nanograms
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)

Form VII

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Semivolatile Compounds

CLIENT SAMPLE ID:	USEPA-QC SPIKE
LAB SAMPLE ID:	EPAQC0415
SAMPLE DATE:	04/09/87
EXTRACTION DATE:	04/09/87
ANALYSIS DATE:	04/15/87
FILE NAME:	EPAQC0415
INSTRUMENT ID:	MSA
MATRIX:	WATER
UNITS:	UG/L

COMPOUNDS			
Acenaphthalene		< 10	
Acenaphthene		17	19.5
Anthracene		32	40
Benzidine		< 80	
Benzo(a)Anthracene		< 10	
Benzo(a)Pyrene		18	24.9
Benzo(b+k)fluoranthenes		31	40
Benzo(g,h,i)Perylene		69	80.4
4-Bromophenyl-phenylether		38	41.5
Butylbenzylphthalate		42	51.3
4-Chloro-3-Methylphenol		59	75
bis(2-Chloroethoxy)Methane		< 10	
2-Chloroethyl)Ether		< 10	
bis(2-Chloroisopropyl)Ether		30	38.8
2-Chloronaphthalene		< 10	
2-Chlorophenol		24	30
4-Chlorophenyl-phenylether		71	76.7
Chrysene		59	69.9
Di-n-Butylphthalate		< 10	
Di-n-Octyl Phthalate		< 10	
Dibenz(a,h)Anthracene		↑ 50	40.7
1,2-Dichlorobenzene		< 10	
1,4-Dichlorobenzene		22	24.8
1,3-Dichlorobenzene		< 10	
3,3'-Dichlorobenzidine		< 20	
2,4-Dichlorophenol		42	50
Diethylphthalate		< 10	
Dimethyl Phthalate		44	40
2,4-Dimethylphenol		14	30
4,6-Dinitro-2-Methylphenol		147	250
2,4-Dinitrophenol		< 50	
2,4-Dinitrotoluene		< 10	
2,6-Dinitrotoluene		< 10	
1 2-Diphenylhydrazine		< 10	
-Ethylhexyl)Phthalate	29.1	25	
F uoranthene	29.8	30	

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincinnati

Water Pollution Quality Control Samples

GC/MS BASE NEUTRALS - II

TRUE VALUES

When diluted to volume according to the instruction, the sample contai- following compounds at these concentration expressed as ug/liter.

Parameter	Sample (3) 4/9/87
1,4-Dichlorobenzene	24.8 ✓
Bis (2 chloroisopropyl) ether	38.8 ✓
Hexachloroethane	30.0 ✓
Nitrobenzene	76.5 ✓
Naphthalene	24.8 ✓
Dimethyl Phthalate	40.0 ✓
Acenaphthene	19.5 ✓
Fluorene	51.2 ✓
4-Chlorophenyl phenyl ether	76.7 ✓
4-Bromophenyl phenyl ether	41.5 ✓
Anthracene	40.0 ✓
Fluoranthene	29.8 ✓
Butyl Benzl Phthalate	51.3 ✓
Chrysene	69.9 ✓
Ethyl Hexyl Phthalate	29.1 ✓
Benzo (b) Fluoranthene	40.0 ✓
Benzo (a) Pyrene	24.9 ✓
Dibenzo (a,h) Anthracene	40.7 ✓
Benzo (g,h,i) perylene	80.4 ✓

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincinnati

Water Pollution Quality Control Samples

GC/MS ACIDS

TRUE VALUES

When diluted to volume according to the instructions, the samples contain the following compounds at these concentrations expressed as ug/liter.

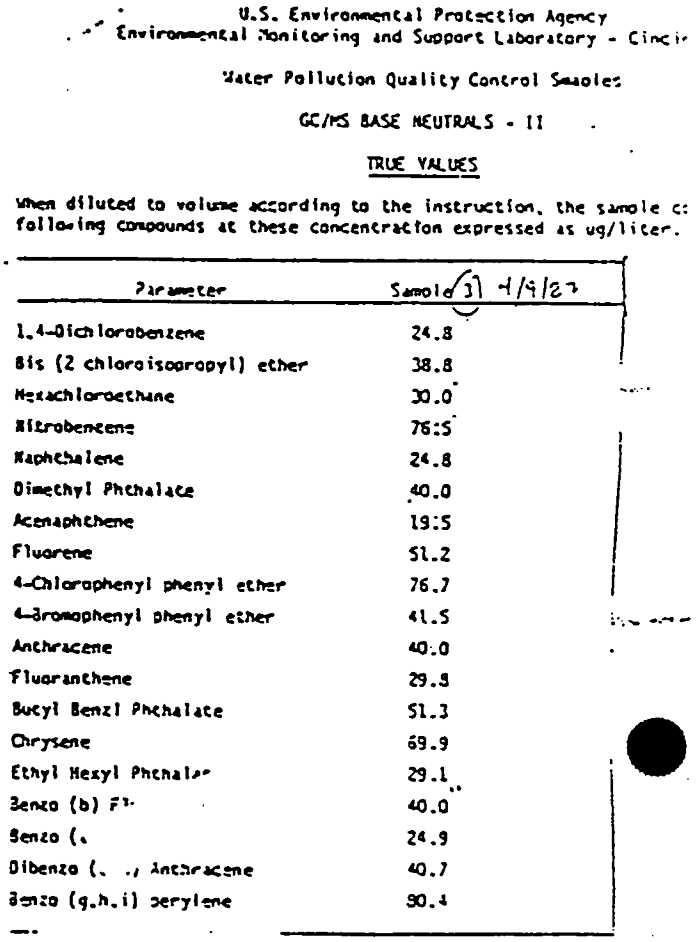
Parameter	Sample (1) 4/9/87
2-Chlorophenol	30 ✓
2-Nitrophenol	50 ✓
Phenol	100 ✓
2,4-Dimethylphenol	30 ✓
2,4-Dichlorophenol	50 ✓
2,4,6-Trichlorophenol	25 ✓
4-Chloro-3-methylphenol	75 ✓
2-[illegible]-4,6-dinitrophenol	250 ✓
ophenol	75 ✓
ophenol	50

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Semivolatile Compounds

CLIENT SAMPLE ID:	USEPA-QC SPIKE
LAB SAMPLE ID:	EPAQC0415
SAMPLE DATE:	04/09/87
EXTRACTION DATE:	04/09/87
ANALYSIS DATE:	04/15/87
FILE NAME:	EPAQC0415
INSTRUMENT ID:	MSA
MATRIX:	WATER
UNITS:	UG/L

COMPOUNDS			
Fluorene		41	51.2
Hexachlorobenzene	<	10	
Hexachlorobutadiene	<	10	
Hexachlorocyclopentadiene	<	10	
Hexachloroethane		26	30.0
Indeno(1,2,3-cd)Pyrene	<	10	
Isophorone	<	10	
N-Nitroso-Di-n-Propylamine	<	10	
N-Nitrosodimethylamine	<	5	
N-Nitrosodiphenylamine	<	10	
Naphthalene		21	24.8
Nitrobenzene		62	76.5
4-Nitrophenol	③	50	50
2-Nitrophenol		38	50
Pentachlorophenol		80	75
Phenanthrene	<	10	
Phenol		69	100
Pyrene	<	10	
1,2,4-Trichlorobenzene	<	10	
2,4,6-Trichlorophenol		22	25



U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cinci

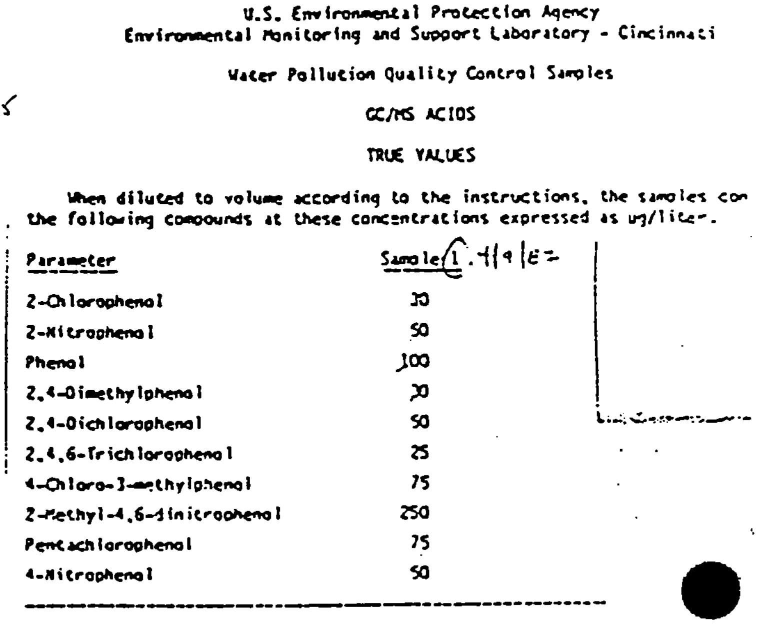
Water Pollution Quality Control Samples

GC/MS BASE NEUTRALS - II

TRUE VALUES

When diluted to volume according to the instruction, the sample c
following compounds at these concentration expressed as ug/liter.

Parameter	Sample ③ 4/9/87
1,4-Dichlorobenzene	24.8
Bis (2 chloroisopropyl) ether	38.8
Hexachloroethane	30.0
Nitrobenzene	76.5
Naphthalene	24.8
Dimethyl Phthalate	40.0
Acenaphthene	19.5
Fluorene	51.2
4-Chlorophenyl phenyl ether	76.7
4-Bromophenyl phenyl ether	41.5
Anthracene	40.0
Fluoranthene	29.9
Butyl Benzl Phthalate	51.3
Chrysene	69.9
Ethyl Hexyl Phthala	29.1
Benzo (b) F	40.0
Benzo (	24.9
Dibenzo ([illegible] Anthracene	40.7
Benzo (g,h,i) perylene	90.4



U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincinnati

Water Pollution Quality Control Samples

GC/MS ACIDS

TRUE VALUES

When diluted to volume according to the instructions, the samples con
the following compounds at these concentrations expressed as ug/liter.

Parameter	Sample ① 4/9/87
2-Chlorophenol	30
2-Nitrophenol	50
Phenol	100
2,4-Dimethylphenol	30
2,4-Dichlorophenol	50
2,4,6-Trichlorophenol	25
4-Chloro-3-methylphenol	75
2-Methyl-4,6-dinitrophenol	250
Pentachlorophenol	75
4-Nitrophenol	50

< - less than d[illegible]ation level

QUALITY CONTROL DATA SUMMARY
FOR ORGANIC ANALYSIS

ASSOCIATED SAMPLES: 2925-2931

FRACTION: VOLATILES

A. TUNING (In chronological order)

B. INITIAL (5-POINT) CALIBRATION

C. CONTINUING CALIBRATION (In chronological order)

D. EPA TRACEABLE SAMPLE

6A

VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: VERSAR ESMO Contract: ________

Lab Code: ______ Case No. ______ SAS No.: ______ SDG No.: ______

Instrument ID: MS-C Calibration Date(s): 07/27/87 07/27/87

Matrix: (soil/water) WATER Level: (low/med) LOW Column: (pack/cap) PACK

Min RRF for SPCC(#) = 0.300 (0.250 for Bromoform) Max %RSD for CCC(*) = 30.0%

LAB FILE ID: RRF20 = 0727V1C1 RRF50 = 0727V2C1
RRF100= 0727V3C1 RRF150= 0727V4C1 RRF200= 0727V5C1

COMPOUND	RRF20	RRF50	RRF100	RRF150	RRF200	RRF	% RSD
Chloromethane #	3.947	4.156	3.091	2.914	3.027	3.427	16.9#
Bromomethane	1.944	2.096	1.693	1.542	1.553	1.766	13.9
Vinyl Chloride *	2.402	2.652	2.023	2.093	2.137	2.261	11.6*
Chloroethane	0.907	0.927	0.827	0.848	0.847	0.871	5.0
Methylene Chloride	1.950	1.878	1.690	1.581	1.631	1.746	9.2
Acetone	0.940	0.681	0.687	0.590	0.670	0.714	18.6
Carbon Disulfide	4.876	4.363	4.115	4.014	4.207	4.315	7.9
1,1-Dichloroethene *	1.606	1.347	1.311	1.304	1.354	1.384	9.1*
1,1-Dichloroethane #	3.545	3.037	3.159	3.092	3.199	3.206	6.2#
1,2-Dichloroethene (total)	1.807	1.458	1.543	1.466	1.529	1.561	9.1
Chloroform *	3.791	3.153	3.336	3.205	3.379	3.373	7.5*
1,2-Dichloroethane	2.766	2.265	2.494	2.391	2.524	2.488	7.5
2-Butanone	0.073	0.031	0.036	0.029	0.029	0.040	47.2
1,1,1-Trichloroethane	0.560	0.427	0.397	0.383	0.388	0.431	17.2
Carbon Tetrachloride	0.535	0.402	0.398	0.387	0.388	0.422	15.1
Vinyl Acetate	0.862	0.675	0.474	0.334	0.121	0.493	58.6
Bromodichloromethane	0.761	0.590	0.580	0.622	0.568	0.624	12.7
1,2-Dichloropropane *	0.576	0.441	0.477	0.474	0.479	0.489	10.4*
cis-1,3-Dichloropropene	0.662	0.521	0.596	0.589	0.598	0.593	8.4
Trichloroethene	0.418	0.334	0.390	0.380	0.399	0.384	8.2
Dibromochloromethane	0.573	0.433	0.507	0.493	0.517	0.505	10.0
1,1,2-Trichloroethane	0.389	0.286	0.324	0.313	0.322	0.327	11.6
Benzene	1.313	0.984	1.050	1.016	1.037	1.080	12.3
trans-1,3-Dichloropropene	0.406	0.309	0.374	0.382	0.598	0.414	26.3
2-Chloroethylvinylether	0.144	0.153	0.167	0.170	0.184	0.164	9.5
Bromoform #	0.348	0.250	0.299	0.290	0.309	0.299	11.8#
4-Methyl-2-pentanone	0.566	0.397	0.444	0.480	0.515	0.480	13.5
2-Hexanone	0.479	0.309	0.375	0.386	0.407	0.391	15.7
Tetrachloroethene	0.447	0.343	0.375	0.359	0.366	0.378	10.7
1,1,2,2-Tetrachloroethane #	0.766	0.557	0.607	0.588	0.577	0.619	13.6#
Toluene *	0.959	0.734	0.783	0.767	0.771	0.803	11.1*
Chlorobenzene #	1.187	0.870	0.920	0.903	0.904	0.957	13.6#
Ethylbenzene *	0.571	0.444	0.474	0.474	0.472	0.487	10.0*
Styrene	0.961	0.756	0.848	0.851	0.860	0.855	8.5
Xylene (total)	0.684	0.489	0.564	0.560	0.556	0.571	12.4
Toluene-d8	1.065	1.025	0.964	0.971	1.014	1.008	4.1
BFB	0.839	0.707	0.704	0.688	0.734	0.734	8.3
1,2-Dichloroethane-d4	2.481	2.379	2.339	2.253	2.428	2.376	3.7

FORM VI VOA 1/87 Rev.

INITIAL CALIBRATION DATA
VOLATILE HSL COMPOUNDS

CASE NO: 45 REGION: W INSTRUMENT ID: MS-C
CONTRACTOR: MM ENV SYSTEMS CALIBRATION DATE: 06/24/87
RACT NO:

MIN AVE RF FOR SPCC IS 0.300 (1) MAX %RSD FOR CCC IS 30%

LABORATORY ID	0624V1C1	0624V2C3	0624V3C1	0624V4C1	0624V5C1 :			CCC*
COMPOUND	RF(20)	RF(50)	RF(100)	RF(150)	RF(200) :	AVE RF	% RSD	SPCC**
CHLOROMETHANE	2.190	1.890	1.846	1.982	1.840 :	1.950	7.5	* *
BROMOMETHANE	1.447	1.282	1.244	1.379	1.259 :	1.322	6.6	
VINYL CHLORIDE	1.480	1.321	1.254	1.384	1.281 :	1.344	6.7	*
CHLOROETHANE	0.635	0.556	0.530	0.545	0.509 :	0.555	8.7	
METHYLENE CHLORIDE	1.534	1.385	1.340	1.361	1.378 :	1.400	5.5	
ACETONE	0.829	0.554	0.518	0.526	0.524 :	0.590	22.7	
CARBON DISULFIDE	3.118	2.679	2.787	3.083	3.031 :	2.940	6.6	
1,1-DICHLOROETHENE	1.328	1.190	1.198	1.234	1.257 :	1.241	4.5	*
1,1-DICHLOROETHANE	2.682	2.381	2.432	2.428	2.449 :	2.474	4.8	* *
1,2-DICHLOROETHENE (TOTAL) . .	1.433	1.320	1.310	1.303	1.320 :	1.337	4.0	
CHLOROFORM	3.136	2.862	2.843	2.878	2.943 :	2.932	4.1	*
1,2-DICHLOROETHANE	2.713	2.419	2.400	2.304	2.194 :	2.406	8.0	
2-BUTANONE	0.027	0.026	0.027	0.027	0.028 :	0.027	2.6	
1,1,1-TRICHLOROETHANE	0.416	0.375	0.406	0.408	0.445 :	0.410	6.1	
CARBON TETRACHLORIDE	0.404	0.373	0.420	0.421	0.466 :	0.417	8.1	
VINYL ACETATE	0.563	0.424	0.417	0.399	0.410 :	0.443	15.3	
BROMODICHLOROMETHANE	0.492	0.486	0.511	0.520	0.566 :	0.515	6.1	
1,2-DICHLOROPROPANE	0.413	0.385	0.397	0.415	0.393 :	0.401	3.2	*
,3-DICHLOROPROPENE . . .	0.350	0.372	0.411	0.459	0.439 :	0.406	11.2	
TRICHLOROETHENE	0.355	0.364	0.398	0.388	0.414 :	0.384	6.3	
DIBROMOCHLOROMETHANE	0.365	0.457	0.520	0.538	0.577 :	0.491	16.9	
1,1,2-TRICHLOROETHANE	0.294	0.317	0.317	0.320	0.333 :	0.316	4.4	
BENZENE	0.883	0.841	0.876	0.865	0.932 :	0.879	3.8	
TRANS-1,3-DICHLOROPROPENE . .	0.226	0.252	0.288	0.316	0.345 :	0.285	16.7	
BROMOFORM	0.263	0.313	0.358	0.376	0.416 :	0.345	17.1	* *
4-METHYL-2-PENTANONE	0.387	0.393	0.403	0.404	0.444 :	0.406	5.5	
2-HEXANONE	0.401	0.298	0.318	0.334	0.355 :	0.341	11.6	
TETRACHLOROETHENE	0.434	0.399	0.419	0.417	0.436 :	0.421	3.6	
1,1,2,2-TETRACHLOROETHANE . .	0.576	0.570	0.566	0.575	0.606 :	0.579	2.7	* *
TOLUENE	0.669	0.636	0.647	0.638	0.676 :	0.653	2.8	*
CHLOROBENZENE	0.893	0.854	0.848	0.836	0.890 :	0.864	3.0	* *
ETHYLBENZENE	0.395	0.365	0.383	0.376	0.398 :	0.383	3.6	*
STYRENE	0.683	0.651	0.705	0.686	0.736 :	0.692	4.5	
XYLENE (TOTAL)	0.419	0.418	0.422	0.393	0.429 :	0.416	3.3	
TOLUENE-D8	1.139	1.012	1.026	1.054	1.027 :	1.052	4.9	
BFB	0.818	0.700	0.700	0.716	0.718 :	0.730	6.8	
1,2-DICHLOROETHANE-D4	2.540	2.189	2.121	2.181	2.013 :	2.209	9.0	

RESPONSE FACTOR (NUMBER IS THE AMOUNT OF UG/L)
AVE RF - AVERAGE RESPONSE FACTOR
%RSD - - PERCENT RELATIVE STANDARD DEVIATION
CCC - - CALIBRATION CHECK COMPOUNDS (*)
C - - SYSTEM PERFORMANCE CHECK COMPOUNDS (**)
(1) - - MINIMUM AVE RF FOR BROMOFORM IS 0.250

FORM VI

GC/MS Tuning and Mass Calibration

BROMOFLUOROBENZENE

Case Number:	5203	Laboratory:	VERSAR, ESMO	Contract:	
Inst ID:	MS2	Sens Date:	06/25/87	Sens Time:	8:10:00
Lab ID:	0625BFBB1	Cali Date:	6/10/86	Analyst:	DC

Data release authorized by: ______________________________

m/z	Ion Abundance Criteria	Spec # 225	
50	15 to 40% of mass 95	23.04	
75	30 to 60% of mass 95	47.97	
95	base peak, 100% relative abundance	100.00	
96	5 to 9% of mass 95	6.78	
173	less than 1% of mass 95	0.00	
174	greater than 50% of mass 95	84.94	
175	5 to 9% of mass 174	5.84	(6.87) 1
176	between 95% and 101% of mass 174	85.66	(*100.) 1
177	5 to 9% of mass 176	5.12	(5.98) 2

1 - value in parenthesis is % of mass 174
2 - value in parenthesis is % of mass 176

GC/MS TUNING AND MASS CALIBRATION
BROMOFLUOROBENZENE

CASE NUMBER: . e
LABORATORY: . e
CONTRACT: . e

INST ID: MS3 SENS DATE: 06/26/87 SENS TIME: 10:23:00
LAB ID: 0626BFBC2 CALI DATE: . e
ANALYST: DC
DATA RELEASE AUTHORIZED BY: ______________________

M/E	ION ABUNDANCE CRITERIA	SPEC # 231	
50	15 TO 40% OF MASS 95	15.36	
75	30 TO 60% OF MASS 95	36.54	
95	BASE PEAK, 100% RELATIVE ABUNDANCE	100.00	
96	5 TO 9% OF MASS 95	6.95	
173	LESS THAN 1% OF MASS 95	0.00	
174	GREATER THAN 50% OF MASS 95	66.32	
175	5 TO 9% OF MASS 174	5.09	(7.68) 1
176	BETWEEN 95% AND 101% OF MASS 174	65.80	(99.21) 1
177	5 TO 9% OF MASS 176	4.25	(6.46) 2

1 - VALUE IN PARENTHESIS IS % OF MASS 174
2 - VALUE IN PARENTHESIS IS % OF MASS 176

GC/MS Tuning and Mass Calibration

BROMOFLUOROBENZENE

Case Number:	5203	Laboratory:	VERSAR, ESMO	Contract:	
Inst ID:	MS2	Sens Date:	06/29/87	Sens Time:	9:48:00
Lab ID:	0629BFBB1	Cali Date:	6/10/86	Analyst:	DC

Data release authorized by: ____________________

m/z	Ion Abundance Criteria	Spec # 225	
50	15 to 40% of mass 95	31.04	
75	30 to 60% of mass 95	47.23	
95	base peak, 100% relative abundance	100.00	
96	5 to 9% of mass 95	6.93	
173	less than 1% of mass 95	0.00	
174	greater than 50% of mass 95	78.57	
175	5 to 9% of mass 174	4.75	(6.05) 1
176	between 95% and 101% of mass 174	78.67	(*100.) 1
177	5 to 9% of mass 176	3.97	(5.05) 2

1 - value in parenthesis is % of mass 174

2 - value in parenthesis is % of mass 176

CONTINUING CALIBRATION CHECK
VOLATILE HSL COMPOUNDS

Case No: 4 Region: VERSAR
tractor: MM ENV SYSTEMS
tract No:
Instrument ID: MS-B

Calibration Date: 06/25/87
Time: 09:22
Laboratory ID: 0625V2B1
Initial Cali. Date: 03/23/87

Minimum RF for SPCC is 0.300 (1) Maximum %D for CCC is 25%

Compound	AVE RF	RF(50)	% D	CCC	SPCC
Chloromethane	5.308	3.698	30.3		* *
Bromomethane	1.885	1.684	10.7		
Vinyl Chloride	2.996	2.486	17.0	*	
Chloroethane	1.271	1.051	17.3		
Methylene Chloride	1.825	1.685	7.7		
Acetone	1.081	0.462	57.3		
Carbon Disulfide	5.038	4.185	16.9		
1,1-Dichloroethene	1.490	1.337	10.3	*	
1,1-Dichloroethane	3.451	2.724	21.1		* *
total-1,2-Dichloroethenes . .	1.525	1.386	9.1		
Chloroform	3.125	2.664	14.8	*	
1,2-Dichloroethane	2.326	1.792	23.0		
2-Butanone	0.033	0.034	-3.0		
1,1,1-Trichloroethane	0.364	0.472	-29.7		
Carbon Tetrachloride	0.366	0.476	-30.1		
Vinyl Acetate	1.249	1.085	13.1		
Bromodichloromethane	0.625	0.649	-3.8		
1,2-Dichloropropane	0.522	0.507	2.9	*	
cis-1,3-Dichloropropene . . .	0.519	0.493	5.0		
hloroethene	0.377	0.402	-6.6		
omochloromethane	0.488	0.509	-4.3		
1,1,2-Trichloroethane	0.377	0.352	6.6		
Benzene	1.146	1.002	12.6		
trans-1,3-Dichloropropene . .	0.336	0.292	13.1		
2-Chloroethylvinylether . . .	0.234	0.180	23.1		
1,1,1,2-Tetrachloroethane . .	0.337	0.356	-5.6		
Bromoform	0.362	0.390	-7.7		* *
4-Methyl-2-pentanone	0.747	0.464	37.9		
2-Hexanone	0.516	0.329	36.2		
Tetrachloroethene	0.401	0.451	-12.5		
1,1,2,2-Tetrachloroethane . .	0.745	0.484	35.0		* *
Toluene	0.736	0.630	14.4	*	
Chlorobenzene	0.947	0.837	11.6		* *
Ethylbenzene	0.416	0.353	15.1	*	
Styrene	0.815	0.675	17.2		
m-Xylene	0.483	0.404	16.4		
1,2-Dichlorobenzene	0.804	0.895	-11.3		
1,4-Dichlorobenzene	0.831	0.763	8.2		
1,3-Dichlorobenzene	0.846	0.839	0.8		

RF(50) - Response Factor from daily standard file at 50 ug/l
AVE RF - Response Factor from initial calibration Form VI
- - - Percent Difference
- - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)
(1) - - Mininum RF for Bromoform is 0.250

Form VII

CONTINUING CALIBRATION CHECK
VOLATILE HSL COMPOUNDS

Case No: 4 Region: VERSAR
Contractor: MM ENV SYSTEMS
Contract No:
Instrument ID: MS-B

Calibration Date: 06/25/87
Time: 09:22
Laboratory ID: 0625V2B1
Initial Cali. Date: 03/23/87

Minimum RF for SPCC is 0.300 (1) Maximum %D for CCC is 25%

Compound	AVE RF	RF(50)	% D	CCC	SPCC
Toluene-d8	1.114	1.001	10.1		
BFB	0.721	0.608	15.7		
1,2-Dichloroethane-d4	1.972	1.637	17.0		

RF(50) - Response Factor from daily standard file at 50 ug/l
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)
(1) - - Mininum RF for Bromoform is 0.250

Form VII

CONTINUING CALIBRATION CHECK
VOLATILE HSL COMPOUNDS

Case No: 4 Region: VERSAR
ntractor: MM ENV SYSTEMS
ntract No:
Instrument ID: MS-B

Calibration Date: 06/25/87
Time: 09:22
Laboratory ID: 0625V2B1
Initial Cali. Date: 03/23/87

Minimum RF for SPCC is 0.300 (1)   Maximum %D for CCC is 25%

Compound	AVE RF	RF(50)	% D	CCC	SPCC
Chloromethane	5.308	3.698	30.3		* *
Bromomethane	1.885	1.684	10.7		
Vinyl Chloride	2.996	2.486	17.0	*	
Chloroethane	1.271	1.051	17.3		
Methylene Chloride	1.825	1.685	7.7		
Acetone	1.081	0.462	57.3		
Carbon Disulfide	5.038	4.185	16.9		
1,1-Dichloroethene	1.490	1.337	10.3	*	
1,1-Dichloroethane	3.451	2.724	21.1		* *
total-1,2-Dichloroethenes . .	1.525	1.386	9.1		
Chloroform	3.125	2.664	14.8	*	
1,2-Dichloroethane	2.326	1.792	23.0		
2-Butanone	0.033	0.034	-3.0		
1,1,1-Trichloroethane	0.364	0.472	-29.7		
Carbon Tetrachloride	0.366	0.476	-30.1		
Vinyl Acetate	1.249	1.085	13.1		
Bromodichloromethane	0.625	0.649	-3.8		
1,2-Dichloropropane	0.522	0.507	2.9	*	
cis-1,3-Dichloropropene . . .	0.519	0.493	5.0		
ichloroethene	0.377	0.402	-6.6		
oromochloromethane	0.488	0.509	-4.3		
1,1,2-Trichloroethane	0.377	0.352	6.6		
Benzene	1.146	1.002	12.6		
trans-1,3-Dichloropropene . .	0.336	0.292	13.1		
2-Chloroethylvinylether . . .	0.234	0.180	23.1		
1,1,1,2-Tetrachloroethane . .	0.337	0.356	-5.6		
Bromoform	0.362	0.390	-7.7		* *
4-Methyl-2-pentanone	0.747	0.464	37.9		
2-Hexanone	0.516	0.329	36.2		
Tetrachloroethene	0.401	0.451	-12.5		
1,1,2,2-Tetrachloroethane . .	0.745	0.484	35.0		* *
Toluene	0.736	0.630	14.4	*	
Chlorobenzene	0.947	0.837	11.6		* *
Ethylbenzene	0.416	0.353	15.1	*	
Styrene	0.815	0.675	17.2		
m-Xylene	0.483	0.404	16.4		
1,2-Dichlorobenzene	0.804	0.895	-11.3		
1,4-Dichlorobenzene	0.831	0.763	8.2		
1,3-Dichlorobenzene	0.846	0.839	0.8		

RF(50) - Response Factor from daily standard file at 50 ug/l
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)
(1) - - Mininum RF for Bromoform is 0.250

Form VII

CONTINUING CALIBRATION CHECK
VOLATILE HSL COMPOUNDS

Case No: 4 Region: VERSAR
Contractor: MM ENV SYSTEMS
Contract No:
Instrument ID: MS-B

Calibration Date: 06/25/87
Time: 09:22
Laboratory ID: 0625V2B1
Initial Cali. Date: 03/23/87

Minimum RF for SPCC is 0.300 (1) Maximum %D for CCC is 25%

Compound	AVE RF	RF(50)	% D	CCC	SPCC
Toluene-d8	1.114	1.001	10.1		
BFB	0.721	0.608	15.7		
1,2-Dichloroethane-d4	1.972	1.637	17.0		

RF(50) - Response Factor from daily standard file at 50 ug/l
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)
(1) - - Mininum RF for Bromoform is 0.250

Form VII

CONTINUING CALIBRATION CHECK
VOLATILE HSL COMPOUNDS

Case No: 4	Region: W	Calibration Date:	06/26/87
ntractor: MM ENV SYSTEMS		Time:	10:47
ntract No:		Laboratory ID:	0626V2C1
Instrument ID: MS-C		Initial Cali. Date:	06/24/87

Minimum RF for SPCC is 0.300 (1)   Maximum %D for CCC is 25%

Compound	AVE RF	RF(50)	% D	CCC	SPCC
Chloromethane	1.950	2.022	-3.7		* *
Bromomethane	1.322	1.681	-27.2		
Vinyl Chloride	1.344	1.524	-13.4	*	
Chloroethane	0.555	0.628	-13.2		
Methylene Chloride	1.400	1.315	6.1		
Acetone	0.590	0.189	68.0		
Carbon Disulfide	2.940	2.833	3.6		
1,1-Dichloroethene	1.241	1.158	6.7	*	
1,1-Dichloroethane	2.474	2.007	18.9		* *
total-1,2-Dichloroethenes . .	1.337	1.335	0.1		
Chloroform	2.932	2.278	22.3	*	
1,2-Dichloroethane	2.406	1.315	45.3		
2-Butanone	0.027	0.027	0.0		
1,1,1-Trichloroethane	0.410	0.354	13.7		
Carbon Tetrachloride	0.417	0.314	24.7		
Vinyl Acetate	0.443	0.484	-9.3		
Bromodichloromethane	0.515	0.442	14.2		
1,2-Dichloropropane	0.401	0.353	12.0	*	
cis-1,3-Dichloropropene	0.406	0.512	-26.1		
ichloroethene	0.384	0.502	-30.7		
bromochloromethane	0.491	0.658	-34.0		
1,1,2-Trichloroethane	0.316	0.343	-8.5		
Benzene	0.879	0.875	0.5		
trans-1,3-Dichloropropene . .	0.285	0.341	-19.6		
2-Chloroethylvinylether . . .	0.142	0.109	23.2		
1,1,1,2-Tetrachloroethane . .	0.354	0.430	-21.5		
Bromoform	0.345	0.347	-0.6		* *
4-Methyl-2-pentanone	0.406	0.318	21.7		
2-Hexanone	0.341	0.214	37.2		
Tetrachloroethene	0.421	0.495	-17.6		
1,1,2,2-Tetrachloroethane . .	0.579	0.622	-7.4		* *
Toluene	0.653	0.693	-6.1	*	
Chlorobenzene	0.864	0.958	-10.9		* *
Ethylbenzene	0.383	0.444	-15.9	*	
Styrene	0.692	0.330	52.3		
m-Xylene	0.435	0.541	-24.4		
1,2-Dichlorobenzene	0.928	0.987	-6.4		
1,4-Dichlorobenzene	0.930	1.044	-12.3		
1,3-Dichlorobenzene	0.925	0.936	-1.2		

RF(50) - Response Factor from daily standard file at 50 ug/l
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)
(1) - - Mininum RF for Bromoform is 0.250

Form VII

CONTINUING CALIBRATION CHECK
VOLATILE HSL COMPOUNDS

Case No: 4 Region: W
Contractor: MM ENV SYSTEMS
Contract No:
Instrument ID: MS-C

Calibration Date: 06/26/87
Time: 10:47
Laboratory ID: 0626V2C1
Initial Cali. Date: 06/24/87

Minimum RF for SPCC is 0.300 (1) Maximum %D for CCC is 25%

Compound	AVE RF	RF(50)	% D	CCC	SPCC
Toluene-d8	1.052	1.004	4.6		
BFB	0.730	0.755	-3.4		
1,2-Dichloroethane-d4	2.209	1.139	48.4		

RF(50) - Response Factor from daily standard file at 50 ug/l
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)
(1) - - Mininum RF for Bromoform is 0.250

Form VII

CONTINUING CALIBRATION CHECK
VOLATILE HSL COMPOUNDS

Case No: 4 Region: VERSAR
tractor: MM ENV SYSTEMS
tract No:
Instrument ID: MS-B

Calibration Date: 06/29/87
Time: 10:22
Laboratory ID: 0629V2B1
Initial Cali. Date: 03/23/87

Minimum RF for SPCC is 0.300 (1) Maximum %D for CCC is 25%

Compound	AVE RF	RF(50)	% D	CCC	SPCC
Chloromethane	5.308	3.822	28.0		**
Bromomethane	1.885	1.700	9.8		
Vinyl Chloride	2.996	2.378	20.6	*	
Chloroethane	1.271	0.947	25.5		
Methylene Chloride	1.825	1.548	15.2		
Acetone	1.081	0.676	37.5		
Carbon Disulfide	5.038	3.603	28.5		
1,1-Dichloroethene	1.490	1.275	14.4	*	
1,1-Dichloroethane	3.451	3.124	9.5		**
total-1,2-Dichloroethenes . .	1.525	1.337	12.3		
Chloroform	3.125	3.205	-2.6	*	
1,2-Dichloroethane	2.326	2.837	-22.0		
2-Butanone	0.033	0.036	-9.1		
1,1,1-Trichloroethane	0.364	0.437	-20.1		
Carbon Tetrachloride	0.366	0.411	-12.3		
Vinyl Acetate	1.249	0.991	20.7		
Bromodichloromethane	0.625	0.590	5.6		
1,2-Dichloropropane	0.522	0.395	24.3	*	
cis-1,3-Dichloropropene . . .	0.519	0.485	6.6		
chloroethene	0.377	0.357	5.3		
romochloromethane	0.488	0.501	-2.7		
1,1,2-Trichloroethane	0.377	0.331	12.2		
Benzene	1.146	0.849	25.9		
trans-1,3-Dichloropropene . .	0.336	0.319	5.1		
2-Chloroethylvinylether . . .	0.234	0.212	9.4		
1,1,1,2-Tetrachloroethane . .	0.337	0.337	0.0		
Bromoform	0.362	0.367	-1.4		**
4-Methyl-2-pentanone	0.747	0.520	30.4		
2-Hexanone	0.516	0.410	20.5		
Tetrachloroethene	0.401	0.389	3.0		
1,1,2,2-Tetrachloroethane . .	0.745	0.465	37.6		**
Toluene	0.736	0.562	23.6	*	
Chlorobenzene	0.947	0.811	14.4		**
Ethylbenzene	0.416	0.318	23.6	*	
Styrene	0.815	0.616	24.4		
m-Xylene	0.483	0.375	22.4		
1,2-Dichlorobenzene	0.804	0.794	1.2		
1,4-Dichlorobenzene	0.831	0.816	1.8		
1,3-Dichlorobenzene	0.846	0.755	10.8		

RF(50) - Response Factor from daily standard file at 50 ug/l
AVE RF - Average Response Factor from initial calibration Form VI
D - - - Percent Difference
CC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)
(1) - - Mininum RF for Bromoform is 0.250

Form VII

CONTINUING CALIBRATION CHECK
VOLATILE HSL COMPOUNDS

[illegible]

Case No: 4 Region: VERSAR
Contractor: MM ENV SYSTEMS
Contract No:
Instrument ID: MS-B

Calibration Date: 06/29/87
Time: 10:22
Laboratory ID: 0629V2B1
Initial Cali. Date: 03/23/87

Minimum RF for SPCC is 0.300 (1) Maximum %D for CCC is 25%

Compound	AVE RF	RF(50)	% D	CCC	SPCC
Toluene-d8	1.114	0.994	10.8		
BFB	0.721	0.716	0.7		
1,2-Dichloroethane-d4	1.972	2.677	-35.8		

RF(50) - Response Factor from daily standard file at 50 ug/l
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)
(1) - - Mininum RF for Bromoform is 0.250

Form VII

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Volatile Compounds

CLIENT SAMPLE ID:	LAB BLANK	EPAQC CONC2
LAB SAMPLE ID:	CBLK0417	WP483
SAMPLE DATE:	04/17/87	04/17/87
ANALYSIS DATE:	04/17/87	04/17/87
FILE NAME:	0417VWBC1	VEPACHC
INSTRUMENT ID:	MS-C	MS-C
MATRIX:	WATER	WATER
UNITS:	UG/L	UG/L
DILUTION FACTOR:	1	1
COMPOUNDS		
Acetone	< 50	< 50
Acrolein	< 10	< 10
Acrylonitrile	< 10	< 10
Benzene	< 1	< 1
Bromodichloromethane	< 1	8.4
Bromoform	< 1	9.3
Bromomethane	< 1	< 1
2-Butanone	< 10	< 10
Carbon Disulfide	< 5	< 5
Carbon Tetrachloride	< 1	14
C[illegible]obenzene	< 1	< 1
C[illegible]oethane	< 1	< 1
2-Chloroethylvinylether	< 1	< 1
Chloroform	< 1	42
Chloromethane	< 1	< 1
Dibromochloromethane	< 1	10
1,2-Dichloroethane	< 1	23
1,1-Dichloroethane	< 1	< 1
1,1-Dichloroethene	< 1	< 1
1,2-Dichloropropane	< 1	< 1
trans-1,3-Dichloropropene	< 1	< 1
cis-1,3-Dichloropropene	< 1	< 1
Ethylbenzene	< 1	< 1
2-Hexanone	< 10	< 10
4-Methyl-2-Pentanone	< 10	< 10
Methylene Chloride	< 5	< 5
Styrene	< 5	< 5
1,1,2,2-Tetrachloroethane	< 1	< 1
Tetrachloroethene	< 1	7.3
Toluene	< 2	< 2
1,1,1-Trichloroethane	< 1	19
1,1,2-Trichloroethane	< 1	< 1
T[illegible]hloroethene	< 1	13
T[illegible]lorofluoromethane	< 1	< 1
Vinyl Acetate	< 10	< 10
Vinyl Chloride	< 1	< 1

Sample 2

Parameter	True Value	$\bar{X}$	S	95% Confidence Limits
1,2-Dichloroethane	22.2	22.0	4.24	13.5 - 30.5
Chloroform	43.0	39.6	7.50	24.6 - 54.6
1,1,1-Trichloroethane	14.3	12.7	2.91	6.9 - 18.5
1,1,2-Trichloroethylene	12.0	10.6	2.67	5.2 - 16.0
Carbontetrachloride	10.0	9.6	2.31	5.0 - 14.2
1,1,2,2-Tetrachloroethylene	6.2	5.9	1.00	3.9 - 7.9
Bromodichloromethane	7.9	7.8	1.45	4.9 - 10.7
Dibromochloromethane	10.7	10.2	2.11	6.0 - 14.4
Bromoform	9.9	9.5	1.93	5.7 - 13.3

WP 483

U S GOVERNMENT PRINTING OFFICE: 1984 -- 759-016/7799

QUALITY CONTROL DATA SUMMARY
FOR ORGANIC ANALYSIS

ASSOCIATED SAMPLES: 2925-2932

FRACTION: BNAs

A. TUNING (In chronological order)

B. INITIAL (5-POINT) CALIBRATION

C. CONTINUING CALIBRATION (In chronological order)

D. EPA TRACEABLE SAMPLE

```
                GC/MS TUNING AND MASS CALIBRATION
                  DECAFLUOROTRIPHENYLPHOSPHINE

CASE NUMBER: 000000       LABORATORY: MMES       CONTRACT:   000000
INST ID:     MS1          SENS DATE: 07/01/87    SENS TIME:   8:44:00
LAB ID:      0701DFTA1    CALI DATE: 04/15/86    ANALYST:    KW
DATA RELEASE AUTHORIZED BY:
                                   ____________________

  M/E     ION ABUNDANCE CRITERIA                 SPEC # 612
  ===     ======================                 ==========

  51      30 TO 60% OF MASS 198                     52.19
  68      LESS THAN 2% OF MASS 69                    0.44    ( 0.67) 1
  69      MASS 69 RELATIVE ABUNDANCE                65.10
  70      LESS THAN 2% OF MASS 69                    0.00    ( 0.00) 1
  127     40 TO 60% OF MASS 198                     52.39
  197     LESS THAN 1% OF MASS 198                   0.00
  198     BASE PEAK, 100% RELATIVE ABUNDANCE       100.00
  199     5 TO 9% OF MASS 198                        6.80
  275     10 TO 30% OF MASS 198                     26.71
  365     GREATER THAN 1% OF MASS 198                4.53
  441     LESS THAN MASS 443                         9.31
  442     GREATER THAN 40% OF MASS 198              60.25
  443     17 TO 23% OF MASS 442                     12.70    (21.09) 2

    1 - VALUE IN PARENTHESIS IS % OF MASS 69
    2 - VALUE IN PARENTHESIS IS % OF MASS 442
```

GC/MS TUNING AND MASS CALIBRATION
DECAFLUOROTRIPHENYLPHOSPHINE

CASE NUMBER: 000000 LABORATORY: MMES CONTRACT: 000000
INST ID: MS1 SENS DATE: 07/09/87 SENS TIME: 9:40:00
LAB ID: 0708DFTA2 CALI DATE: 04/15/86 ANALYST: KW
DATA RELEASE AUTHORIZED BY: ____________________

M/E	ION ABUNDANCE CRITERIA	SPEC # 604	
51	30 TO 60% OF MASS 198	39.61	
68	LESS THAN 2% OF MASS 69	0.00	(0.00) 1
69	MASS 69 RELATIVE ABUNDANCE	61.14	
70	LESS THAN 2% OF MASS 69	0.00	(0.00) 1
127	40 TO 60% OF MASS 198	57.80	
197	LESS THAN 1% OF MASS 198	0.00	
198	BASE PEAK, 100% RELATIVE ABUNDANCE	100.00	
199	5 TO 9% OF MASS 198	7.94	
275	10 TO 30% OF MASS 198	27.07	
365	GREATER THAN 1% OF MASS 198	5.17	
441	LESS THAN MASS 443	11.79	
442	GREATER THAN 40% OF MASS 198	69.11	
443	17 TO 23% OF MASS 442	15.20	(22.00) 2

1 - VALUE IN PARENTHESIS IS % OF MASS 69
2 - VALUE IN PARENTHESIS IS % OF MASS 442

GC/MS TUNING AND MASS CALIBRATION
DECAFLUOROTRIPHENYLPHOSPHINE.

CASE NUMBER: 000000
INST ID: MS1
LAB ID: 0715DFTA2
DATA RELEASE AUTHORIZED BY:

LABORATORY: MMES
SENS DATE: 07/16/87
CALI DATE: 04/15/86

CONTRACT: 000000
SENS TIME: 9:47:00
ANALYST: KW

M/E	ION ABUNDANCE CRITERIA	SPEC # 604	
51	30 TO 60% OF MASS 198	41.35	
68	LESS THAN 2% OF MASS 69	0.74	(1.49) 1
69	MASS 69 RELATIVE ABUNDANCE	49.91	
70	LESS THAN 2% OF MASS 69	0.00	(0.00) 1
127	40 TO 60% OF MASS 198	46.13	
197	LESS THAN 1% OF MASS 198	0.00	
198	BASE PEAK, 100% RELATIVE ABUNDANCE	100.00	
199	5 TO 9% OF MASS 198	7.04	
275	10 TO 30% OF MASS 198	26.62	
365	GREATER THAN 1% OF MASS 198	5.29	
441	LESS THAN MASS 443	10.08	
442	GREATER THAN 40% OF MASS 198	66.40	
443	17 TO 23% OF MASS 442	13.38	(20.15) 2

1 - VALUE IN PARENTHESIS IS % OF MASS 69
2 - VALUE IN PARENTHESIS IS % OF MASS 442

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 2)

Case No: 5203 Region: LAB
Contractor: MM ENV SYSTEMS
Contract No:
Instrument ID: MSA

Calibration Date: 07/01/87
Time: 11:28
Laboratory ID: 0701S2A2
Initial Cali. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
Dibenzofuran		1.803				
2,4-Dinitrotoluene		0.344	0.297	13.7		
Diethylphthalate		1.686	1.710	-1.4		
4-Chlorophenyl-phenylether . .		0.676	0.575	14.9		
Fluorene		1.275	1.117	12.4		
4-Nitroaniline	x	0.097				
4,6-Dinitro-2-Methylphenol . .	x	0.128	0.082	35.9		
N-Nitrosodiphenylamine		0.494	0.464	6.1	*	
4-Bromophenyl-phenylether . .		0.316	0.252	20.3		
Hexachlorobenzene		0.373	0.323	13.4		
Pentachlorophenol	x	0.160	0.148	7.5	*	
Phenanthrene		1.193	1.017	14.8		
Anthracene		1.194	1.002	16.1		
Di-n-Butylphthalate		1.615	1.610	0.3		
Fluoranthene		1.228	1.092	11.1	*	
Pyrene		1.449	1.359	6.2		
Butylbenzylphthalate		0.758	0.702	7.4		
3,3′-Dichlorobenzidine		0.051	0.264	-417.6		
Benzo(a)Anthracene		1.100	0.918	16.5		
Chrysene		1.128	0.923	18.2		
bis(2-Ethylhexyl)Phthalate . .		1.072	0.981	8.5		
Di-n-Octyl Phthalate		2.656	2.183	17.8	*	
Benzo(b)Fluoranthene		1.564				
Benzo(k)Fluoranthene		1.568				
Benzo(a)Pyrene		1.209	0.981	18.9	*	
Indeno(1,2,3-cd)Pyrene		0.701	0.921	-31.4		
Dibenz(a,h)Anthracene		0.705	0.712	-1.0		
Benzo(g,h,i)Perylene		0.724	0.872	-20.4		
Perylene						
Nitrobenzene-d5		0.799	1.794	-124.5		
2-Fluorobiphenyl		1.358	1.092	19.6		
Terphenyl-d14		0.692	0.768	-11.0		
Phenol-d5		1.701	1.507	11.4		
2-Flourophenol		1.403	1.163	17.1		
2,4,6-Tribromophenol		0.210	0.232	-10.5		

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
x - - - Due to low response analyze at 80 total nanograms
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)

Form VII

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 1)

Case No: 5203 Region: LAB
[illegible]actor: MM ENV SYSTEMS
Contract No:
Instrument ID: MSA

Calibration Date: 07/01/87
Time: 11:28
Laboratory ID: 0701S2A2
Initial Cali. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
Phenol		1.703	1.450	14.9	*	
bis(2-Chloroethyl)Ether . . .		1.700	1.373	19.2		
2-Chlorophenol		1.538	1.278	16.9		
1,3-Dichlorobenzene		1.772	1.388	21.7		
1,4-Dichlorobenzene		1.826	1.464	19.8	*	
Benzyl Alcohol		0.931				
1,2-Dichlorobenzene		1.757	1.339	23.8		
2-Methylphenol		0.931				
bis(2-Chloroisopropyl)Ether .		1.955	1.616	17.3		
4-Methylphenol		1.333				
N-Nitroso-Di-n-Propylamine . .		1.700	1.246	26.7		* *
Hexachloroethane		0.897	0.788	12.2		
Nitrobenzene		0.502	0.477	5.0		
Isophorone		0.969	0.821	15.3		
2-Nitrophenol		0.207	0.189	8.7	*	
2,4-Dimethylphenol		0.313	0.428	-36.7		
Benzoic Acid	x	0.118				
bis(2-Chloroethoxy)Methane . .		0.503	0.435	13.5		
[illegible]ichlorophenol		0.298	0.254	14.8	*	
1,2,4-Trichlorobenzene		0.356	0.321	9.8		
Naphthalene		1.015	0.967	4.7		
4-Chloroaniline		0.179				
Hexachlorobutadiene		0.236	0.231	2.1	*	
4-Chloro-3-Methylphenol . . .		0.375	0.365	2.7	*	
2-Methylnaphthalene		0.875				
Hexachlorocyclopentadiene . .		0.262	0.258	1.5		* *
2,4,6-Trichlorophenol		0.462	0.354	23.4	*	
2,4,5-Trichlorophenol	x	0.367				
2-Chloronaphthalene		1.311	1.029	21.5		
2-Nitroaniline	x	0.422				
Dimethyl Phthalate		1.517	1.382	8.9		
Acenaphthalene		1.807	1.529	15.4		
2,6-Dinitrotoluene			0.233			
3-Nitroaniline	x	0.093				
Acenaphthene		1.190	1.017	14.5	*	
2,4-Dinitrophenol	x	0.113	0.062	45.1		* *
4-Nitrophenol	x	0.370	0.256	30.8		* *

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
[illegible] - - - Due to low response analyze at 80 total nanograms
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 1)

Case No: 5203 Region: ____________

Contractor: VERSAR ESMO

Contract No: ____________

Instrument ID: MS-A

Calibration Date: 07/09/87

Time: 11:29

Laboratory ID: 0709S2A2

Initial Cali. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
Phenol		1.703	1.827	-7.3	*	
bis(2-Chloroethyl)Ether		1.700	1.547	9.0		
2-Chlorophenol		1.538	1.603	-4.2		
1,3-Dichlorobenzene		1.772	1.675	5.5		
1,4-Dichlorobenzene		1.826	1.705	6.6	*	
Benzyl Alcohol		0.931				
1,2-Dichlorobenzene		1.757	1.678	4.5		
2-Methylphenol		0.931				
bis(2-Chloroisopropyl)Ether		1.955	1.395	28.6		
4-Methylphenol		1.333				
N-Nitroso-Di-n-Propylamine		1.700	1.302	23.4		**
Hexachloroethane		0.897	1.006	-12.2		
Nitrobenzene		0.502	0.896	-78.5		
Isophorone		0.969	0.987	-1.9		
2-Nitrophenol		0.207	0.235	-13.5	*	
2,4-Dimethylphenol		0.313	0.561	-79.2		
Benzoic Acid	x	0.118				
bis(2-Chloroethoxy)Methane		0.503	0.547	-8.7		
2,4-Dichlorophenol		0.298	0.302	-1.3	*	
1,2,4-Trichlorobenzene		0.356	0.359	-0.8		
Naphthalene		1.015	1.086	-7.0		
4-Chloroaniline		0.179				
Hexachlorobutadiene		0.236	0.264	-11.9	*	
4-Chloro-3-Methylphenol		0.375	0.447	-19.2	*	
2-Methylnaphthalene		0.875				
Hexachlorocyclopentadiene		0.262	0.334	-27.5		**
2,4,6-Trichlorophenol		0.462	0.387	16.2	*	
2,4,5-Trichlorophenol	x	0.367				
2-Chloronaphthalene		1.311	1.176	10.3		
2-Nitroaniline	x	0.422				
Dimethyl Phthalate		1.517	1.572	-3.6		
Acenaphthalene		1.807	1.713	5.2		
2,6-Dinitrotoluene			0.267			
3-Nitroaniline	x	0.093				
Acenaphthene		1.190	1.250	-5.0	*	
2,4-Dinitrophenol	x	0.113	0.144	-27.4		**

RF(50) -	Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF -	Average Response Factor from initial calibration Form VI
%D - - -	Percent Difference
x - - -	Due to low response analyze at 80 total nanograms
CCC - -	Calibration Check Compounds (*)
SPCC - -	System Performance Check Compounds (**)

Form VII

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 2)

Case No: 5203 Region: ______
Contractor: VERSAR ESMO
Contract No: ______
Instrument ID: MS-A

Calibration Date: 07/09/87
Time: 11:29
Laboratory ID: 0709S2A2
Initial Cali. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
4-Nitrophenol	x	0.370	0.335	9.5		**
Dibenzofuran		1.803				
2,4-Dinitrotoluene		0.344	0.428	-24.4		
Diethylphthalate		1.686	1.839	-9.1		
4-Chlorophenyl-phenylether		0.676	0.680	-0.6		
Fluorene		1.275	1.328	-4.2		
4-Nitroaniline	x	0.097				
4,6-Dinitro-2-Methylphenol	x	0.128	0.151	-18.0		
N-Nitrosodiphenylamine		0.494	0.459	7.1	*	
4-Bromophenyl-phenylether		0.316	0.303	4.1		
Hexachlorobenzene		0.373	0.398	-6.7		
Pentachlorophenol	x	0.160	0.193	-20.6	*	
Phenanthrene		1.193	1.138	4.6		
Anthracene		1.194	1.089	8.8		
Di-n-Butylphthalate		1.615	1.632	-1.1		
Fluoranthene		1.228	1.190	3.1	*	
Pyrene		1.449	1.831	-26.4		
Butylbenzylphthalate		0.758	0.877	-15.7		
3,3'-Dichlorobenzidine		0.051	0.136	-166.7		
Benzo(a)Anthracene		1.100	1.089	1.0		
Chrysene		1.128	1.059	6.1		
bis(2-Ethylhexyl)Phthalate		1.072	1.070	0.2		
Chrysene						
Di-n-Octyl Phthalate		2.656	2.013	24.2	*	
Benzo(b+k)fluoranthenes			1.376			
Benzo(b)fluoranthene		1.564				
Benzo(k)fluoranthene		1.568				
Benzo(a)Pyrene		1.209	1.231	-1.8	*	
Indeno(1,2,3-cd)Pyrene		0.701	1.086	-54.9		
Dibenz(a,h)Anthracene		0.705	0.757	-7.4		
Benzo(g,h,i)Perylene		0.724	0.876	-21.0		
Perylene						
C8 to C20 HYDROCARBONS						

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
x - - - Due to low response analyze at 80 total nanograms
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)

Form VII

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 2)

Case No: S716 Region:
Contractor: VERSAR ESMO
Contract No:
Instrument ID: MS-A

Calibration Date: 07/16/87
Time: 12:28
Laboratory ID: 0716S2A2
Initial Cali. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
4-Nitrophenol	x	0.370	0.292	21.1		* *
Dibenzofuran		1.803				
2,4-Dinitrotoluene		0.344	0.383	-11.3		
Diethylphthalate		1.686	1.769	-4.9		
4-Chlorophenyl-phenylether . .		0.676	0.672	0.6		
Fluorene		1.275	1.351	-6.0		
4-Nitroaniline	x	0.097				
4,6-Dinitro-2-Methylphenol . .	x	0.128	0.135	-5.5		
N-Nitrosodiphenylamine		0.494	0.390	21.1	*	
4-Bromophenyl-phenylether . .		0.316	0.284	10.1		
Hexachlorobenzene		0.373	0.367	1.6		
Pentachlorophenol	x	0.160	0.149	6.9	*	
Phenanthrene		1.193	1.124	5.8		
Anthracene		1.194	1.084	9.2		
Di-n-Butylphthalate		1.615	1.613	0.1		
Fluoranthene		1.228	1.242	-1.1	*	
Pyrene		1.449	1.866	-28.8		
Butylbenzylphthalate		0.758	0.759	-0.1		
3,3'-Dichlorobenzidine		0.051	0.083	-62.7		
Benzo(a)Anthracene		1.100	1.026	6.7		
Chrysene		1.128	1.073	4.9		
bis(2-Ethylhexyl)Phthalate . .		1.072	1.002	6.5		
Chrysene						
Di-n-Octyl Phthalate		2.656	2.287	13.9	*	
Benzo(b+k)fluoranthenes . . .			1.503			
Benzo(b)fluoranthene		1.564				
Benzo(k)fluoranthene		1.568				
Benzo(a)Pyrene		1.209	1.200	0.7	*	
Indeno(1,2,3-cd)Pyrene		0.701	0.973	-38.8		
Dibenz(a,h)Anthracene		0.705	0.722	-2.4		
Benzo(g,h,i)Perylene		0.724	0.765	-5.7		

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
x - - - Due to low response analyze at 80 total nanograms
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)

Form VII

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 1)

Case No: S716 Region: ______
Contractor: VERSAR ESMO
ntract No: ______
strument ID: MS-A

Calibration Date: 07/16/87
Time: 12:28
Laboratory ID: 0716S2A2
Initial Cali. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
Phenol		1.703	1.683	1.2	*	
bis(2-Chloroethyl)Ether		1.700	1.483	12.8		
2-Chlorophenol		1.538	1.536	0.1		
1,3-Dichlorobenzene		1.772	1.693	4.5		
1,4-Dichlorobenzene		1.826	1.770	3.1	*	
Benzyl Alcohol		0.931				
1,2-Dichlorobenzene		1.757	1.656	5.7		
2-Methylphenol		0.931				
bis(2-Chloroisopropyl)Ether		1.955	1.567	19.8		
4-Methylphenol		1.333				
N-Nitroso-Di-n-Propylamine		1.700	1.239	27.1		* *
Hexachloroethane		0.897	0.901	-0.4		
Nitrobenzene		0.502	0.509	-1.4		
Isophorone		0.969	0.911	6.0		
2-Nitrophenol		0.207	0.212	-2.4	*	
2,4-Dimethylphenol		0.313	0.492	-57.2		
Benzoic Acid	x	0.118				
bis(2-Chloroethoxy)Methane		0.503	0.481	4.4		
4-Dichlorophenol		0.298	0.293	1.7	*	
2,4-Trichlorobenzene		0.356	0.387	-8.7		
Naphthalene		1.015	1.108	-9.2		
4-Chloroaniline		0.179				
Hexachlorobutadiene		0.236	0.286	-21.2	*	
4-Chloro-3-Methylphenol		0.375	0.398	-6.1	*	
2-Methylnaphthalene		0.875				
Hexachlorocyclopentadiene		0.262	0.333	-27.1		* *
2,4,6-Trichlorophenol		0.462	0.410	11.3	*	
2,4,5-Trichlorophenol	x	0.367				
2-Chloronaphthalene		1.311	1.169	10.8		
2-Nitroaniline	x	0.422				
Dimethyl Phthalate		1.517	1.457	4.0		
Acenaphthalene		1.807	1.679	7.1		
2,6-Dinitrotoluene			0.250			
3-Nitroaniline	x	0.093				
Acenaphthene		1.190	1.214	-2.0	*	
2,4-Dinitrophenol	x	0.113	0.113	0.0		* *

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
x - - - Due to low response analyze at 80 total nanograms
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)

Form VII

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Semivolatile Compounds

CLIENT SAMPLE ID: USEPA-QC SPIKE
LAB SAMPLE ID: EPAQC0415
SAMPLE DATE: 04/09/87
EXTRACTION DATE: 04/09/87
ANALYSIS DATE: 04/15/87
FILE NAME: EPAQC0415
INSTRUMENT ID: MSA
MATRIX: WATER
UNITS: UG/L

COMPOUNDS	
Acenaphthalene	< 10
Acenaphthene	17
Anthracene	32
Benzidine	< 80
Benzo(a)Anthracene	< 10
Benzo(a)Pyrene	18
Benzo(b+k)Fluoranthenes	31
Benzo(g,h,i)Perylene	69
4-Bromophenyl-phenylether	38
Butylbenzylphthalate	42
4-Chloro-3-Methylphenol	59
bis(2-Chloroethoxy)Methane	< 10
bis(2-Chloroethyl)Ether	< 10
bis(2-Chloroisopropyl)Ether	30
2-Chloronaphthalene	< 10
2-Chlorophenol	24
4-Chlorophenyl-phenylether	71
Chrysene	59
Di-n-Butylphthalate	< 10
Di-n-Octyl Phthalate	< 10
Dibenz(a,h)Anthracene	50
1,2-Dichlorobenzene	< 10
1,4-Dichlorobenzene	22
1,3-Dichlorobenzene	< 10
3,3'-Dichlorobenzidine	< 20
2,4-Dichlorophenol	42
Diethylphthalate	< 10
Dimethyl Phthalate	44
2,4-Dimethylphenol	14
4,6-Dinitro-2-Methylphenol	147
2,4-Dinitrophenol	< 50
2,4-Dinitrotoluene	< 10
2,6-Dinitrotoluene	< 10
1,2-Diphenylhydrazine	< 10
bis(2-Ethylhexyl)Phthalate	25
Fluoranthene	30

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincinnati

Water Pollution Quality Control Samples

GC/MS BASE NEUTRALS - II

TRUE VALUES

When diluted to volume according to the instruction, the sample contain following compounds at these concentration expressed as ug/liter.

Parameter	Sample (1) 4/9/87
1,4-Dichlorobenzene	24.8
Bis (2 chloroisopropyl) ether	38.8
Hexachloroethane	30.0
Nitrobenzene	76.5
Naphthalene	24.8
Dimethyl Phthalate	40.0
Acenaphthene	19.5
Fluorene	51.2
4-Chlorophenyl phenyl ether	76.7
4-Bromophenyl phenyl ether	41.5
Anthracene	40.0
Fluoranthene	29.3
Butyl Benzl Phthalate	51.3
Chrysene	69.9
Ethyl Hexyl Phthalate	29.1
Benzo (b) Fluoranthene	40.0
Benzo (a) Pyrene	24.9
Dibenzo (a,h) Anthracene	40.7
Benzo (g,h,i) perylene	30.4

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincinnati

Water Pollution Quality Control Samples

GC/MS ACIDS

TRUE VALUES

When diluted to volume according to the instructions, the samples contain the following compounds at these concentrations expressed as ug/liter.

Parameter	Sample (1. 4/9/87
2-Chlorophenol	30
2-Nitrophenol	50
Phenol	100
2,4-Dimethylphenol	30
2,4-Dichlorophenol	50
2,4,6-Trichlorophenol	25
4-Chloro-3-methylphenol	75
2-Methyl-4,6-dinitrophenol	250
lorophenol	75
nol	50

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Semivolatile Compounds

CLIENT SAMPLE ID:	USEPA-QC SPIKE
LAB SAMPLE ID:	EPAQC0415
SAMPLE DATE:	04/09/87
EXTRACTION DATE:	04/09/87
ANALYSIS DATE:	04/15/87
FILE NAME:	EPAQC0415
INSTRUMENT ID:	MSA
MATRIX:	WATER
UNITS:	UG/L

COMPOUNDS	
Fluorene	41
Hexachlorobenzene	< 10
Hexachlorobutadiene	< 10
Hexachlorocyclopentadiene	< 10
Hexachloroethane	26
Indeno(1,2,3-cd)Pyrene	< 10
Isophorone	< 10
N-Nitroso-Di-n-Propylamine	< 10
N-Nitrosodimethylamine	< 5
N-Nitrosodiphenylamine	< 10
Naphthalene	21
Nitrobenzene	62
4-Nitrophenol	< 50
2-Nitrophenol	38
Pentachlorophenol	80
Phenanthrene	< 10
Phenol	69
Pyrene	< 10
1,2,4-Trichlorobenzene	< 10
2,4,6-Trichlorophenol	22

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincin

Water Pollution Quality Control Samples

GC/MS BASE NEUTRALS - II

TRUE VALUES

When diluted to volume according to the instruction, the sample co following compounds at these concentration expressed as ug/liter.

Parameter	Sample (3) 4/9/87
1,4-Dichlorobenzene	24.8
Bis (2 chloroisopropyl) ether	38.8
Hexachloroethane	30.0
Nitrobenzene	76.5
Naphthalene	24.8
Dimethyl Phthalate	40.0
Acenaphthene	19.5
Fluorene	51.2
4-Chlorophenyl phenyl ether	76.7
4-Bromophenyl phenyl ether	41.5
Anthracene	40.0
Fluoranthene	29.8
Butyl Benzl Phthalate	51.3
Chrysene	69.9
Ethyl Hexyl Phthalate	29.1
Benzo (b) Fluoranthene	40.0
Benzo (a) Pyrene	24.9
Dibenzo (a,h) Anthracene	40.3
Benzo (g,h,i) perylene	90.4

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincinnati

Water Pollution Quality Control Samples

GC/MS ACIDS

TRUE VALUES

When diluted to volume according to the instructions, the samples cont the following compounds at these concentrations expressed as ug/liter.

Parameter	Sample (1) 4/9/87
2-Chlorophenol	30
2-Nitrophenol	50
Phenol	100
2,4-Dimethylphenol	30
2,4-Dichlorophenol	50
2,4,6-Trichlorophenol	25
4-Chloro-3-methylphenol	75
2-Methyl-4,6-dinitrophenol	250
Pentachlorophenol	75
4-Nitrophenol	50

< - less than [illegible]ation level

QUALITY CONTROL DATA SUMMARY
FOR ORGANIC ANALYSIS

ASSOCIATED SAMPLES: 2988-2989

FRACTION: VOLATILES

A. TUNING (In chronological order)

B. INITIAL (5-POINT) CALIBRATION

C. CONTINUING CALIBRATION (In chronological order)

D. EPA TRACEABLE SAMPLE

INITIAL CALIBRATION DATA
VOLATILE HSL COMPOUNDS

CASE NO: 45
REGION: W
INSTRUMENT ID: MS-C
CONTRACTOR: MM ENV SYSTEMS
CALIBRATION DATE: 06/24/87
CONTRACT NO:

MIN AVE RF FOR SPCC IS 0.300 (1)   MAX XRSD FOR CCC IS 30X

LABORATORY ID	0624V1C1	0624V2C3	0624V3C1	0624V4C1	0624V5C1			CCC*
COMPOUND	RF(20)	RF(50)	RF(100)	RF(150)	RF(200)	AVE RF	X RSD	SPCC**
CHLOROMETHANE	2.190	1.890	1.846	1.982	1.840	1.950	7.5	* *
BROMOMETHANE	1.447	1.282	1.244	1.379	1.259	1.322	6.6	
VINYL CHLORIDE	1.480	1.321	1.254	1.384	1.281	1.344	6.7	*
CHLOROETHANE	0.635	0.556	0.530	0.545	0.509	0.555	8.7	
METHYLENE CHLORIDE	1.534	1.385	1.340	1.361	1.378	1.400	5.5	
ACETONE	0.829	0.554	0.518	0.526	0.524	0.590	22.7	
CARBON DISULFIDE	3.118	2.679	2.787	3.083	3.031	2.940	6.6	
1,1-DICHLOROETHENE	1.328	1.190	1.198	1.234	1.257	1.241	4.5	*
1,1-DICHLOROETHANE	2.682	2.381	2.432	2.428	2.449	2.474	4.8	* *
1,2-DICHLOROETHENE (TOTAL) . .	1.433	1.320	1.310	1.303	1.320	1.337	4.0	
CHLOROFORM	3.136	2.862	2.843	2.878	2.943	2.932	4.1	*
1,2-DICHLOROETHANE	2.713	2.419	2.400	2.304	2.194	2.406	8.0	
2-BUTANONE	0.027	0.026	0.027	0.027	0.028	0.027	2.6	
1,1,1-TRICHLOROETHANE	0.416	0.375	0.406	0.408	0.445	0.410	6.1	
CARBON TETRACHLORIDE	0.404	0.373	0.420	0.421	0.466	0.417	8.1	
VINYL ACETATE	0.563	0.424	0.417	0.399	0.410	0.443	15.3	
BROMODICHLOROMETHANE	0.492	0.486	0.511	0.520	0.566	0.515	6.1	
1,2-DICHLOROPROPANE	0.413	0.385	0.397	0.415	0.393	0.401	3.2	*
CIS-1,3-DICHLOROPROPENE . . .	0.350	0.372	0.411	0.459	0.439	0.406	11.2	
TRICHLOROETHENE	0.355	0.364	0.398	0.388	0.414	0.384	6.3	
DIBROMOCHLOROMETHANE	0.365	0.457	0.520	0.538	0.577	0.491	16.9	
1,1,2-TRICHLOROETHANE	0.294	0.317	0.317	0.320	0.333	0.316	4.4	
BENZENE	0.883	0.841	0.876	0.865	0.932	0.879	3.8	
TRANS-1,3-DICHLOROPROPENE . .	0.226	0.252	0.288	0.316	0.345	0.285	16.7	
BROMOFORM	0.263	0.313	0.358	0.376	0.416	0.345	17.1	* *
4-METHYL-2-PENTANONE	0.387	0.393	0.403	0.404	0.444	0.406	5.5	
2-HEXANONE	0.401	0.298	0.318	0.334	0.355	0.341	11.6	
TETRACHLOROETHENE	0.434	0.399	0.419	0.417	0.436	0.421	3.6	
1,1,2,2-TETRACHLOROETHANE . .	0.576	0.570	0.566	0.575	0.606	0.579	2.7	* *
TOLUENE	0.669	0.636	0.647	0.638	0.676	0.653	2.8	*
CHLOROBENZENE	0.893	0.854	0.848	0.836	0.890	0.864	3.0	* *
ETHYLBENZENE	0.395	0.365	0.383	0.376	0.398	0.383	3.6	*
STYRENE	0.683	0.651	0.705	0.686	0.736	0.692	4.5	
XYLENE (TOTAL)	0.419	0.418	0.422	0.393	0.429	0.416	3.3	
TOLUENE-D8	1.139	1.012	1.026	1.054	1.027	1.052	4.9	
BFB	0.818	0.700	0.700	0.716	0.718	0.730	6.8	
1,2-DICHLOROETHANE-D4	2.540	2.189	2.121	2.181	2.013	2.209	9.0	

RESPONSE FACTOR (NUMBER IS THE AMOUNT OF UG/L)
AVE RF - AVERAGE RESPONSE FACTOR
XRSD - - PERCENT RELATIVE STANDARD DEVIATION
CCC - - CALIBRATION CHECK COMPOUNDS (*)
SPCC - - SYSTEM PERFORMANCE CHECK COMPOUNDS (**)
(1) - - MINIMUM AVE RF FOR BROMOFORM IS 0.250

FORM VI

6A
VOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: VERSAR ESMO Contract: ____________

Code: ________ Case No.: ________ SAS No.: ________ SDG No.: ______

Instrument ID: MS-C Calibration Date(s): 07/27/87 07/27/87

Matrix: (soil/water) WATER Level: (low/med) LOW Column: (pack/cap) PACK

Min RRF for SPCC(#) = 0.300 (0.250 for Bromoform) Max %RSD for CCC(*) = 30.0%

LAB FILE ID: RRF20 = 0727V1C1 RRF50 = 0727V2C1
RRF100= 0727V3C1 RRF150= 0727V4C1 RRF200= 0727V5C1

COMPOUND	RRF20	RRF50	RRF100	RRF150	RRF200	$\overline{RRF}$	% RSD
Chloromethane #	3.947	4.156	3.091	2.914	3.027	3.427	16.9#
Bromomethane	1.944	2.096	1.693	1.542	1.553	1.766	13.9
Vinyl Chloride *	2.402	2.652	2.023	2.093	2.137	2.261	11.6*
Chloroethane	0.907	0.927	0.827	0.848	0.847	0.871	5.0
Methylene Chloride	1.950	1.878	1.690	1.581	1.631	1.746	9.2
Acetone	0.940	0.681	0.687	0.590	0.670	0.714	18.6
Carbon Disulfide	4.876	4.363	4.115	4.014	4.207	4.315	7.9
1,1-Dichloroethene *	1.606	1.347	1.311	1.304	1.354	1.384	9.1*
1,1-Dichloroethane #	3.545	3.037	3.159	3.092	3.199	3.206	6.2#
1,2-Dichloroethene (total)	1.807	1.458	1.543	1.466	1.529	1.561	9.1
Chloroform *	3.791	3.153	3.336	3.205	3.379	3.373	7.5*
2-Dichloroethane	2.766	2.265	2.494	2.391	2.524	2.488	7.5
Butanone	0.073	0.031	0.036	0.029	0.029	0.040	47.2
1,1,1-Trichloroethane	0.560	0.427	0.397	0.383	0.388	0.431	17.2
Carbon Tetrachloride	0.535	0.402	0.398	0.387	0.388	0.422	15.1
Vinyl Acetate	0.862	0.675	0.474	0.334	0.121	0.493	58.6
Bromodichloromethane	0.761	0.590	0.580	0.622	0.568	0.624	12.7
1,2-Dichloropropane *	0.576	0.441	0.477	0.474	0.479	0.489	10.4*
cis-1,3-Dichloropropene	0.662	0.521	0.596	0.589	0.598	0.593	8.4
Trichloroethene	0.418	0.334	0.390	0.380	0.399	0.384	8.2
Dibromochloromethane	0.573	0.433	0.507	0.493	0.517	0.505	10.0
1,1,2-Trichloroethane	0.389	0.286	0.324	0.313	0.322	0.327	11.6
Benzene	1.313	0.984	1.050	1.016	1.037	1.080	12.3
trans-1,3-Dichloropropene	0.406	0.309	0.374	0.382	0.598	0.414	26.3
2-Chloroethylvinylether	0.144	0.153	0.167	0.170	0.184	0.164	9.5
Bromoform #	0.348	0.250	0.299	0.290	0.309	0.299	11.8#
4-Methyl-2-pentanone	0.566	0.397	0.444	0.480	0.515	0.480	13.5
2-Hexanone	0.479	0.309	0.375	0.386	0.407	0.391	15.7
Tetrachloroethene	0.447	0.343	0.375	0.359	0.366	0.378	10.7
1,1,2,2-Tetrachloroethane #	0.766	0.557	0.607	0.588	0.577	0.619	13.6#
Toluene *	0.959	0.734	0.783	0.767	0.771	0.803	11.1*
Chlorobenzene #	1.187	0.870	0.920	0.903	0.904	0.957	13.6#
Ethylbenzene *	0.571	0.444	0.474	0.474	0.472	0.487	10.0*
Styrene	0.961	0.756	0.848	0.851	0.860	0.855	8.5
Xylene (total)	0.684	0.489	0.564	0.560	0.556	0.571	12.4
luene-d8	1.065	1.025	0.964	0.971	1.014	1.008	4.1
3	0.839	0.707	0.704	0.688	0.734	0.734	8.3
1,2-Dichloroethane-d4	2.481	2.379	2.339	2.253	2.428	2.376	3.7

GC/MS Tuning and Mass Calibration

BROMOFLUOROBENZENE

Case Number: 5203
Inst ID: MS2
Lab ID: 0629BFB81

Laboratory: VERSAR, ESMOContract:
Sens Date: 06/29/87
Cali Date: 6/10/86

Sens Time: 9:48:00
Analyst: DC

Data release authorized by: ____________________

m/z	Ion Abundance Criteria	Spec # 225	
50	15 to 40% of mass 95	31.04	
75	30 to 60% of mass 95	47.23	
95	base peak, 100% relative abundance	100.00	
96	5 to 9% of mass 95	6.93	
173	less than 1% of mass 95	0.00	
174	greater than 50% of mass 95	78.57	
175	5 to 9% of mass 174	4.75	(6.05) 1
176	between 95% and 101% of mass 174	78.67	(*100.) 1
177	5 to 9% of mass 176	3.97	(5.05) 2

1 - value in parenthesis is % of mass 174
2 - value in parenthesis is % of mass 176

GC/MS Tuning and Mass Calibration

BROMOFLUOROBENZENE

se Number:	5203	Laboratory:	VERSAR,	ESMOContract:	
Inst ID:	MS2	Sens Date:	06/30/87	Sens Time:	8:56:00
Lab ID:	0630BFBB1	Cali Date:	6/10/86	Analyst:	DC

Data release authorized by: ____________________

m/z	Ion Abundance Criteria	Spec # 224	
50	15 to 40% of mass 95	30.08	
75	30 to 60% of mass 95	52.72	
95	base peak, 100% relative abundance	100.00	
96	5 to 9% of mass 95	8.83	
173	less than 1% of mass 95	0.00	
174	greater than 50% of mass 95	82.59	
175	5 to 9% of mass 174	6.17	(7.47) 1
176	between 95% and 101% of mass 174	82.31	(99.66) 1
177	5 to 9% of mass 176	4.98	(6.05) 2

1 - value in parenthesis is % of mass 174
2 - value in parenthesis is % of mass 176

CONTINUING CALIBRATION CHECK
VOLATILE HSL COMPOUNDS

Case No: 4

Region: VERSAR

Contractor: MM ENV SYSTEMS

Contract No:

Instrument ID: MS-B

Calibration Date: 06/29/87

Time: 10:22

Laboratory ID: 0629V2B1

Initial Cali. Date: 03/23/87

Minimum RF for SPCC is 0.300 (1)   Maximum %D for CCC is 25%

Compound	AVE RF	RF(50)	% D	CCC	SPCC
Chloromethane	5.308	3.822	28.0		* *
Bromomethane	1.885	1.700	9.8		
Vinyl Chloride	2.996	2.378	20.6	*	
Chloroethane	1.271	0.947	25.5		
Methylene Chloride	1.825	1.548	15.2		
Acetone	1.081	0.676	37.5		
Carbon Disulfide	5.038	3.603	28.5		
1,1-Dichloroethene	1.490	1.275	14.4	*	
1,1-Dichloroethane	3.451	3.124	9.5		* *
total-1,2-Dichloroethenes . .	1.525	1.337	12.3		
Chloroform	3.125	3.205	-2.6	*	
1,2-Dichloroethane	2.326	2.837	-22.0		
2-Butanone	0.033	0.036	-9.1		
1,1,1-Trichloroethane	0.364	0.437	-20.1		
Carbon Tetrachloride	0.366	0.411	-12.3		
Vinyl Acetate	1.249	0.991	20.7		
Bromodichloromethane	0.625	0.590	5.6		
1,2-Dichloropropane	0.522	0.395	24.3	*	
cis-1,3-Dichloropropene . . .	0.519	0.485	6.6		
Trichloroethene	0.377	0.357	5.3		
Dibromochloromethane	0.488	0.501	-2.7		
1,1,2-Trichloroethane	0.377	0.331	12.2		
Benzene	1.146	0.849	25.9		
trans-1,3-Dichloropropene . .	0.336	0.319	5.1		
2-Chloroethylvinylether . . .	0.234	0.212	9.4		
1,1,1,2-Tetrachloroethane . .	0.337	0.337	0.0		
Bromoform	0.362	0.367	-1.4		* *
4-Methyl-2-pentanone	0.747	0.520	30.4		
2-Hexanone	0.516	0.410	20.5		
Tetrachloroethene	0.401	0.389	3.0		
1,1,2,2-Tetrachloroethane . .	0.745	0.465	37.6		* *
Toluene	0.736	0.562	23.6	*	
Chlorobenzene	0.947	0.811	14.4		* *
Ethylbenzene	0.416	0.318	23.6	*	
Styrene	0.815	0.616	24.4		
m-Xylene	0.483	0.375	22.4		
1,2-Dichlorobenzene	0.804	0.794	1.2		
1,4-Dichlorobenzene	0.831	0.816	1.8		
1,3-Dichlorobenzene	0.846	0.755	10.8		

RF(50) - Response Factor from daily standard file at 50 ug/l

AVE RF - Average Response Factor from initial calibration Form VI

%D - - - Percent Difference

CCC - - Calibration Check Compounds (*)

SPCC - - System Performance Check Compounds (**)

(1) - - Mininum RF for Bromoform

CONTINUING CALIBRATION CHECK
VOLATILE HSL COMPOUNDS

Case No: 4 Region: VERSAR Calibration Date: 06/29/87
Contractor: MM ENV SYSTEMS Time: 10:22
C[illegible]act No: Laboratory ID: 0629V2B1
I[illegible].ument ID: MS-B Initial Cali. Date: 03/23/87

Minimum RF for SPCC is 0.300 (1) Maximum %D for CCC is 25%

Compound	AVE RF	RF(50)	% D	CCC	SPCC
Toluene-d8	1.114	0.994	10.8		
BFB	0.721	0.716	0.7		
1,2-Dichloroethane-d4	1.972	2.677	-35.8		

RF(50) - Response Factor from daily standard file at 50 ug/l
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)
(1) - - Mininum RF for Bromoform is 0.250

Form VII

CONTINUING CALIBRATION CHECK
VOLATILE HSL COMPOUNDS

CASE NO: 4 REGION: VERSAR
CONTRACTOR: MM ENV SYSTEMS
CONTRACT NO:
INSTRUMENT ID: MS-B

CALIBRATION DATE: 06/30/87
TIME: 10:06
LABORATORY ID: 0630V281
INITIAL CALI. DATE: 03/23/87

MINIMUM RF FOR SPCC IS 0.300 (1) MAXIMUM XD FOR CCC IS 25X

COMPOUND	AVE RF	RF(50)	X D	CCC	SPCC
CHLOROMETHANE	5.308	3.859	27.3		* *
BROMOMETHANE	1.885	1.926	-2.2		
VINYL CHLORIDE	2.996	2.453	18.1	*	
CHLOROETHANE	1.271	0.941	26.0		
METHYLENE CHLORIDE	1.825	1.696	7.1		
ACETONE	1.081	0.856	20.8		
CARBON DISULFIDE	5.038	4.139	17.8		
1,1-DICHLOROETHENE	1.490	1.461	1.9	*	
1,1-DICHLOROETHANE	3.451	3.470	-0.6		* *
TOTAL-1,2-DICHLOROETHENES	1.525	1.484	2.7		
CHLOROFORM	3.125	3.584	-14.7	*	
1,2-DICHLOROETHANE	2.326	2.849	-22.5		
2-BUTANONE	0.033	0.028	15.2		
1,1,1-TRICHLOROETHANE	0.364	0.482	-32.4		
CARBON TETRACHLORIDE	0.366	0.494	-35.0		
VINYL ACETATE	1.249	0.946	24.3		
BROMODICHLOROMETHANE	0.625	0.653	-4.5		
1,2-DICHLOROPROPANE	0.522	0.422	19.2	*	
CIS-1,3-DICHLOROPROPENE	0.519	0.513	1.2		
TRICHLOROETHENE	0.377	0.401	-6.4		
DIBROMOCHLOROMETHANE	0.488	0.542	-11.1		
1,1,2-TRICHLOROETHANE	0.377	0.344	8.8		
BENZENE	1.146	0.959	16.3		
TRANS-1,3-DICHLOROPROPENE	0.336	0.333	0.9		
2-CHLOROETHYLVINYLETHER	0.234	0.187	20.1		
1,1,1,2-TETRACHLOROETHANE	0.337	0.360	-6.8		
BROMOFORM	0.362	0.384	-6.1		* *
4-METHYL-2-PENTANONE	0.747	0.518	30.7		
2-HEXANONE	0.516	0.391	24.2		
TETRACHLOROETHENE	0.401	0.447	-11.5		
1,1,2,2-TETRACHLOROETHANE	0.745	0.462	38.0		* *
TOLUENE	0.736	0.615	16.4	*	
CHLOROBENZENE	0.947	0.861	9.1		* *
ETHYLBENZENE	0.416	0.348	16.3	*	
STYRENE	0.815	0.650	20.2		
M-XYLENE	0.483	0.407	15.7		
1.2-DICHLOROBENZENE	0.804	0.775	3.6		
1.4-DICHLOROBENZENE	0.831	0.847	-1.9		
1.3-DICHLOROBENZENE	0.846	0.790	6.6		

RF(50) - RESPONSE FACTOR FROM DAILY STANDARD FILE AT 50 UG/L
AVE RF - AVERAGE RESPONSE FACTOR FROM INITIAL CALIBRATION FORM VI
XD - - - PERCENT DIFFERENCE
CCC - - CALIBRATION CHECK COMPOUNDS (*)
SPCC - - SYSTEM PERFORMANCE CHECK COMPOUNDS (**)
(1) - - MININUM RF FOR BROMOFORM IS

ORM VII

[illegible]

VOLATILE HSL COMPOUNDS

CASE NO: 4	REGION: VERSAR	CALIBRATION DATE:	06/30/87
CONTRACTOR: MM ENV SYSTEMS		TIME:	10:06
CONTRACT NO:		LABORATORY ID:	0630V281
STRUMENT ID: MS-8		INITIAL CALI. DATE:	03/23/87

MINIMUM RF FOR SPCC IS 0.300 (1)   MAXIMUM %D FOR CCC IS 25%

COMPOUND	AVE RF	RF(50)	% D	CCC	SPCC
TOLUENE-D8	1.114	1.034	7.2		
BFB	0.721	0.712	1.2		
1,2-DICHLOROETHANE-D4	1.972	2.561	-29.9		

RF(50) - RESPONSE FACTOR FROM DAILY STANDARD FILE AT 50 UG/L
AVE RF - AVERAGE RESPONSE FACTOR FROM INITIAL CALIBRATION FORM VI
%D - - - PERCENT DIFFERENCE
CCC - - CALIBRATION CHECK COMPOUNDS (*)
SPCC - - SYSTEM PERFORMANCE CHECK COMPOUNDS (**)
(1) - - MININUM RF FOR BROMOFORM IS 0.250

FORM VII

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Volatile Compounds

CLIENT SAMPLE ID:	LAB BLANK	EPAQC CONC2
LAB SAMPLE ID:	CBLK0417	WP483
SAMPLE DATE:	04/17/87	04/17/87
ANALYSIS DATE:	04/17/87	04/17/87
FILE NAME:	0417VWBC1	VEPACHC
INSTRUMENT ID:	MS-C	MS-C
MATRIX:	WATER	WATER
UNITS:	UG/L	UG/L
DILUTION FACTOR:	1	1
COMPOUNDS		
Acetone	< 50	< 50
Acrolein	< 10	< 10
Acrylonitrile	< 10	< 10
Benzene	< 1	< 1
Bromodichloromethane	< 1	8.4
Bromoform	< 1	9.3
Bromomethane	< 1	< 1
2-Butanone	< 10	< 10
Carbon Disulfide	< 5	< 5
Carbon Tetrachloride	< 1	14
Chlorobenzene	< 1	< 1
Chloroethane	< 1	< 1
2-Chloroethylvinylether	< 1	< 1
Chloroform	< 1	42
Chloromethane	< 1	< 1
Dibromochloromethane	< 1	10
1,2-Dichloroethane	< 1	23
1,1-Dichloroethane	< 1	< 1
1,1-Dichloroethene	< 1	< 1
1,2-Dichloropropane	< 1	< 1
trans-1,3-Dichloropropene	< 1	< 1
cis-1,3-Dichloropropene	< 1	< 1
Ethylbenzene	< 1	< 1
2-Hexanone	< 10	< 10
4-Methyl-2-Pentanone	< 10	< 10
Methylene Chloride	< 5	< 5
Styrene	< 5	< 5
1,1,2,2-Tetrachloroethane	< 1	< 1
Tetrachloroethene	< 1	7.3
Toluene	< 2	< 2
1,1,1-Trichloroethane	< 1	19
1,1,2-Trichloroethane	< 1	< 1
Trichloroethene	< 1	13
Trichlorofluoromethane	< 1	< 1
Vinyl Acetate	< 10	< 10
Vinyl Chloride		< 1

Sample 2

Parameter	True Value	$\bar{X}$	S	95% Confidence Limits
1,2-Dichloroethane	22.2	22.0	4.24	13.5 - 30.5
Chloroform	43.0	39.6	7.50	24.6 - 54.6
1,1,1-Trichloroethane	14.3	12.7	2.91	6.9 - 18.5
1,1,2-Trichloroethylene	12.0	10.6	2.67	5.2 - 16.0
Carbontetrachloride	10.0	9.6	2.31	5.0 - 14.2
1,1,2,2-Tetrachloroethylene	6.2	5.9	1.00	3.9 - 7.9
Bromodichloromethane	7.9	7.8	1.45	4.9 - 10.7
Dibromochloromethane	10.7	10.2	2.11	6.0 - 14.4
Bromoform	9.9	9.5	1.93	5.7 - 13.3

WP 483

QUALITY CONTROL DATA SUMMARY
FOR ORGANIC ANALYSIS

ASSOCIATED SAMPLES: 2988-2989

FRACTION: BNAs

A. TUNING (In chronological order)

B. INITIAL (5-POINT) CALIBRATION

C. CONTINUING CALIBRATION (In chronological order)

D. EPA TRACEABLE SAMPLE

INITIAL CALIBRATION DATA
SEMIVOLATILE HSL COMPOUNDS
(PAGE 1)

CASE NO: 5203　　REGION: LAB　　INSTRUMENT ID: MSA
CONTRACTOR: VERSAR ESMO　　CALIBRATION DATE: 01/27/87
CONTRACT NO:

MINIMUM AVE RF FOR SPCC IS 0.050　　MAXIMUM %RSD FOR CCC IS 30%

LABORATORY ID	012751A1	012752A1	012753A1	012754A2	012755A2	:			CCC*
COMPOUND	RF(20)	RF(50)	RF(80)	RF(120)	RF(160)	:	AVE RF	% RSD	SPCC**
PHENOL	1.927	1.839	1.613	1.610	1.528	:	1.703	10.0	*
BIS(2-CHLOROETHYL)ETHER . . .	1.839	1.762	1.664	1.652	1.582	:	1.700	5.9	
2-CHLOROPHENOL	1.725	1.618	1.450	1.441	1.455	:	1.538	8.3	
1,3-DICHLOROBENZENE	1.938	1.802	1.719	1.692	1.707	:	1.772	5.8	
1,4-DICHLOROBENZENE	2.047	1.863	1.789	1.708	1.722	:	1.826	7.6	*
BENZYL ALCOHOL	0.952	0.961	0.891	0.910	0.940	:	0.931	3.2	
1,2-DICHLOROBENZENE	1.960	1.775	1.700	1.664	1.684	:	1.757	6.9	
2-METHYLPHENOL	0.952	0.961	0.891	0.910	0.940	:	0.931	3.2	
BIS(2-CHLOROISOPROPYL)ETHER .	2.096	2.056	1.860	1.914	1.849	:	1.955	5.8	
4-METHYLPHENOL	1.509	1.384	1.273	1.244	1.255	:	1.333	8.5	
N-NITROSO-DI-N-PROPYLAMINE . .	1.621	1.628	1.478	1.902	1.871	:	1.700	10.6	* *
HEXACHLOROETHANE	0.936	0.918	0.882	0.864	0.884	:	0.897	3.3	
NITROBENZENE	0.543	0.518	0.486	0.478	0.487	:	0.502	5.4	
ISOPHORONE	1.011	0.950	0.954	0.968	0.962	:	0.969	2.5	
2-NITROPHENOL	0.198	0.201	0.206	0.214	0.215	:	0.207	3.7	*
2,4-DIMETHYLPHENOL	0.319	0.307	0.311	0.314	0.314	:	0.313	1.4	
BENZOIC ACID	X	0.109	0.095	0.177	0.090	:	0.118	34.2	
BIS(2-CHLOROETHOXY)METHANE . .	0.535	0.497	0.493	0.493	0.495	:	0.503	3.6	
2,4-DICHLOROPHENOL	0.325	0.290	0.291	0.293	0.292	:	0.298	5.0	*
1,2,4-TRICHLOROBENZENE	0.403	0.353	0.353	0.336	0.336	:	0.356	7.7	
NAPHTHALENE	1.153	1.028	0.996	0.951	0.947	:	1.015	8.3	
4-CHLOROANILINE	0.135	0.166	0.182	0.258	0.154	:	0.179	26.5	
HEXACHLOROBUTADIENE	0.264	0.228	0.241	0.225	0.220	:	0.236	7.5	*
4-CHLORO-3-METHYLPHENOL . . .	0.402	0.368	0.374	0.372	0.359	:	0.375	4.3	*
2-METHYLNAPHTHALENE	1.048	0.850	0.841	0.819	0.816	:	0.875	11.2	
HEXACHLOROCYCLOPENTADIENE . .	0.252	0.230	0.239	0.287	0.301	:	0.262	11.8	* *
2,4,6-TRICHLOROPHENOL	0.427	0.405	0.429	0.491	0.556	:	0.462	13.4	*
2,4,5-TRICHLOROPHENOL	X	0.423	0.418	0.346	0.279	:	0.367	18.6	
2-CHLORONAPHTHALENE	1.463	1.285	1.285	1.261	1.263	:	1.311	6.5	
2-NITROANILINE	X	0.461	0.390	0.402	0.434	:	0.422	7.6	
DIMETHYL PHTHALATE	1.868	1.674	1.289	1.599	1.154	:	1.517	19.2	
ACENAPHTHALENE	1.988	1.832	1.800	1.690	1.723	:	1.807	6.4	
3-NITROANILINE	X	0.189	0.084	0.060	0.117	:	0.093	27.9	
ACENAPHTHENE	1.514	1.290	1.273	0.998	0.874	:	1.190	21.4	*
2,4-DINITROPHENOL	X	0.117	0.108	0.113	0.114	:	0.113	3.3	* *
4-NITROPHENOL	X	0.189	0.115	1.055	0.121	:	0.370	123.8	* *
DIBENZOFURAN	2.321	1.872	1.826	1.786	1.209	:	1.803	22.0	

RESPONSE FACTOR (NUMBER IS THE AMOUNT OF NANOGRAMS)
AVE RF - AVERAGE RESPONSE FACTOR
%RSD - - PERCENT RELATIVE STANDARD DEVIATION
CCC - - CALIBRATION CHECK COMPOUNDS (*)
SPCC - - SYSTEM PERFORMANCE CHECK COMPOUNDS (**)
X - - - NOT DETECTABLE AT 20.NG

'ORM VI

INITIAL CALIBRATION DATA
SEMIVOLATILE HSL COMPOUNDS
(PAGE 2)

CASE NO: 5203
REGION: LAB
INSTRUMENT ID: MSA
CONTRACTOR: VERSAR ESMO
CALIBRATION DATE: 01/27/87
CONTRACT NO:

MINIMUM AVE RF FOR SPCC IS 0.050 MAXIMUM %RSD FOR CCC IS 30%

LABORATORY ID	0127S1A1	0127S2A1	0127S3A1	0127S4A2	0127S5A2			CCC*
COMPOUND	RF(20)	RF(50)	RF(80)	RF(120)	RF(160)	AVE RF	% RSD	SPCC**
2,4-DINITROTOLUENE	0.370	0.381	0.347	0.312	0.312	0.344	9.3	
2,6-DINITROTOLUENE								
DIETHYLPHTHALATE	2.052	1.783	1.596	1.542	1.456	1.686	14.1	
4-CHLOROPHENYL-PHENYLETHER . .	0.827	0.764	0.724	0.563	0.502	0.676	20.4	
FLUORENE	1.425	1.315	1.266	1.177	1.194	1.275	7.9	
4-NITROANILINE	X	0.114	0.130	0.065	0.079	0.097	31.1	
4,6-DINITRO-2-METHYLPHENOL . .	X	0.122	0.128	0.134	0.126	0.128	3.9	
N-NITROSODIPHENYLAMINE	0.644	0.512	0.472	0.453	0.391	0.494	19.1	*
4-BROMOPHENYL-PHENYLETHER . .	0.327	0.308	0.333	0.307	0.304	0.316	4.2	
HEXACHLOROBENZENE	0.455	0.359	0.387	0.352	0.311	0.373	14.3	
PENTACHLOROPHENOL	X	0.151	0.175	0.163	0.151	0.160	7.2	*
PHENANTHRENE	1.318	1.211	1.252	1.122	1.061	1.193	8.6	
ANTHRACENE	1.384	1.169	1.221	1.108	1.089	1.194	9.9	
DI-N-BUTYLPHTHALATE	1.611	1.543	1.690	1.652	1.581	1.615	3.6	
FLUORANTHENE	1.191	1.162	1.437	1.192	1.160	1.228	9.6	*
PYRENE	1.748	1.427	1.386	1.354	1.329	1.449	11.8	
BUTYLBENZYLPHTHALATE	0.799	0.805	0.757	0.692	0.736	0.758	6.2	
3,3'-DICHLOROBENZIDINE	0.077	0.073	0.041	0.032	0.033	0.051	43.1	
BENZO(A)ANTHRACENE	1.124	1.132	1.144	1.047	1.051	1.100	4.3	
CHRYSENE	1.275	1.186	1.175	0.982	1.020	1.128	10.9	
BIS(2-ETHYLHEXYL)PHTHALATE . .	1.041	1.092	1.093	1.073	1.062	1.072	2.0	
DI-N-OCTYL PHTHALATE	2.242	2.323	2.903	3.061	2.750	2.656	13.5	*
BENZO(B)FLUORANTHENE	1.539	1.668	1.551	1.595	1.469	1.564	4.7	
BENZO(K)FLUORANTHENE	1.984	1.421	1.492	1.511	1.434	1.568	15.0	
BENZO(A)PYRENE	1.347	1.185	1.148	1.210	1.153	1.209	6.7	*
INDENO(1,2,3-CD)PYRENE	0.834	0.762	0.704	0.607	0.597	0.701	14.5	
DIBENZ(A,H)ANTHRACENE	0.841	0.783	0.685	0.598	0.616	0.705	14.9	
BENZO(G,H,I)PERYLENE	1.022	0.744	0.695	0.586	0.571	0.724	25.2	
NITROBENZENE-D5	0.801	0.833	0.764	0.787	0.811	0.799	3.2	
2-FLUOROBIPHENYL	1.584	1.367	1.284	1.255	1.300	1.358	9.8	
TERPHENYL-D14	0.761	0.694	0.762	0.627	0.614	0.692	10.2	
PHENOL-D5	1.813	1.809	1.655	1.608	1.620	1.701	6.0	
2-FLOUROPHENOL	1.430	1.389	1.334	1.388	1.476	1.403	3.8	
2,4,6-TRIBROMOPHENOL	0.263	0.214	0.219	0.183	0.173	0.210	16.8	

RESPONSE FACTOR (NUMBER IS THE AMOUNT OF NANOGRAMS)
AVE RF - AVERAGE RESPONSE FACTOR
%RSD - - PERCENT RELATIVE STANDARD DEVIATION
CCC - - CALIBRATION CHECK COMPOUNDS (*)
SPCC - - SYSTEM PERFORMANCE CHECK COMPOUNDS (**)
X - - - NOT DETECTABLE AT 20 NG

FORM VI

GC/MS TUNING AND MASS CALIBRATION
DECAFLUOROTRIPHENYLPHOSPHINE

CASE NUMBER:	000000	LABORATORY:	MMES	CONTRACT:	000000
INST ID:	MS1	SENS DATE:	07/09/87	SENS TIME:	9:40:00
LAB ID:	0708DFTA2	CALI DATE:	04/15/86	ANALYST:	KW

DATA RELEASE AUTHORIZED BY: ______________________

M/E	ION ABUNDANCE CRITERIA	SPEC # 604	
51	30 TO 60% OF MASS 198	39.61	
68	LESS THAN 2% OF MASS 69	0.00	(0.00) 1
69	MASS 69 RELATIVE ABUNDANCE	61.14	
70	LESS THAN 2% OF MASS 69	0.00	(0.00) 1
127	40 TO 60% OF MASS 198	57.80	
197	LESS THAN 1% OF MASS 198	0.00	
198	BASE PEAK, 100% RELATIVE ABUNDANCE	100.00	
199	5 TO 9% OF MASS 198	7.94	
275	10 TO 30% OF MASS 198	27.07	
365	GREATER THAN 1% OF MASS 198	5.17	
441	LESS THAN MASS 443	11.79	
442	GREATER THAN 40% OF MASS 198	69.11	
443	17 TO 23% OF MASS 442	15.20	(22.00) 2

1 - VALUE IN PARENTHESIS IS % OF MASS 69
2 - VALUE IN PARENTHESIS IS % OF MASS 442

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 2)

Case No: 5203 Region: ______
Contractor: VERSAR ESMO
Contract No: ______
Instrument ID: MS-A

Calibration Date: 07/09/87
Time: 11:29
Laboratory ID: 0709S2A2
Initial Cali. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
4-Nitrophenol	x	0.370	0.335	9.5		* *
Dibenzofuran		1.803				
2,4-Dinitrotoluene		0.344	0.428	-24.4		
Diethylphthalate		1.686	1.839	-9.1		
4-Chlorophenyl-phenylether		0.676	0.680	-0.6		
Fluorene		1.275	1.328	-4.2		
4-Nitroaniline	x	0.097				
4,6-Dinitro-2-Methylphenol	x	0.128	0.151	-18.0		
N-Nitrosodiphenylamine		0.494	0.459	7.1	*	
4-Bromophenyl-phenylether		0.316	0.303	4.1		
Hexachlorobenzene		0.373	0.398	-6.7		
Pentachlorophenol	x	0.160	0.193	-20.6	*	
Phenanthrene		1.193	1.138	4.6		
Anthracene		1.194	1.089	8.8		
Di-n-Butylphthalate		1.615	1.632	-1.1		
Fluoranthene		1.228	1.190	3.1	*	
Pyrene		1.449	1.831	-26.4		
Butylbenzylphthalate		0.758	0.877	-15.7		
3,3'-Dichlorobenzidine		0.051	0.136	-166.7		
Benzo(a)Anthracene		1.100	1.089	1.0		
Chrysene		1.128	1.059	6.1		
bis(2-Ethylhexyl)Phthalate		1.072	1.070	0.2		
Chrysene						
Di-n-Octyl Phthalate		2.656	2.013	24.2	*	
Benzo(b+k)fluoranthenes			1.376			
Benzo(b)fluoranthene		1.564				
Benzo(k)fluoranthene		1.568				
Benzo(a)Pyrene		1.209	1.231	-1.8	*	
Indeno(1,2,3-cd)Pyrene		0.701	1.086	-54.9		
Dibenz(a,h)Anthracene		0.705	0.757	-7.4		
Benzo(g,h,i)Perylene		0.724	0.876	-21.0		
Perylene						
C8 to C20 HYDROCARBONS						

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
x - - - Due to low response analyze at 80 total nanograms
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)

Form VII

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 1)

Case No: 5203 Region: ______
Contractor: VERSAR ESMO
Contract No: ______
Instrument ID: MS-A
Calibration Date: 07/09/87
Time: 11:29
Laboratory ID: 0709S2A2
Initial Cali. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
Phenol		1.703	1.827	-7.3	*	
bis(2-Chloroethyl)Ether		1.700	1.547	9.0		
2-Chlorophenol		1.538	1.603	-4.2		
1,3-Dichlorobenzene		1.772	1.675	5.5		
1,4-Dichlorobenzene		1.826	1.705	6.6	*	
Benzyl Alcohol		0.931				
1,2-Dichlorobenzene		1.757	1.678	4.5		
2-Methylphenol		0.931				
bis(2-Chloroisopropyl)Ether		1.955	1.395	28.6		
4-Methylphenol		1.333				
N-Nitroso-Di-n-Propylamine		1.700	1.302	23.4		**
Hexachloroethane		0.897	1.006	-12.2		
Nitrobenzene		0.502	0.896	-78.5		
Isophorone		0.969	0.987	-1.9		
2-Nitrophenol		0.207	0.235	-13.5	*	
2,4-Dimethylphenol		0.313	0.561	-79.2		
Benzoic Acid	x	0.118				
bis(2-Chloroethoxy)Methane		0.503	0.547	-8.7		
2,4-Dichlorophenol		0.298	0.302	-1.3	*	
1,2,4-Trichlorobenzene		0.356	0.359	-0.8		
Naphthalene		1.015	1.086	-7.0		
4-Chloroaniline		0.179				
Hexachlorobutadiene		0.236	0.264	-11.9	*	
4-Chloro-3-Methylphenol		0.375	0.447	-19.2	*	
2-Methylnaphthalene		0.875				
Hexachlorocyclopentadiene		0.262	0.334	-27.5		**
2,4,6-Trichlorophenol		0.462	0.387	16.2	*	
2,4,5-Trichlorophenol	x	0.367				
2-Chloronaphthalene		1.311	1.176	10.3		
2-Nitroaniline	x	0.422				
Dimethyl Phthalate		1.517	1.572	-3.6		
Acenaphthalene		1.807	1.713	5.2		
2,6-Dinitrotoluene			0.267			
3-Nitroaniline	x	0.093				
Acenaphthene		1.190	1.250	-5.0	*	
2,4-Dinitrophenol	x	0.113	0.144	-27.4		**

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
x - - - Due to low response analyze at 80 total nanograms
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)

Form VII

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Semivolatile Compounds

CLIENT SAMPLE ID:	USEPA-QC SPIKE
LAB SAMPLE ID:	EPAQC0415
SAMPLE DATE:	04/09/87
EXTRACTION DATE:	04/09/87
ANALYSIS DATE:	04/15/87
FILE NAME:	EPAQC0415
INSTRUMENT ID:	MSA
MATRIX:	WATER
UNITS:	UG/L

COMPOUNDS	
Acenaphthalene	< 10
Acenaphthene	17
Anthracene	32
Benzidine	< 80
Benzo(a)Anthracene	< 10
Benzo(a)Pyrene	18
Benzo(b+k)Fluoranthenes	31
Benzo(g,h,i)Perylene	69
4-Bromophenyl-phenylether	38
Butylbenzylphthalate	42
4-Chloro-3-Methylphenol	59
bis(2-Chloroethoxy)Methane	< 10
bis(2-Chloroethyl)Ether	< 10
bis(2-Chloroisopropyl)Ether	30
2-Chloronaphthalene	< 10
2-Chlorophenol	24
4-Chlorophenyl-phenylether	71
Chrysene	59
Di-n-Butylphthalate	< 10
Di-n-Octyl Phthalate	< 10
Dibenz(a,h)Anthracene	50
1,2-Dichlorobenzene	< 10
1,4-Dichlorobenzene	22
1,3-Dichlorobenzene	< 10
3,3'-Dichlorobenzidine	< 20
2,4-Dichlorophenol	42
Diethylphthalate	< 10
Dimethyl Phthalate	44
2,4-Dimethylphenol	14
4,6-Dinitro-2-Methylphenol	147
2,4-Dinitrophenol	< 50
2,4-Dinitrotoluene	< 10
2,6-Dinitrotoluene	< 10
1,2-Diphenylhydrazine	< 10
bis(2-Ethylhexyl)Phthalate	25
Fluoranthene	30

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincinnati

Water Pollution Quality Control Samples

GC/MS BASE NEUTRALS - II

TRUE VALUES

When diluted to volume according to the instruction, the sample contain following compounds at these concentration expressed as ug/liter.

Parameter	Sample (3) 4/9/87
1,4-Dichlorobenzene	24.8
Bis (2 chloroisopropyl) ether	38.8
Hexachloroethane	30.0
Nitrobenzene	76.5
Naphthalene	24.8
Dimethyl Phthalate	40.0
Acenaphthene	19.5
Fluorene	51.2
4-Chlorophenyl phenyl ether	76.7
4-Bromophenyl phenyl ether	41.5
Anthracene	40.0
Fluoranthene	29.5
Butyl Benzl Phthalate	51.3
Chrysene	69.9
Ethyl Hexyl Phthalate	29.1
Benzo (b) Fluoranthene	40.0
Benzo (a) Pyrene	24.9
Dibenzo (a,h) Anthracene	40.7
Benzo (g,h,i) perylene	90.4

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincinnati

Water Pollution Quality Control Samples

GC/MS ACIDS

TRUE VALUES

When diluted to volume according to the instructions, the samples contain the following compounds at these concentrations expressed as ug/liter.

Parameter	Sample (1) 4/9/87
2-Chlorophenol	30
2-Nitrophenol	50
Phenol	100
2,4-Dimethylphenol	30
2,4-Dichlorophenol	50
2,4,6-Trichlorophenol	25
4-Chloro-3-methylphenol	75
2-Methyl-4,6-dinitrophenol	250
ophenol	75
nol	50

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Semivolatile Compounds

CLIENT SAMPLE ID:	USEPA-QC SPIKE
LAB SAMPLE ID:	EPAQC0415
SAMPLE DATE:	04/09/87
EXTRACTION DATE:	04/09/87
ANALYSIS DATE:	04/15/87
FILE NAME:	EPAQC0415
INSTRUMENT ID:	MSA
MATRIX:	WATER
UNITS:	UG/L

COMPOUNDS	
Fluorene	41
Hexachlorobenzene	< 10
Hexachlorobutadiene	< 10
Hexachlorocyclopentadiene	< 10
Hexachloroethane	26
Indeno(1,2,3-cd)Pyrene	< 10
Isophorone	< 10
N-Nitroso-Di-n-Propylamine	< 10
N-Nitrosodimethylamine	< 5
N-Nitrosodiphenylamine	< 10
Naphthalene	21
Nitrobenzene	62
4-Nitrophenol	< 50
2-Nitrophenol	38
Pentachlorophenol	80
Phenanthrene	< 10
Phenol	69
Pyrene	< 10
1,2,4-Trichlorobenzene	< 10
2,4,6-Trichlorophenol	22

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincin

Water Pollution Quality Control Samples

GC/MS BASE NEUTRALS - II

TRUE VALUES

When diluted to volume according to the instruction, the sample cc following compounds at these concentration expressed as ug/liter.

Parameter	Sample (3) 4/9/87
1,4-Dichlorobenzene	24.8
Bis (2 chloroisopropyl) ether	38.8
Hexachloroethane	30.0
Nitrobenzene	76.5
Naphthalene	24.8
Dimethyl Phthalate	40.0
Acenaphthene	19.5
Fluorene	51.2
4-Chlorophenyl phenyl ether	76.7
4-Bromophenyl phenyl ether	41.5
Anthracene	40.0
Fluoranthene	29.8
Butyl Benzl Phthalate	51.3
Chrysene	63.9
Ethyl Hexyl Phthalate	29.1
Benzo (b) Fluoranthene	40.0
Benzo (a) Pyrene	24.9
Dibenzo (a,h) Anthracene	40.7
Benzo (g,h,i) perylene	90.4

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincinnati

Water Pollution Quality Control Samples

GC/MS ACIDS

TRUE VALUES

When diluted to volume according to the instructions, the samples conc the following compounds at these concentrations expressed as ug/liter.

Parameter	Sample (1) 4/9/87
2-Chlorophenol	30
2-Nitrophenol	50
Phenol	100
2,4-Dimethylphenol	30
2,4-Dichlorophenol	50
2,4,6-Trichlorophenol	25
4-Chloro-3-methylphenol	75
2-Methyl-4,6-dinitrophenol	250
Pentachlorophenol	75
4-Nitrophenol	50

< - less than ntitation level

QUALITY CONTROL DATA SUMMARY
FOR ORGANIC ANALYSIS

ASSOCIATED SAMPLES: 3338-3341

FRACTION: VOLATILES

A. TUNING (In chronological order)

B. INITIAL (5-POINT) CALIBRATION

C. CONTINUING CALIBRATION (In chronological order)

D. EPA TRACEABLE SAMPLE

INITIAL CALIBRATION DATA
VOLATILE HSL COMPOUNDS

CASE NO: 45 REGION: W INSTRUMENT ID: MS-C
CONTRACTOR: MM ENV SYSTEMS CALIBRATION DATE: 06/24/87
CONTRACT NO:

MIN AVE RF FOR SPCC IS 0.300 (1) MAX %RSD FOR CCC IS 30%

LABORATORY ID	0624V1C1	0624V2C3	0624V3C1	0624V4C1	0624V5C1			CCC*
COMPOUND	RF(20)	RF(50)	RF(100)	RF(150)	RF(200)	AVE RF	% RSD	SPCC**
CHLOROMETHANE	2.190	1.890	1.846	1.982	1.840	1.950	7.5	**
BROMOMETHANE	1.447	1.282	1.244	1.379	1.259	1.322	6.6	
VINYL CHLORIDE	1.480	1.321	1.254	1.384	1.281	1.344	6.7	*
CHLOROETHANE	0.635	0.556	0.530	0.545	0.509	0.555	8.7	
METHYLENE CHLORIDE	1.534	1.385	1.340	1.361	1.378	1.400	5.5	
ACETONE	0.829	0.554	0.518	0.526	0.524	0.590	22.7	
CARBON DISULFIDE	3.118	2.679	2.787	3.083	3.031	2.940	6.6	
1,1-DICHLOROETHENE	1.328	1.190	1.198	1.234	1.257	1.241	4.5	*
1,1-DICHLOROETHANE	2.682	2.381	2.432	2.428	2.449	2.474	4.8	**
1,2-DICHLOROETHENE (TOTAL)	1.433	1.320	1.310	1.303	1.320	1.337	4.0	
CHLOROFORM	3.136	2.862	2.843	2.878	2.943	2.932	4.1	*
1,2-DICHLOROETHANE	2.713	2.419	2.400	2.304	2.194	2.406	8.0	
2-BUTANONE	0.027	0.026	0.027	0.027	0.028	0.027	2.6	
1,1,1-TRICHLOROETHANE	0.416	0.375	0.406	0.408	0.445	0.410	6.1	
CARBON TETRACHLORIDE	0.404	0.373	0.420	0.421	0.466	0.417	8.1	
VINYL ACETATE	0.563	0.424	0.417	0.399	0.410	0.443	15.3	
BROMODICHLOROMETHANE	0.492	0.486	0.511	0.520	0.566	0.515	6.1	
1,2-DICHLOROPROPANE	0.413	0.385	0.397	0.415	0.393	0.401	3.2	*
CIS-1,3-DICHLOROPROPENE	0.350	0.372	0.411	0.459	0.439	0.406	11.2	
TRICHLOROETHENE	0.355	0.364	0.398	0.388	0.414	0.384	6.3	
DIBROMOCHLOROMETHANE	0.365	0.457	0.520	0.538	0.577	0.491	16.9	
1,1,2-TRICHLOROETHANE	0.294	0.317	0.317	0.320	0.333	0.316	4.4	
BENZENE	0.883	0.841	0.876	0.865	0.932	0.879	3.8	
TRANS-1,3-DICHLOROPROPENE	0.226	0.252	0.288	0.316	0.345	0.285	16.7	
BROMOFORM	0.263	0.313	0.358	0.376	0.416	0.345	17.1	**
4-METHYL-2-PENTANONE	0.387	0.393	0.403	0.404	0.444	0.406	5.5	
2-HEXANONE	0.401	0.298	0.318	0.334	0.355	0.341	11.6	
TETRACHLOROETHENE	0.434	0.399	0.419	0.417	0.436	0.421	3.6	
1,1,2,2-TETRACHLOROETHANE	0.576	0.570	0.566	0.575	0.606	0.579	2.7	**
TOLUENE	0.669	0.636	0.647	0.638	0.676	0.653	2.8	*
CHLOROBENZENE	0.893	0.854	0.848	0.836	0.890	0.864	3.0	**
ETHYLBENZENE	0.395	0.365	0.383	0.376	0.398	0.383	3.6	*
STYRENE	0.683	0.651	0.705	0.686	0.736	0.692	4.5	
XYLENE (TOTAL)	0.419	0.418	0.422	0.393	0.429	0.416	3.3	
TOLUENE-D8	1.139	1.012	1.026	1.054	1.027	1.052	4.9	
BFB	0.818	0.700	0.700	0.716	0.718	0.730	6.8	
1,2-DICHLOROETHANE-D4	2.540	2.189	2.121	2.181	2.013	2.209	9.0	

RESPONSE FACTOR (NUMBER IS THE AMOUNT OF UG/L)
AVE RF - AVERAGE RESPONSE FACTOR
%RSD - - PERCENT RELATIVE STANDARD DEVIATION
CCC - - CALIBRATION CHECK COMPOUNDS (*)
SPCC - - SYSTEM PERFORMANCE CHECK COMPOUNDS (**)
(1) - - MINIMUM AVE RF FOR BROMOFORM IS 0.250

FORM VI

GC/MS TUNING AND MASS CALIBRATION
BROMOFLUOROBENZENE

CASE NUMBER:	0914	LABORATORY:	MMES	CONTRACT:	217-50-9309
INST ID:	MS3	SENS DATE:	08/05/87	SENS TIME:	8:34:00
LAB ID:	0805BFBC1	CALI DATE:	06/24/87	ANALYST:	DC

DATA RELEASE AUTHORIZED BY: ____________________

M/E	ION ABUNDANCE CRITERIA	SPEC # 226	
50	15 TO 40% OF MASS 95	19.60	
75	30 TO 60% OF MASS 95	48.76	
95	BASE PEAK, 100% RELATIVE ABUNDANCE	100.00	
96	5 TO 9% OF MASS 95	7.90	
173	LESS THAN 1% OF MASS 95	0.00	
174	GREATER THAN 50% OF MASS 95	77.76	
175	5 TO 9% OF MASS 174	4.84	(6.22) 1
176	BETWEEN 95% AND 101% OF MASS 174	77.89	(100.15) 1
177	5 TO 9% OF MASS 176	4.12	(5.29) 2

1 - VALUE IN PARENTHESIS IS % OF MASS 174
2 - VALUE IN PARENTHESIS IS % OF MASS 176

7A
VOLATILE CONTINUING CALIBRATION CHECK

Lab Name: VERSAR ESMO Contract: ______

Lab Code: ______ Case No.: ______ SAS No.: ______ SDG No.: ______

Instrument ID: MS-C Calibration date: 08/05/87 Time: 1255

Lab File ID: 0805V2C2 Init. Calib. Date(s): 07/27/87 07/27/87

Matrix: (soil/water) WATER Level: (low/med) LOW Column: (pack/cap) PACK

Min RRF50 for SPCC(#) = 0.300 (0.250 for Bromoform) Max %D for CCC(*) = 25.0%

COMPOUND		RRF	RRF50	%D	
Chloromethane	#	3.427	3.243	5.4	#
Bromomethane		1.766	2.207	-25.0	
Vinyl Chloride	*	2.261	1.915	15.3	*
Chloroethane		0.871	0.744	14.6	
Methylene Chloride		1.746	1.746	0.0	
Acetone		0.714	0.602	15.7	
Carbon Disulfide		4.315	4.450	-3.1	
1,1-Dichloroethene	*	1.384	1.551	-12.1	*
1,1-Dichloroethane	#	3.206	2.566	20.0	#
1,2-Dichloroethene (total)		1.561	1.618	-3.7	
Chloroform	*	3.373	3.091	8.4	*
1,2-Dichloroethane		2.488	2.327	6.5	
2-Butanone		0.040	0.024	40.0	
1,1,1-Trichloroethane		0.431	0.366	15.1	
Carbon Tetrachloride		0.422	0.391	7.3	
Vinyl Acetate		0.493	0.542	-9.9	
Bromodichloromethane		0.624	0.503	19.4	
1,2-Dichloropropane	*	0.489	0.404	17.4	*
cis-1,3-Dichloropropene		0.593	0.516	13.0	
Trichloroethene		0.384	0.456	-18.8	
Dibromochloromethane		0.505	0.596	-18.0	
1,1,2-Trichloroethane		0.327	0.347	-6.1	
Benzene		1.080	1.038	3.9	
trans-1,3-Dichloropropene		0.414	0.336	18.8	
2-Chloroethylvinylether		0.164	0.148	9.8	
Bromoform	#	0.299	0.355	-18.7	#
4-Methyl-2-pentanone		0.480	0.371	22.7	
2-Hexanone		0.391	0.300	23.3	
Tetrachloroethene		0.378	0.444	-17.5	
1,1,2,2-Tetrachloroethane	#	0.619	0.533	13.9	#
Toluene	*	0.803	0.754	6.1	*
Chlorobenzene	#	0.957	0.972	-1.6	#
Ethylbenzene	*	0.487	0.476	2.3	*
Styrene		0.855	0.793	7.3	
Xylene (total)		0.571	0.536	6.1	
Toluene-d8		1.008	0.924	8.3	
BFB		0.734	0.658	10.4	
1,2-Dichloroethane-d4		2.376	1.900	20.0	

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Volatile Compounds

CLIENT SAMPLE ID:	LAB BLANK	EPAQC CONC2
LAB SAMPLE ID:	CBLK0417	WP483
SAMPLE DATE:	04/17/87	04/17/87
ANALYSIS DATE:	04/17/87	04/17/87
FILE NAME:	0417VWBC1	VEPACHC
INSTRUMENT ID:	MS-C	MS-C
MATRIX:	WATER	WATER
UNITS:	UG/L	UG/L
DILUTION FACTOR:	1	1
COMPOUNDS		
Acetone	< 50	< 50
Acrolein	< 10	< 10
Acrylonitrile	< 10	< 10
Benzene	< 1	< 1
Bromodichloromethane	< 1	8.4
Bromoform	< 1	9.3
Bromomethane	< 1	< 1
2-Butanone	< 10	< 10
Carbon Disulfide	< 5	< 5
[illegible]bon Tetrachloride	< 1	14
[illegible]lorobenzene	< 1	< 1
Chloroethane	< 1	< 1
2-Chloroethylvinylether	< 1	< 1
Chloroform	< 1	42
Chloromethane	< 1	< 1
Dibromochloromethane	< 1	10
1,2-Dichloroethane	< 1	23
1,1-Dichloroethane	< 1	< 1
1,1-Dichloroethene	< 1	< 1
1,2-Dichloropropane	< 1	< 1
trans-1,3-Dichloropropene	< 1	< 1
cis-1,3-Dichloropropene	< 1	< 1
Ethylbenzene	< 1	< 1
2-Hexanone	< 10	< 10
4-Methyl-2-Pentanone	< 10	< 10
Methylene Chloride	< 5	< 5
Styrene	< 5	< 5
1,1,2,2-Tetrachloroethane	< 1	< 1
Tetrachloroethene	< 1	7.3
Toluene	< 2	< 2
[illegible],1-Trichloroethane	< 1	19
[illegible],2-Trichloroethane	< 1	< 1
Trichloroethene	< 1	13
Trichlorofluoromethane	< 1	< 1
Vinyl Acetate		< 10
Vinyl Chloride	< 1	< 1

Sample 2

Parameter	True Value	$\bar{X}$	S	95% Confidence Limits
1,2-Dichloroethane	22.2	22.0	4.24	13.5 - 30.5
Chloroform	43.0	39.6	7.50	24.6 - 54.6
1,1,1-Trichloroethane	14.3	12.7	2.91	6.9 - 18.5
1,1,2-Trichloroethylene	12.0	10.6	2.67	5.2 - 16.0
Carbontetrachloride	10.0	9.6	2.31	5.0 - 14.2
1,1,2,2-Tetrachloroethylene	6.2	5.9	1.00	3.9 - 7.9
Bromodichloromethane	7.9	7.8	1.45	4.9 - 10.7
Dibromochloromethane	10.7	10.2	2.11	6.0 - 14.4
Bromoform	9.9	9.5	1.93	5.7 - 13.3

WP

QUALITY CONTROL DATA SUMMARY
FOR ORGANIC ANALYSIS

ASSOCIATED SAMPLES: 3338-3341

FRACTION: BNAs

A. TUNING (In chronological order)

B. INITIAL (5-POINT) CALIBRATION

C. CONTINUING CALIBRATION (In chronological order)

D. EPA TRACEABLE SAMPLE

INITIAL CALIBRATION DATA
SEMIVOLATILE HSL COMPOUNDS
(PAGE 1)

REGION: LAB

INSTRUMENT ID: MSA

CALIBRATION DATE: 01/27/87

E NO: 5203

NTRACTOR: VERSAR ESMO

CONTRACT NO:

MINIMUM AVE RF FOR SPCC IS 0.050 MAXIMUM %RSD FOR CCC IS 30%

LABORATORY ID	012751A1	012752A1	012753A1	012754A2	012755A2			CCC*
COMPOUND	RF(20)	RF(50)	RF(80)	RF(120)	RF(160)	AVE RF	% RSD	SPCC**
PHENOL	1.927	1.839	1.613	1.610	1.528	1.703	10.0	*
BIS(2-CHLOROETHYL)ETHER	1.839	1.752	1.664	1.652	1.582	1.700	5.9	
2-CHLOROPHENOL	1.725	1.618	1.450	1.441	1.455	1.538	8.3	
1,3-DICHLOROBENZENE	1.938	1.802	1.719	1.692	1.707	1.772	5.8	
1,4-DICHLOROBENZENE	2.047	1.863	1.789	1.708	1.722	1.826	7.6	*
BENZYL ALCOHOL	0.952	0.961	0.891	0.910	0.940	0.931	3.2	
1,2-DICHLOROBENZENE	1.960	1.775	1.700	1.664	1.684	1.757	6.9	
2-METHYLPHENOL	0.952	0.961	0.891	0.910	0.940	0.931	3.2	
BIS(2-CHLOROISOPROPYL)ETHER	2.096	2.056	1.860	1.914	1.849	1.955	5.8	
4-METHYLPHENOL	1.509	1.384	1.273	1.244	1.255	1.333	8.5	
N-NITROSO-DI-N-PROPYLAMINE	1.621	1.628	1.478	1.902	1.871	1.700	10.6	* *
HEXACHLOROETHANE	0.936	0.918	0.882	0.864	0.884	0.897	3.3	
NITROBENZENE	0.543	0.518	0.486	0.478	0.487	0.502	5.4	
ISOPHORONE	1.011	0.950	0.954	0.968	0.962	0.969	2.5	
2-NITROPHENOL	0.198	0.201	0.206	0.214	0.215	0.207	3.7	*
2,4-DIMETHYLPHENOL	0.319	0.307	0.311	0.314	0.314	0.313	1.4	
BENZOIC ACID	X	0.109	0.095	0.177	0.090	0.118	34.2	
BIS(2-CHLOROETHOXY)METHANE	0.535	0.497	0.493	0.493	0.495	0.503	3.6	
2.4-DICHLOROPHENOL	0.325	0.290	0.291	0.293	0.292	0.298	5.0	*
1.2.4-TRICHLOROBENZENE	0.403	0.353	0.353	0.336	0.336	0.356	7.7	
NAPHTHALENE	1.153	1.028	0.996	0.951	0.947	1.015	8.3	
4-CHLOROANILINE	0.135	0.166	0.182	0.258	0.154	0.179	26.5	
HEXACHLOROBUTADIENE	0.264	0.228	0.241	0.225	0.220	0.236	7.5	*
4-CHLORO-3-METHYLPHENOL	0.402	0.368	0.374	0.372	0.359	0.375	4.3	*
2-METHYLNAPHTHALENE	1.048	0.850	0.841	0.819	0.816	0.875	11.2	
HEXACHLOROCYCLOPENTADIENE	0.252	0.230	0.239	0.287	0.301	0.262	11.8	* *
2,4,6-TRICHLOROPHENOL	0.427	0.405	0.429	0.491	0.556	0.462	13.4	*
2.4.5-TRICHLOROPHENOL	X	0.423	0.418	0.346	0.279	0.367	18.6	
2-CHLORONAPHTHALENE	1.463	1.295	1.285	1.261	1.263	1.311	6.5	
2-NITROANILINE	X	0.461	0.390	0.402	0.434	0.422	7.6	
DIMETHYL PHTHALATE	1.868	1.674	1.299	1.599	1.154	1.517	19.2	
ACENAPHTHALENE	1.988	1.832	1.800	1.690	1.723	1.807	6.4	
3-NITROANILINE	X	0.109	0.084	0.060	0.117	0.093	27.9	
ACENAPHTHENE	1.514	1.290	1.273	0.998	0.874	1.190	21.4	*
2,4-DINITROPHENOL	X	0.117	0.108	0.113	0.114	0.113	3.3	* *
4-NITROPHENOL	X	0.139	0.115	1.055	0.121	0.370	123.8	* *
DIBENZOFURAN	2.321	1.872	1.826	1.786	1.209	1.803	22.0	

RESPONSE FACTOR (NUMBER IS THE AMOUNT OF NANOGRAMS)

AVE RF - AVERAGE RESPONSE FACTOR

%RSD - - PERCENT RELATIVE STANDARD DEVIATION

CCC - - CALIBRATION CHECK COMPOUNDS (*)

SPCC - - SYSTEM PERFORMANCE CHECK COMPOUNDS (**)

X - - - NOT DETECTABLE AT 20 NG

FORM VI

5B

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: VERSAR ESMO Contract: ________

Lab Code: ______ Case No.: D807 SAS No.: ______ SDG No.: ______

Lab File ID: 0807DFTA1 DFTPP Injection Date: 08/07/87

Instrument ID: MS-A DFTPP Injection Time: 1003

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	46.8
68	Less than 2.0% of mass 69	(0.0)1
69	Mass 69 relative abundance	56.8
70	Less than 2.0% of mass 69	(0.0)1
127	40.0 - 60.0% of mass 198	56.3
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	8.2
275	10.0 - 30.0% of mass 198	29.9
365	Greater than 1.00% of mass 198	7.50
441	Present, but less than mass 443	14.2
442	Greater than 40.0% of mass 198	95.1
443	17.0 - 23.0% of mass 442	(19.6)2

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	ABLK0804	LAB	0804SWBA1	08/07/87	2206
02	3338	LDBWG	BNA3338	08/07/87	2245
03	3339	DLSW-	BNA3339	08/07/87	2324
04	3340	LDAWG	BNA3340	08/08/87	0003
05	3340MS	LDAWG	BNA3340MS	08/08/87	0043
06	3340MSD	LDAWG	BNA3340MSD	08/08/87	0123
07	3341	LDFB	BNA3341	08/08/87	0202
08	AMSTD804	METHOD	0804MSTD	08/08/87	0242

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 1)

Case No:	5203	Calibration Date:	08/07/87
Region:		Time:	10:26
ntractor:	VERSAR ESMO	Laboratory ID:	0807S2A1
Contract No:		Initial Cali. Date:	01/27/87
Instrument ID:	MS-A		

Minimum RF for SPCC is 0.050   Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
Phenol		1.703	1.588	6.8	*	
bis(2-Chloroethyl)Ether		1.700	1.285	24.4		
2-Chlorophenol		1.538	1.364	11.3		
1,3-Dichlorobenzene		1.772	1.574	11.2		
1,4-Dichlorobenzene		1.826	1.606	12.0	*	
Benzyl Alcohol		0.931	0.731	21.5		
1,2-Dichlorobenzene		1.757	1.572	10.5		
2-Methylphenol		0.931	1.284	-37.9		
bis(2-Chloroisopropyl)Ether		1.955	1.164	40.5		
4-Methylphenol		1.333	1.325	0.6		
N-Nitroso-Di-n-Propylamine		1.700	1.111	34.6		**
Hexachloroethane		0.897	0.957	-6.7		
Nitrobenzene		0.502	0.677	-34.9		
Isophorone		0.969	0.934	3.6		
2-Nitrophenol		0.207	0.215	-3.9	*	
2,4-Dimethylphenol		0.313	0.519	-65.8		
Benzoic Acid	x	0.118	0.083	29.7		
s(2-Chloroethoxy)Methane		0.503	0.490	2.6		
4-Dichlorophenol		0.298	0.301	-1.0	*	
1,2,4-Trichlorobenzene		0.356	0.363	-2.0		
Naphthalene		1.015	1.025	-1.0		
4-Chloroaniline		0.179	0.111	38.0		
Hexachlorobutadiene		0.236	0.295	-25.0	*	
4-Chloro-3-Methylphenol		0.375	0.460	-22.7	*	
2-Methylnaphthalene		0.875	0.730	16.6		
Hexachlorocyclopentadiene		0.262	0.349	-33.2		**
2,4,6-Trichlorophenol		0.462	0.412	10.8	*	
2,4,5-Trichlorophenol	x	0.367	0.387	-5.4		
2-Chloronaphthalene		1.311	1.094	16.6		
2-Nitroaniline	x	0.422	0.409	3.1		
Dimethyl Phthalate		1.517	1.403	7.5		
Acenaphthalene		1.807	1.583	12.4		
2,6-Dinitrotoluene		0.263	0.273	-3.8		
3-Nitroaniline	x	0.093	0.037	60.2		
Acenaphthene		1.190	1.147	3.6	*	
2,4-Dinitrophenol	x	0.113	0.151	-33.6		**

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)

AVE RF - Average Response Factor from initial calibration Form VI

%D - - - Percent Difference

x - - - Due to low response analyze at 80 total nanograms

CCC - - Calibration Check Compounds (*)

SPCC - - System Performance Check Compounds (**)

Form VII

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 2)

Case No: 5203 Region: ____________
Contractor: VERSAR ESMO
Contract No: ____________
Instrument ID: MS-A

Calibration Date: 08/07/87
Time: 10:26
Laboratory ID: 080752A1
Initial Cali. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
4-Nitrophenol	x	0.370	0.327	11.6		* *
Dibenzofuran		1.803	1.632	9.5		
2,4-Dinitrotoluene		0.344	0.390	-13.4		
Diethylphthalate		1.686	1.710	-1.4		
4-Chlorophenyl-phenylether		0.676	0.626	7.4		
Fluorene		1.275	1.211	5.0		
4-Nitroaniline	x	0.097	0.130	-34.0		
4,6-Dinitro-2-Methylphenol	x	0.128	0.147	-14.8		
N-Nitrosodiphenylamine		0.494	0.395	20.0	*	
4-Bromophenyl-phenylether		0.316	0.309	2.2		
Hexachlorobenzene		0.373	0.412	-10.5		
Pentachlorophenol	x	0.160	0.184	-15.0	*	
Phenanthrene		1.193	1.139	4.5		
Anthracene		1.194	1.081	9.5		
Di-n-Butylphthalate		1.615	1.707	-5.7		
Fluoranthene		1.228	1.198	2.4	*	
Pyrene		1.449	1.564	-7.9		
Butylbenzylphthalate		0.758	0.808	-6.6		
3,3'-Dichlorobenzidine		0.051	0.111	-117.6		
Benzo(a)Anthracene		1.100	1.086	1.3		
Chrysene		1.128	0.969	14.1		
bis(2-Ethylhexyl)Phthalate		1.072	1.095	-2.1		
Di-n-Octyl Phthalate		2.656	2.119	20.2	*	
Benzo(b)fluoranthene		1.564	1.442	7.8		
Benzo(k)fluoranthene		1.568	1.453	7.3		
Benzo(a)Pyrene		1.209	1.096	9.3	*	
Indeno(1,2,3-cd)Pyrene		0.701	0.908	-29.5		
Dibenz(a,h)Anthracene		0.705	0.707	-0.3		
Benzo(g,h,i)Perylene		0.724	0.731	-1.0		

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
x - - - Due to low response analyze at 80 total nanograms
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)

Form VII

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Semivolatile Compounds

CLIENT SAMPLE ID: USEPA-QC SPIKE
LAB SAMPLE ID: EPAQC0415
SAMPLE DATE: 04/09/87
EXTRACTION DATE: 04/09/87
ANALYSIS DATE: 04/15/87
FILE NAME: EPAQC0415
INSTRUMENT ID: MSA
MATRIX: WATER
UNITS: UG/L

COMPOUNDS	
Acenaphthalene	< 10
Acenaphthene	17
Anthracene	32
Benzidine	< 80
Benzo(a)Anthracene	< 10
Benzo(a)Pyrene	18
Benzo(b+k)Fluoranthenes	31
Benzo(g,h,i)Perylene	69
4-Bromophenyl-phenylether	38
Butylbenzylphthalate	42
4-Chloro-3-Methylphenol	59
bis(2-Chloroethoxy)Methane	< 10
s(2-Chloroethyl)Ether	< 10
s(2-Chloroisopropyl)Ether	30
2-Chloronaphthalene	< 10
2-Chlorophenol	24
4-Chlorophenyl-phenylether	71
Chrysene	59
Di-n-Butylphthalate	< 10
Di-n-Octyl Phthalate	< 10
Dibenz(a,h)Anthracene	50
1,2-Dichlorobenzene	< 10
1,4-Dichlorobenzene	22
1,3-Dichlorobenzene	< 10
3,3'-Dichlorobenzidine	< 20
2,4-Dichlorophenol	42
Diethylphthalate	< 10
Dimethyl Phthalate	44
2,4-Dimethylphenol	14
4,6-Dinitro-2-Methylphenol	147
2,4-Dinitrophenol	< 50
2,4-Dinitrotoluene	< 10
2,6-Dinitrotoluene	< 10
1,2-Diphenylhydrazine	< 10
bis(2-Ethylhexyl)Phthalate	25
Fluoranthene	30

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincinnat

Water Pollution Quality Control Samples

GC/MS BASE NEUTRALS - II

TRUE VALUES

When diluted to volume according to the instruction, the sample contai following compounds at these concentration expressed as ug/liter.

Parameter	Sample 3 4/9/87
1,4-Dichlorobenzene	24.8
Bis (2 chloroisopropyl) ether	38.8
Hexachloroethane	30.0
Nitrobenzene	76.5
Naphthalene	24.8
Dimethyl Phthalate	40.0
Acenaphthene	19.5
Fluorene	51.2
4-Chlorophenyl phenyl ether	76.7
4-Bromophenyl phenyl ether	41.5
Anthracene	40.0
Fluoranthene	29.3
Butyl Benzl Phthalate	51.3
Chrysene	69.9
Ethyl Hexyl Phthalate	29.1
Benzo (b) Fluoranthene	40.0
Benzo (a) Pyrene	24.9
Dibenzo (a,h) Anthracene	40.7
Benzo (g,h,i) perylene	90.4

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincinnati

Water Pollution Quality Control Samples

GC/MS ACIDS

TRUE VALUES

When diluted to volume according to the instructions, the samples contain the following compounds at these concentrations expressed as ug/liter.

Parameter	Sample 1. 4/9/87
2-Chlorophenol	30
2-Nitrophenol	50
Phenol	100
2,4-Dimethylphenol	30
2,4-Dichlorophenol	50
2,4,6-Trichlorophenol	25
4-Chloro-3-methylphenol	75
2-Methyl-4,6-dinitrophenol	250
Pentachlorophenol	75
4-Nitrophenol	50

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Semivolatile Compounds

CLIENT SAMPLE ID:	USEPA-QC SPIKE
LAB SAMPLE ID:	EPAQC0415
SAMPLE DATE:	04/09/87
EXTRACTION DATE:	04/09/87
ANALYSIS DATE:	04/15/87
FILE NAME:	EPAQC0415
INSTRUMENT ID:	MSA
MATRIX:	WATER
UNITS:	UG/L

COMPOUNDS	
Fluorene	41
Hexachlorobenzene	< 10
Hexachlorobutadiene	< 10
Hexachlorocyclopentadiene	< 10
Hexachloroethane	26
Indeno(1,2,3-cd)Pyrene	< 10
Isophorone	< 10
N-Nitroso-Di-n-Propylamine	< 10
N-Nitrosodimethylamine	< 5
N-Nitrosodiphenylamine	< 10
Naphthalene	21
Nitrobenzene	62
4-Nitrophenol	< 50
2-Nitrophenol	38
Pentachlorophenol	80
Phenanthrene	< 10
Phenol	69
Pyrene	< 10
1,2,4-Trichlorobenzene	< 10
2,4,6-Trichlorophenol	22

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincir

Water Pollution Quality Control Samples

GC/MS BASE NEUTRALS - II

TRUE VALUES

When diluted to volume according to the instruction, the sample cc following compounds at these concentration expressed as ug/liter.

Parameter	Sample (3) 4/9/87
1,4-Dichlorobenzene	24.8
Bis (2 chloroisopropyl) ether	38.8
Hexachloroethane	30.0
Nitrobenzene	76.5
Naphthalene	24.8
Dimethyl Phthalate	40.0
Acenaphthene	19.5
Fluorene	51.2
4-Chlorophenyl phenyl ether	76.7
4-Bromophenyl phenyl ether	41.5
Anthracene	40.0
Fluoranthene	29.8
Butyl Benzl Phthalate	51.3
Chrysene	68.9
Ethyl Hexyl Phthalate	29.1
Benzo (b) Fluoranthene	40.0
Benzo (a) Pyrene	24.9
Dibenzo (a,h) Anthracene	40.7
Benzo (g,h,i) perylene	90.4

U.S. Environmental Protection Agency
Environmental Monitoring and Support Laboratory - Cincinnati

Water Pollution Quality Control Samples

GC/MS ACIDS

TRUE VALUES

When diluted to volume according to the instructions, the samples cor the following compounds at these concentrations expressed as ug/liter.

Parameter	Sample (1) 4/9/87
2-Chlorophenol	30
2-Nitrophenol	50
Phenol	100
2,4-Dimethylphenol	30
2,4-Dichlorophenol	50
2,4,6-Trichlorophenol	25
4-Chloro-3-methylphenol	75
2-Methyl-4,6-dinitrophenol	250
Pentachlorophenol	75
4-Nitrophenol	50

< - less than ntitation level